SOIL AND WATER CONSERVATION SOCIETY

Understanding & Protecting Wisconsin's Groundwater

Wisconsin Soil and Water Conservation Society

Thursday, February 9, 2012

Overview

Overview of Wisconsin's Hydrogeology
By Ken Bradbury - Program Leader, Hydrology, Wisconsin Geological and Natural History Survey

Wisconsin is rich in groundwater resources, and excellent high-yielding aquifers occur in many parts of the state. Groundwater is part of the water cycle, and groundwater moves from recharge to discharge areas along flow paths governed by local geology and topography. Groundwater sustains levels and flows in Wisconsin's springs, lakes, streams, and wetlands, and groundwater and surface water are so well-connected that they can be thought of and managed as a single resource. Pumping from high-capacity wells has reduced groundwater levels and impacted surface water resources in some areas, and the severity of these impacts depends on the local hydrogeologic setting. This talk will discuss the general hydrogeology of Wisconsin and how groundwater resources vary across the state.

Implications of Groundwater Pumping on Wisconsin Water Health – The Central Sands Example
By George Kraft - Professor, University of Wisconsin Stevens Point

Groundwater pumping unavoidably lowers water levels and reduces stream flows. At some point, an increasing amount of groundwater pumping will exceed the capacity of landscapes to support both pumping and healthy lakes, streams, and wetlands. The central sands are one locale where this capacity has been exceeded. Today, some 3000 irrigation wells in three central sands counties pump about 67 billion gallons of water annually. This pumping has caused stream headwaters and lakes to dry along with attendant ecosystem impacts such as fish kills. Efforts to manage groundwater pumping within the constraints of healthy surface waters have thus far been stymied. More water stressed regions will be created in other parts of the state as groundwater pumping expands if Wisconsin does not adopt a groundwater management strategy.

Drawdown and Recovery around Green Bay, WI: Following the Bouncing Groundwater Levels
By Dave Hart - Hydrogeologist, Wisconsin Geological and Natural History Survey

The deep confined sandstone aquifer in the region around Green Bay, Wisconsin has experienced two major drawdown and recovery cycles due to Green Bay in 1957 and then surrounding communities in 2007 switching from groundwater to surface water. Historically, wells drilled into this aquifer were flowing with heads 10s of feet above land surface. Today groundwater levels are rising and a few wells have again begun flowing. The drawdown's and recoveries illustrate how aquifers and communities respond to groundwater availability.

Groundwater Challenges of Calumet County Private Wells in Karst Landscapes
By Danielle Santry- Groundwater Specialist, Calumet County Land & Water Conservation Department

An in depth look at groundwater vulnerability on karst landscapes, groundwater quality data from the Calumet County private well testing program, and the challenges of maintaining productive agricultural operations on sensitive landscapes.

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Human Viruses in Deep Groundwater
By Ken Bradbury - Program Leader, Hydrology, Wisconsin Geological and Natural History Survey

Over the past few years we have repeatedly found human viruses in water produced by deep wells in the Madison area. These virus detections were surprising because the wells draw water from beneath a shale aquitard and groundwater movement was thought to be too slow to allow infective viruses to penetrate deeply. The viruses are specific to humans and apparently originate as leakage from sanitary sewers. These findings are causing us to rethink long-accepted concepts of groundwater protection based on uniform-flow assumptions by emphasizing more rapid transport through subsurface fractures and other heterogeneities. Our research is continuing to investigate potential virus transport pathways. The important implication is that deep water supply wells may be more vulnerable to contamination than previously assumed.

Sulfide minerals, wells and water quality
By Dave Johnson - Hydrogeologist, Wisconsin Department of Natural Resources

Sulfide minerals are very common in the bedrock aquifers across the state and can be found in glacial deposits too. The various sources of sulfide minerals will be described. The sulfide minerals can severely affect groundwater and drinking water quality when geochemical conditions are changed due to well construction/operation and regional drawdown in an aquifer. Extremely low pH and very high levels of metals and arsenic have been found in numerous potable wells across the state. Differences in the water quality will be explained by the source of the sulfide. The DNR has developed well construction methods to minimize the impact of sulfide oxidation which has proven successful. The development of these drilling techniques and the use of them across the state will be explained. Conservation of groundwater as an important factor in minimizing the problem from sulfides will also be discussed.

Effects of nutrient management on groundwater quality: Nitrogen Issues and concerns
By Kevin Masarik - Senior Outreach Specialist, University of Wisconsin Stevens Point

There is increasing interest in the water quality benefits of nutrient management to groundwater. A seven-year study of nitrate leaching (1996-2002) showed the effects on water quality of sub-optimal, economic optimal and excess nitrogen fertilization. We know from this study that economic optimal rates are preferred to over application of nitrogen; however concentrations below fields receiving optimal rates of nitrogen were still significantly elevated over natural levels traditionally found in groundwater. If we assume that farmers have historically been over-applying nitrogen, the implication is that groundwater quality should be getting better as a result of nutrient management. Each watershed landscape is a complex system and the long residence time of groundwater, changing rotations, conversion of CRP land back to production, climatic variability and other factors make answering this question difficult beyond field scale experiments. Some practices may even negate water quality improvements from nutrient management.

Hydrofrac Sand Mining in Wisconsin: The Resource and the Issues
By Bruce Brown - Senior Geologist, Wisconsin Geological and Natural History Survey

The frac mining process, where and how it works and where it doesn't. Why Wisconsin and Minnesota are the hot spots for sand mining. What defines good frac sand and were the resources are located. Also the environmental concerns and operational issues that have resulted from the sudden expansion of the industry with be covered.