

## **Chapter 6 -- DIRECTIONS FOR FUTURE GROUNDWATER PROTECTION**

The Groundwater Coordinating Council (GCC) is directed by statute to include in its annual report a "list and description of current and anticipated groundwater problems" and to "set forth the recommendations of the Council" (s. 15.347(13)(g), Wis. Stats.). The purpose of this Chapter is to call attention to statewide priorities in the area of research, monitoring, policy, planning, and coordination related to groundwater and to provide direction to the GCC and its Subcommittees. In addition, this Chapter sets forth the Council's recommendations for future groundwater protection and management needs to state agencies, the Governor, the Legislature, and the citizens of Wisconsin.

### **RESEARCH & MONITORING PRIORITIES**

- **Evaluate acute and chronic impacts to groundwater from manure management practices:** Groundwater contamination associated with manure handling and disposal is an ongoing problem in many parts of Wisconsin. Rural home owners sometimes report brown, discolored, or smelly well water, and some of these cases have been directly linked to manure contamination. Concern about this problem is increasing as Wisconsin farming methods have evolved toward larger farms with thousands of animal units and proportionally higher waste loads. Manure handling has also evolved toward producing material with higher liquid content, which is easier to transport and store but has a higher probability of moving to groundwater than the higher-solid manure produced by traditional Wisconsin farms. A statewide assessment of manure-groundwater issues is needed to understand the scope and magnitude of the problem. Mechanisms, pathways, and timing of movement into groundwater, the influence of landscape settings and climatic factors, the applicability of new analytical tools and methods of vulnerability assessment and best management practices (BMPs) and the threat of associated contaminants (bacteria, nitrate, pharmaceuticals, viruses, other pathogens, etc) all need to be better understood. Several manure management research and monitoring projects started in FY 08. The GCC and its subcommittees need to help evaluate the findings and guide follow-up projects on this topic to assure an effective response to this problem.
- **Understand and better predict impacts from groundwater withdrawals:** Recent headlines about lakes, streams, and springs drying up in various parts of the state, and severe groundwater level drawdowns in southeastern Wisconsin have generated many questions about the effects of groundwater withdrawals on surface waters and long-term groundwater availability. There is a need to further quantify hydrologic relationships between surface water and groundwater, as well as to develop tools to evaluate the impacts of withdrawals on surface waters. The GCC should continue to encourage research efforts that will address this issue.
- **Continue to evaluate and catalog Wisconsin's groundwater resources.** Water supply problems are typically not statewide problems but rather local supply problems. That is, the flow of water in the natural system cannot always keep up with the local demands placed upon it; our ability to extract water locally exceeds the natural replenishment. In addition, water cannot be transported easily around the state to meet local shortages. So although we have ample amounts of water in our state, we can still experience water shortages locally. The groundwater resource needs to be further defined in terms of its quality, quantity, and availability.

- **Investigate extent and origins of naturally occurring substances in groundwater:** Continued problems of elevated arsenic, low pH, and other water quality problems in domestic wells exist over large areas of northeast Wisconsin. Additionally elevated sulfate, total dissolved solids (TDS), and radium have been found in some new deep municipal wells in the Lower Fox River Valley and some such wells is difficult to use. In some other existing deep wells as far south as Milwaukee, the TDS have been steadily increasing over the years. These radium, sulfate and TDS levels pose a problem for local water managers, and the origin of the dissolved solids is not completely understood. The State needs more information about the extent and causes of these problems in order to give advice to homeowners, municipalities, and well drilling contractors. The GCC should continue to encourage research efforts that will provide information useful in addressing these issues.
  
- **Evaluate occurrence of recently discovered groundwater contaminants:** Recent research conducted in Europe and the U.S. indicates that traces of pharmaceuticals (including antibiotics and hormones) and pesticide breakdown products are common contaminants found in groundwater and surface water. Recent sampling funded by the WDNR and USGS documented wastewater byproducts in some drinking water wells in Wisconsin. In addition, studies have found evidence of viruses and other microbial agents in both municipal water supplies and domestic wells. More research is needed to evaluate the threats these substances pose a threat to Wisconsin's groundwater resource, and also to human health.
  
- **Understand the links between land use and groundwater quantity and quality:** Intelligent decision-making requires an understanding of how land use change (such as a change from rural to urban land use) impacts groundwater.. For example, Juckem et al. (2008) show that land management mitigates or magnifies stresses such as climate change; agricultural nonpoint source rules require nutrient management plans that protect surface water quality, but may also improve groundwater quality. Another example is the impact of storm water infiltration on groundwater. Stormwater infiltration rules require storm water infiltration trenches in many commercial and multi-family residential settings in Wisconsin. This will help reduce runoff in urban areas, but the impacts of trenches on groundwater are not fully understood. Research is needed to determine the impact of infiltration devices on local groundwater, and to assess the need for signage or abandonment criteria to protect the groundwater resource.
  
- **Evaluate potential impacts of climate change on Wisconsin's groundwater:** Climate change will likely increase the frequency and severity of weather patterns that may produce unprecedented flooding or drought conditions. As a result, land and water use patterns may also change and bring new threats to the groundwater supply. These may include biological or chemical contamination issues or increased demand for groundwater by agricultural, municipal, and commercial users. Additionally, recent groundwater/surface-water modeling by USGS suggests that climate change will affect timing of groundwater recharge, amount of baseflow in streams, the relative contribution of groundwater to lakes, and the wetland distribution on our landscape. More work is needed on the range of possible climates in Wisconsin's future. Work is also needed on feedback mechanisms between climate and groundwater to fully characterize the envelope of possible changes to Wisconsin's groundwater resource. This research will help identify ways to properly manage Wisconsin's groundwater supply under changing conditions.

## **POLICY & PLANNING PRIORITIES**

- **Address groundwater quantity management issues at both statewide and regional levels:** Groundwater quantity issues came to the forefront of public discussion in FY 04, with the development and passage of landmark groundwater quantity legislation, 2003 Wisconsin Act 310. Since passage of the new law the DNR has begun implementing the new law and the Groundwater Advisory Committee has addressed specific policy issues related to groundwater management planning and the overall effectiveness of the law. There is a need for proactive regional groundwater planning in certain areas of the state where development/population growth pressures intersect limited groundwater resources leading to water availability and sustainability issues. The GCC will continue to serve as a resource for addressing scientific and technical questions related to groundwater quantity and facilitate further dialogue among all parties on potential approaches and solutions as well as identifying additional areas with developing or potential groundwater quantity problems.
- **Find solutions to groundwater nonpoint pollution problems:** A 2008 DATCP report indicated that 33.5% of wells contain a detectable level of at least one pesticide or pesticide metabolite and 11.7% of Wisconsin's wells still contain detectable atrazine residues. In addition, 9% exceed the nitrate standard. These rates are substantially higher in agricultural areas. More work is needed to determine if Wisconsin groundwater will continue to deteriorate without a substantial change in farming practices, and what practices will sustain both agriculture and groundwater quality. The GCC will support the agencies and the UWS in obtaining information pertinent to the human health implications of consuming nitrate and pesticide contaminated groundwater and the effect of discharge of this groundwater on surface waters and their ecosystems.
- **Meet funding needs for nutrient management practice research to evaluate resource protection effectiveness.** From 2005 to 2007, nitrogen fertilizer sales increased 25% resulting in the application of approximately 400 million pounds of N in excess of UW recommendations. A recent DATCP survey of private well water quality shows increasing probability of nitrogen contamination of drinking water as the percentage of nearby agricultural land use increases. A USGS study further finds that nitrate contamination of groundwater is increasing statewide. The adoption of nutrient management plans by farmers would reduce nitrogen loading to groundwater. Nutrient management planning has increased dramatically in recent years and with a tight agricultural economy, farmers are embracing nutrient management because it is both economically as well as environmentally positive. While nutrient management planning is a necessary first step, the plans must be implemented and maintained over time. Additionally, the individual practices that make up nutrient management plans need to be researched and evaluated to ensure both practicality for farmers as well as effective groundwater and surface water protection. No funds for this needed research are currently budgeted.
- **Develop methods to assess and protect against health hazards posed by exposure to 'orphan' contaminants as well as multiple contaminants in a water supply.** Data collected by DNR and DATCP indicate that many groundwater aquifers are contaminated with 'orphan' chemicals, such as pesticide degradates, chlorinated organics and petroleum derivatives, for which toxicity information is inadequate to support risk assessment. Solutions are needed to effectively address scenarios where multiple contaminants are present in a well. Frequently wells are found to have one or more pesticide degradates present, perhaps in tandem with a parent compound or totally unrelated compounds. The GCC will support the agencies in their attempt to develop uniform methods that can be used to establish contaminant-specific advisories for owners of impacted water supplies.

- **Continue to fund groundwater monitoring and research:** Numerous years of state budget cuts and increased costs have reduced the number of groundwater research and monitoring projects that are funded each year (see Table 3 in Chapter 2). Continued cuts will hamper the State's ability to address critical groundwater monitoring and research needs in the future. Research and monitoring are necessary to identify and test cost-effective groundwater management strategies that are needed to prevent groundwater problems that are much more time-, labor-, and cost-intensive to remediate than to prevent in the first place. The GCC encourages its member agencies and the Legislature to restore adequate resources for groundwater monitoring and research and to seek partnerships to leverage additional funds.

## **COORDINATION PRIORITIES**

- **Support implementation of a Statewide Groundwater Monitoring Strategy:** Chapter 160 of the Wisconsin Statutes requires the DNR to work with other agencies and the GCC to develop and operate a system for monitoring and sampling groundwater to determine whether harmful substances are present (s. 160.27, Wis. Stats.). In FY 04, several agencies worked together to develop and refine a Statewide Groundwater Monitoring Strategy to guide agency monitoring efforts for the next eight to ten years. The strategy has been incorporated into the DNR Water Monitoring Strategy (<http://dnr.wi.gov/org/water/monitoring/strategy.htm>). In FY 07 a multiagency groundwater monitoring workgroup developed a process and priorities for taking the first step: enhancing the Wisconsin Observation Well Network. The GAC, in its 2006 and 2007 reports, stressed the value of an enhanced monitoring network and included recommendations urging sufficient funding. However, at this time funding has not been found to support significant improvement of the monitoring well network. The GCC encourages agencies, the university, and federal and local partners to implement this and other components of the strategy and to seek funding to support its implementation.
- **Support Implementation of the Great Lakes Compact:** The Great Lakes Compact establishes a consistent framework for oversight of groundwater and surface water in the Great Lakes basin. Implementing legislation—2007 Wisconsin Act 227—includes a water use permitting system for review and approval of water withdrawals and diversion applications, direction to develop a statewide water conservation and efficiency program, and a statewide requirement for water supply service area planning. Effective implementation will rely on sound data and research and development of innovative approaches to water use and management. The GCC will play an important role in supporting these research and management initiatives.
- **Coordinate and facilitate consistent messages on groundwater related issues:** The public has benefited from the consistent educational messages that have been endorsed by the GCC. Through the Education Subcommittee, the GCC will continue to provide its leadership and assistance to state agencies that provide educational materials to the public. In FY 05, the Subcommittee created a “Groundwater Information Network” with non-governmental organizations to further its mission of promoting consistent messages regarding groundwater protection and building a groundwater consistency. The GCC will continue to use this network and other means to promote water stewardship and awareness, find innovative ways to encourage testing of private water supplies, and provide materials for local communities to support comprehensive planning activities.
- **Promote consistency between the agencies on data management issues:** Through the DNR’s Groundwater Retrieval Network (GRN) and the GCC’s Monitoring and Data

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Management Subcommittee's two publications *Directory of Groundwater Databases* and *Recommended Minimum Data Elements for Groundwater Databases*, state and local government agencies now have more convenient access to groundwater data and guidance on multi-user-friendly data element choices. These efforts must be maintained by continuing to identify data needs and ways to make data easily accessible and promote data consistency. In addition, the Great Lakes Compact implementing legislation directs the DNR to develop a statewide water use database. This commitment to managing the resource through sound scientific methods needs to be continued by the GCC providing leadership and communication on data management.

- **Ensure access to findings of groundwater research and monitoring projects:** The UW-Madison Water Resources Institute website ([www.wri.wisc.edu](http://www.wri.wisc.edu)) was rebuilt in FY 08 to make it easier and faster for visitors to find information about WRI research projects and publications. To provide the public with a real-time link to information about current research the site was integrated with the UW Aquatic Sciences Center's interactive Project Reporting Online (iPRO) system, an online tool that allows principal investigators to report on the progress of their projects. The new site features a fresh design with better readability and vivid photography. In FY 09 the WRI Water Resources Library has continued to digitize and post the abstracts and final reports of many WRI and DNR groundwater-related monitoring and research projects funded through the Wisconsin Groundwater Research and Monitoring Program. There are still many projects that need to be posted and more need to be added as they become available. Another WRI initiative is the development of topical fact sheets to summarize research and monitoring findings relative to important groundwater issues in the state. Fact sheets on nitrate and arsenic have been completed and work continues on groundwater quantity and pathogens in groundwater fact sheets. The GCC supports development of these fact sheets and resources and will continue to promote ways to translate sound science into effective groundwater management strategies.

References Cited:

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