Groundwater Awareness Week

March 7 – 13, 2010 is National Groundwater Awareness Week. Groundwater is found in the spaces between particles and cracks in underground rock in formations known as aquifers. Even though it is out of sight, groundwater should not be far out of mind. In Texas, groundwater provides 59% of all freshwater used, supplies 79% of the water used by agriculture and is a source of drinking water for over 6.95 million Texans.

Groundwater Awareness Week 1
- *Groundwater 101* 1
- *The Hydrologic Cycle* 2
- *Threats to Groundwater* 2
  - *Natural Contamination* 2
  - *Contamination from Man's Activities* 3
  - *Use* 3
  - *Storm Water* 3
  - *Onsite Wastewater Treatment Systems* 3
- *Who Protects My Groundwater?* 4
- *What You Can Do!* 5
- *Groundwater Facts & References** 6
- *National Groundwater Awareness Week Flyer* 6

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 groundwater.

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 33 percent of the population used groundwater as a drinking water source in 2000.

According to the 2007 Texas Water Plan developed by the Texas Water Development Board, groundwater supplied 59 percent of the 16.2 million acre-feet of water used in the State in 2003. Farmers use about 79 percent of this groundwater to irrigate crops. Approximately 36 percent of the water used for municipal needs was groundwater. 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 sand and rock called aquifers. Aquifers typically consist of gravel, sand, sandstone, or fractured rock, like limestone and granite. These materials are permeable because they have 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 be 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 and 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, snow melt, or runoff moving through the overlying layers of soil and seeping into the aquifer below. In some areas of the world, people face serious water shortages because groundwater is used faster than it is naturally replenished. Groundwater may also be polluted by human activities.

Top of Document

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.

Top of Document

Threats to Groundwater

There is no doubt that groundwater is an important and valuable resource, as it provides a large percentage of the 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.

Natural Contamination -- In a small percentage of wells, contaminates such as nitrate, sulfate, arsenic, radionuclides, perchlorate and total dissolved solids have exceeded federal standards. There is some debate as to whether all occurrences of these constituents are naturally occurring or the result of man-made activities. The Texas AgriLife Extension Service (TAES) has developed a number of Drinking Water Problems Fact Sheets which discuss the sources, health affects, where problems are known to exist, what can be done by the well owner, and different water treatment methods that can be used by the private well owner. All of these Fact Sheets can be found at the TAES online bookstore (http://agrilifebookstore.org/) – on the left side of the webpage:

- Click on "SEARCH"
- Enter "drinking water" (without quotes) for "Keyword or Phrase ?" and then click on **Submit Query**
- Click on the publication icon/number of interest (some of which are available in Spanish), and then click on **View PDF** to view or print it free of cost
- TAES publications L-5450 and L-5450S ("Solving Water Quality Problems in the Home" in English and Spanish, respectively) and E-176 ("What's In My Water?") are a good introduction to this subject

- Additional publications of interest include Arsenic (L-5467 and L-5467S), Perchlorate (L-5468 and L-5468S), Nitrate (B-6184 and B-6184S), Radionuclides (B-6192 and B-6192S), MTBE (L-5502), and Benzene (L-5513)

Contamination from Man's Activities -- There are 4,729 cases of groundwater contamination from man's activities in Texas in 2007, as listed in the Texas Groundwater Protection Committee's 2008 Joint Groundwater Monitoring and Contamination Report. This report gives the status of the remediation effort, county, type of contamination, and location for each case and describes the groundwater monitoring efforts and programs at each state agency. The most commonly reported contaminants come from leaking 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 5,267 case of documented groundwater contamination reported in 2007 in Texas, 65 percent are related to the storage of petroleum products underground.

In addition, the volume of water used, storm water contamination, and the poor maintenance of septic systems are also threats to groundwater 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.

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 conserve your groundwater:

- Run full loads of dishes and laundry.
- Check for leaky faucets and have them fixed.
- Keep a pitcher of drinking water in the refrigerator.
- Purchase water efficient appliances.
- Utilize drought tolerant landscaping.
- Don’t over water plants and lawns.

Storm Water – Rainfall in urban areas can threaten groundwater by carrying contaminants into the groundwater as recharge to the aquifer. 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. This ends up discharging into waterways as sediment, sludge and solids or recharging aquifers. The most effective way to reduce contamination is to prevent pollution entering the storm water system. Here are some examples of what you can do to prevent groundwater contamination from storm water:

- Dispose of chemicals properly.
- Take used motor oil to a recycling center.
- Limit the amount of fertilizer used on plants.
- Decrease or eliminate fertilizer and pesticide use.
- Wash your car at a car wash where water is collected for treatment before discharge.
- Never dump oil or other hazardous materials down the storm drain or on pavement that will eventually lead to the storm drain.
- Clean up automotive spills.

Many cities have household hazardous waste drop offs. Does yours?

Onsite Wastewater Treatment Systems – Sewage systems dispose of waste from homes and businesses -- often referred to as Septic Systems. Proper maintenance, construction and use can

protect groundwater resources. However, improper use and poor maintenance can lead to contamination of groundwater supplies from bacteria, viruses and other pollutants.

Here are some management ideas to improve your septic system performance:

- Install a low-flow toilet. Well-designed units give a complete flush with 1½ gallons per flush. Caution: displacing water with bricks or water bottles in old toilet tanks often gives less than a total flush and dissolving bricks can cause leaking problems.
- Install low-flow showerheads, hand held showers with pause control, and temperature balance valve controls.
- Shut off water while shaving and brushing teeth (saves up to 5 gallons per minute).
- Do not use a garbage disposal or dispose of vegetables, meat, fat, oil, coffee grounds and other undigested food products in the septic system. (Use composting or garbage service.)
- Reduce the use of drain cleaners by minimizing the amount of grease and food particles that go down the drain.
- Wash only full loads. Adjust load level settings for small loads.
- Reroute the water softener and iron filter recharge water outside the septic system. It does not need to be treated.
- There is no quick fix or substitute for proper operation and regular maintenance. Do not use starters, feeders, cleaners and other additives. Many of these additives suggest they work via "enzyme" or "bacterial" action. But there are millions of bacteria and plenty of food for them entering the system in normal sewage. If the bacterial activity level is low, figure out what is killing them (for example, household cleaners) and correct it. High levels of activity will return after the correction.

Top of Document

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

- **Groundwater Monitoring**

By monitoring for changes in groundwater quantity and quality

- **Resource Management**

By regulating groundwater, oil, gas, and mineral recovery to ensure the protection of groundwater **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 Chapter III of the Texas Groundwater Protection Strategy.**

Top of Document

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. Protecting your source of groundwater is also up to you. Texans are fortunate to have the advantage of vast natural resources, among them clean and safe sources of drinking water. However, to ensure these continued resources we must all take a greater role in protecting our sources of drinking water. Do you know where your source water comes from? Is it groundwater or surface water? Does it come from a private or public water supply? What are the possible contaminants near your water supply?

Here are a few things you can do to protect your source of drinking water:

1 - Be aware – Do you know where the tap water in your house comes from? Is it groundwater or surface water? Does it come from a spring, lake or other public water supply? Are there potential sources of contamination near by?

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. When using chemicals on your lawn and garden, do you follow the label directions? More is not better with these products.

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.

Here are eleven 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.
- Properly dispose of pharmaceutical products. Find out if your city or pharmacy has established programs for disposal of expired medications and other pharmaceuticals.
- If you have a private well, it is your responsibility to protect and maintain it. Water wells should be sampled and tested at least once a year to help ensure safe water consumption.

Top of Document

*Groundwater Facts & References**

Groundwater provides an estimated*

Nationwide	Texas
• 22% of all freshwater withdrawals	• 59% of all freshwater withdrawals
• 37% of agricultural use (mostly for irrigation)	• 79% of agricultural use (mostly for irrigation)
• 37% of the public water supply withdrawals	• 36% of the public water supply withdrawals
• 99% of drinking water for the rural population	• >99% of drinking water for the rural population

**From the United States Geological Survey, the Environmental Protection Agency (EPA), the Texas Water Development Board, and the Texas Commission on Environmental Quality*

- Ninety four percent of Texans depend on public drinking water supplies. Seven percent of that supply, 94 million gallons per day, is from groundwater, serving over 5,760,000 Texans.
- There are 13,923 active public water supply wells in Texas ranging in depth from 17 to 5,400 feet.
- Nine major aquifers and 21 minor aquifers supply 59% of all the water used in the state.
- In addition, 1,190,000 Texans rely on groundwater from their own wells for their drinking water and use 131 million gallons per day.
- The quality of Texas' groundwater is generally good, and after the required disinfection, meets EPA's safe drinking water standards without additional treatment.

Only 2.5% of the water on the earth is fresh. Of this small amount, 68.9% is glaciers, 30.8% is groundwater and lakes and rivers make up only 0.3%.
http://earthobservatory.nasa.gov/Study/WeighingWater/

For more information on groundwater visit:

- The Texas Groundwater Protection Committee (TGPC) at http://www.tgpc.state.tx.us
  - TGPC Frequently Asked Questions (FAQs) at http://www.tgpc.state.tx.us/FAQs.htm
- 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/public/awarenessweek/index.aspx
- The U.S. Geological Survey at http://water.usgs.gov and http://pubs.usgs.gov/circ/2004/circ1268/
- The Texas Water Development Board 2007 State Water Plan, Volume II, Chapter 7, Groundwater Resources

National Groundwater Awareness Week Flyer

Top of Document