

Wisconsin Groundwater Coordinating Council

Fiscal Year 2013

REPORT TO THE LEGISLATURE



August 2013

2013 GROUNDWATER COORDINATING COUNCIL MEMBERS

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Department of Agriculture, Trade, and Consumer Protection – **John Petty**
Department of Safety and Professional Services – **Eric Scott**
Department of Health Services - **Henry Anderson, MD**
Department of Transportation - **Dan Scudder**
Geological and Natural History Survey (State Geologist) - **James Robertson**
Governor's Representative – **George Kraft**
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* Member of Standing Joint Solicitation Work Group

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Wisconsin County Code Administrators - **Ray Schmidt**
Capitol Area Regional Planning Commission – **Mike Kakuska**
Wisconsin Rural Water Association – **Andrew Aslesen**
Wisconsin Water Association - **Nancy Quirk**



State of Wisconsin \ GROUNDWATER COORDINATING COUNCIL

Scott Walker, Governor

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August 2, 2013

To: The Citizens of Wisconsin

The Honorable Governor Scott Walker
Senate Committee on Environment and Natural Resources
Assembly Committee on Natural Resources
Secretary Mark Gottlieb - Department of Transportation
Secretary Dave Ross - Department of Safety and Professional Services
Secretary Ben Brancel - Department of Agriculture, Trade & Consumer Protection
Secretary Kitty Rhoades - Department of Health Services
Secretary Cathy Stepp - Department of Natural Resources
President Kevin P. Reilly - University of Wisconsin System
State Geologist James Robertson - Geological and Natural History Survey

Ken Johnson,
Council Chair
DNR

James Robertson
WGNHS

John Petty
DATCP

Henry Anderson, MD
DHS

James Hurley
UWS

Eric Scott
DSPS

Dan Scudder
DOT

George Kraft
GOVERNOR'S REP.

The Groundwater Coordinating Council (GCC) is pleased to release its 2013 Report to the Legislature. The GCC was formed in 1984 to help state agencies coordinate non-regulatory activities and exchange information on groundwater. For the past 29 years, the GCC has served as a model for interagency coordination and cooperation among state agencies, the Governor, local and federal government, and the university. It is one of the few groups in the nation to effectively coordinate groundwater activities in its state from an advisory position.

This report summarizes and provides links to information on GCC and agency activities related to groundwater protection and management in FY 13 (July 1, 2012 to June 30, 2013). The links also provide information on the condition of the groundwater resource. At the end of this report are the GCC's recommendations titled *Directions for Future Groundwater Protection*.

(<http://dnr.wi.gov/topic/groundwater/documents/GCC/Report/Recommendations.pdf>). The report and supporting materials are available online at <http://dnr.wi.gov/topic/Groundwater/GCC/report.html>.

Highlights of the State's groundwater protection activities this past year include:

- Research and monitoring contributing to our understanding of many groundwater issues including the impacts of agricultural practices, strontium, hexavalent chromium, climate change, water use, fecal contamination and various hydrogeological environments on groundwater quality and quantity.
- Progress on the use of existing groundwater quality data in characterizing the condition of the groundwater resource.
- Improvements to the statewide groundwater observation well network by WGNHS, USGS, and DNR. These improvements include bringing a number of existing wells into the network, drilling a new monitoring well in Waukesha County, and adding two spring gaging stations to the network.

We hope you will find this report to be a useful reference in protecting Wisconsin's valuable groundwater resource.

Sincerely,

Ken Johnson, Chair
Groundwater Coordinating Council

PURPOSE OF THE GCC AND THIS REPORT

In 1984, the Legislature enacted 1983 Wisconsin Act 410, Wisconsin's Comprehensive Groundwater Protection Act, to improve the management of the state's groundwater. The Groundwater Coordinating Council (GCC) was created and is directed by s. 160.50, Wis. Stats., to "serve as a means of increasing the efficiency and facilitating the effective functioning of state agencies in activities related to groundwater management. The Groundwater Coordinating Council shall advise and assist state agencies in the coordination of non-regulatory programs and the exchange of information related to groundwater, including, but not limited to, agency budgets for groundwater programs, groundwater monitoring, data management, public information and education, laboratory analysis and facilities, research activities and the appropriation and allocation of state funds for research." For a summary of statutory language relating to the GCC see: <http://dnr.wi.gov/topic/groundwater/documents/GCC/Report/StatLanguage.pdf>

The GCC is required by s. 15.347, Wis. Stats., to prepare a report which "summarizes the operations and activities of the council..., describes the state of the groundwater resource and its management and sets forth the recommendations of the council. The annual report shall include a description of the current groundwater quality of the state, an assessment of groundwater management programs, information on the implementation of ch. 160, Wis. Stats., and a list and description of current and anticipated groundwater problems." This report is due each August. The purpose of this report is to fulfill this requirement for fiscal year 2013 (FY 13). Please note that this report has been prepared in the style of an executive summary with supporting information referenced by numerous Internet links.

Membership of the GCC includes the Secretaries of the Departments of Natural Resources (DNR); Safety and Professional Services (DSPS), Agriculture, Trade & Consumer Protection (DATCP); Health Services (DHS); Transportation (DOT); the President of the University of Wisconsin System (UWS); the State Geologist; and a representative of the Governor. Agency designees and members of the two GCC subcommittees are listed on the inside of the front cover and at (<http://dnr.wi.gov/topic/groundwater/documents/GCC/Report/Members.pdf>). More information about the GCC and its activities can be found on the GCC web pages: <http://dnr.wi.gov/topic/Groundwater/GCC/>.

The GCC's role in facilitating inter-agency coordination includes the exchange of information regarding 1983 Wisconsin Act 410, Wisconsin's Comprehensive Groundwater Protection Act, Wisconsin's Groundwater Protection Act - 2003 Wisconsin Act 310, the Great Lakes Compact, 2007 Wisconsin Act 227, the federal Safe Drinking Water Act's Wellhead Protection and Source Water Protection provisions, and many other regulations. For a summary of Wisconsin's groundwater law see <http://dnr.wi.gov/topic/groundwater/documents/GCC/Report/WIgroundwaterLaw.pdf>.

GROUNDWATER COORDINATION ACTIVITIES

To complete coordination activities, the GCC is authorized to create subcommittees on "the subjects within the scope of its general duties...and other subjects deemed appropriate by the Council." See a list of GCC subcommittee members on the inside cover of this report.

The GCC and its subcommittees regularly bring together staff from over 15 different agencies, institutions and organizations to communicate and work together on a variety of research, monitoring and data management, educational, local government and planning issues. In addition, numerous contacts and informal conversations are generated both at meetings and through email communications among GCC and subcommittee members, leading to better communication across agency lines on a variety of

groundwater-related issues. These activities regularly create efficiencies and provide numerous benefits to Wisconsin's taxpayers.

Coordination of Groundwater Research and Monitoring Program

The GCC is directed to "advise the Secretary of Administration on the allocation of funds appropriated to the Board of Regents of the University of Wisconsin under s. 20.285(1)(a) for groundwater research." In 1990 this directive led to the collaborative formation of a joint solicitation process by the UWS, DNR, DATCP, and Commerce (now DSPS) and to the Wisconsin Groundwater Research and Monitoring Program (WGRMP). The joint solicitation was first carried out for projects funded in FY 92.

In FY 13 the GCC, the UWS, DNR and the Groundwater Research Advisory Council (GRAC) again collaborated on the annual solicitation for groundwater research and monitoring proposals as specified in a November 2002 Memorandum of Understanding

<http://dnr.wi.gov/topic/groundwater/documents/GCC/MonitoringResearch/MOU2002.pdf>. After a multi-agency effort spear-headed by the UW Water Resources Institute, the GCC approved the FY 14 Joint Solicitation for Proposals in August of 2012:

<http://dnr.wi.gov/topic/groundwater/documents/GCC/MonitoringResearch/JointSolicitationFY14.pdf>. A total of 20 project proposals were received. A comprehensive review process including the GRAC, the GCC's Monitoring & Research Subcommittee and outside technical experts resulted in recommendations that were used by the UWS and DNR in deciding which groundwater-related proposals to fund in FY 14. The process resulted in the selection of six new projects for funding for FY 14, two by UWS and four by DNR. The GCC approved the proposed UWS groundwater research plan as required by s. 160.50(1m), Wis. Stats., and a letter to this effect was sent to the UWS President and the Department of Administration.

Links to WGRMP project lists

Projects funded in FY 13:

<http://dnr.wi.gov/topic/groundwater/documents/GCC/MonitoringResearch/CurrentProjects.pdf>

Projects selected for funding in FY 14:

<http://dnr.wi.gov/topic/groundwater/documents/GCC/MonitoringResearch/FutureProjects.pdf>

All Wisconsin state-funded groundwater research and monitoring projects:

<http://dnr.wi.gov/topic/groundwater/documents/GCC/MonitoringResearch/AllProjects.pdf>

The UW Water Resources Institute (WRI) provides access to summaries and reports of GCC-facilitated groundwater research (<http://wri.wisc.edu/Default.aspx?tabid=69>) as well as cataloging all WRI research reports into WorldCat and MadCat, two library indexing tools that provide both worldwide and statewide access to this research. The Water Resources Library has partnered with UW Libraries' Digital Collections Center to digitize and post UWS and DNR final project reports. As a result of this partnership, full-text reports are also available through the UW Ecology and Natural Resources Digital Collection at <http://digital.library.wisc.edu/1711.dl/EcoNatRes.Groundwater>. In 2013 progress continued in locating older final reports and summaries for digitization and availability on the Internet.

In May of 2013, the National Institutes for Water Resources received a 50% cut in funding from the USGS as a result of the federal sequester. In addition to eliminating the \$1.2 million national research competition, each of the 54 institutes (including the UW Water Resources Institute) received a 40% reduction in base funding. Locally, the cut was absorbed entirely by the WRI administration and outreach budgets – the entire 104(b) allocation for federal FY13 was used to partially fund two new climate change projects submitted to the Wisconsin FY 14 joint solicitation. As of this writing, it is unclear if the cuts will be restored in the next federal budget. At present, only the national competition is slated to receive funds, and base-support for the institutes has been eliminated. Without base support, or alternate new

revenue, it will be difficult for UW WRI to continue fulfilling the WGRMP coordination role described above.

Information and Outreach Activities

For the 13th year in a row, 3 groundwater workshops for teachers were taught jointly by GCC Outreach and Partnership Subcommittee members from the DNR, WGNHS and the Center for Watershed Science and Education (CWSE) at Stevens Point. In January and February, educators from 24 schools and nature centers took part in the workshops held at Mount Horeb, Eau Claire, and Green Bay. The workshop leaders instructed teachers on using a groundwater sand-tank model and provided additional resources to incorporate groundwater concepts into their classroom. Educators who attended the workshops received a free model. With funding from a U.S. Environmental Protection Agency (EPA) wellhead protection grant, over 275 groundwater models have been given to schools and nature centers since 2001 and nearly 550 educators have received hands-on training in using the model effectively.

Outreach and Partnership Subcommittee members representing The UW-Stevens Point Center for Watershed Science and Education contributed to news releases for the annual “Groundwater Awareness Week” in March 2013 that were distributed to media outlets. Stephen Ales and Kevin Masarik also participated in a question and answer regarding groundwater issues with listeners of the Larry Meiller Radio Show during Groundwater Awareness Week.

Other Coordination Activities

The GCC continued to promote communication, coordination and cooperation between the state agencies through its quarterly meetings. In FY 13, the GCC received briefings, heard presentations, and discussed:

- The Wisconsin Institute for Sustainable Agriculture Central Sands Initiative
- Assessing levels of potential health effects of endocrine disrupting chemicals (EDCs) in groundwater associated with karst areas in Northeast Wisconsin
- The FY 2014 Joint Solicitation
- Wisconsin’s Nutrient Reduction Strategy
- Microbial source tracking tools and trends
- New Water Use Data
- Molybdenum in groundwater in Southeast Wisconsin
- The geology of frac sand
- Using existing data sources to better-characterize the condition of the groundwater resource
- Preparation of the FY 13 GCC Report to the Legislature.
- Many other informational items presented by the agencies.

More information on the coordinating efforts of the GCC can be found in the FY 2013 GCC meeting minutes at: <http://dnr.wi.gov/topic/Groundwater/GCC/minutes.html>. Through these activities, the GCC continues to play an important role in ensuring agency coordination, increasing efficiency, and facilitating the effective functioning of state agencies in activities related to groundwater protection and management. Ultimately groundwater is better protected, which benefits public health and preserves Wisconsin's natural resources for future generations.

SUMMARY OF AGENCY GROUNDWATER ACTIVITIES

State agencies and the University of Wisconsin System addressed numerous issues related to groundwater protection and management in FY 13. Detailed discussions of the groundwater activities of each agency can be found on the following GCC web pages:

*Wisconsin Groundwater Coordinating Council Fiscal Year 2013 Report to the Legislature
August 2013*

Department of Natural Resources groundwater activities:

<http://dnr.wi.gov/topic/groundwater/documents/GCC/AgencyActivities/DNRactivities.pdf>

Department of Agriculture, Trade, and Consumer Protection groundwater activities

<http://dnr.wi.gov/topic/groundwater/documents/GCC/AgencyActivities/DATCPactivities.pdf>

Department of Safety and Professional Services groundwater activities:

<http://dnr.wi.gov/topic/groundwater/documents/GCC/AgencyActivities/DSPSactivities.pdf>

Department of Transportation groundwater activities

<http://dnr.wi.gov/topic/groundwater/documents/GCC/AgencyActivities/DOTactivities.pdf>

Department of Health Services groundwater activities

<http://dnr.wi.gov/topic/groundwater/documents/GCC/AgencyActivities/DHSactivities.pdf>

Wisconsin Geological and Natural History Survey groundwater activities:

<http://dnr.wi.gov/topic/groundwater/documents/GCC/AgencyActivities/WGNHactivities.pdf>

University of Wisconsin System groundwater activities

<http://dnr.wi.gov/topic/groundwater/documents/GCC/AgencyActivities/UWSactivities.pdf>

United States Geological Survey – Wisconsin Division groundwater activities

<http://dnr.wi.gov/topic/groundwater/documents/GCC/AgencyActivities/USGSactivities.pdf>

United States Department of Agriculture – Natural Resources Conservation Service groundwater

activities: <http://dnr.wi.gov/topic/groundwater/documents/GCC/AgencyActivities/NRCSactivities.pdf>

CONDITION OF THE RESOURCE: Groundwater Quality

Major groundwater quality concerns in Wisconsin include:

Volatile Organic Compounds (VOCs)

Sources of VOCs in Wisconsin's groundwater include landfills, underground storage tanks, and hazardous substance spills. Thousands of wells have been sampled for VOCs and about 60 different VOCs have been found in Wisconsin groundwater. Trichloroethylene is the VOC found most often in Wisconsin's groundwater. More information on VOCs in Wisconsin groundwater can be found here:

<http://dnr.wi.gov/topic/groundwater/documents/GCC/GwQuality/VOCs.pdf>

Pesticides

Pesticide contamination in groundwater results from field applications, pesticide spills, misuse, or improper storage and disposal. Pesticide metabolites are related chemical compounds that form when the parent pesticide compounds break down in the soil and groundwater. The most commonly detected pesticide compounds in Wisconsin groundwater are: metabolites of alachlor (Lasso) and metolachlor (Dual), and atrazine and its metabolites.

A 2007 DATCP private well survey estimated that the proportion of wells in Wisconsin that contained a pesticide or pesticide metabolite was 33.5%. Areas of the state with a higher intensity of agriculture generally had higher frequencies of detections of pesticides. The two most commonly-detected pesticide compounds, metolachlor ESA and alachlor ESA, each had a proportion estimate of 21.6%.

In October 2011 DATCP reported on the results of its 2010 Survey of Weed Management Practices in Wisconsin's Atrazine Prohibition Areas (PA) (<http://datcp.wi.gov/uploads/Environment/pdf/WeedMgtAtrazinePAs.pdf>). The main purpose of this survey was to identify differences in herbicide use and other weed control practices inside and outside of Wisconsin's atrazine prohibition areas. Survey results suggest that although many corn growers would like the option to use atrazine in a prohibition area, they have adapted to growing corn without it. Half of the respondents indicated that they do not find it more difficult to control weeds in a PA without atrazine.

The DATCP pesticide database contains test results from nearly 13,000 wells tested with the immunoassay screen for atrazine and over 5,500 wells tested by the full gas chromatography method. In June 2013, DATCP produced a map showing locations and atrazine levels of private drinking water wells tested for atrazine in the state. The immunoassay screen results showed that about 40 percent of private wells tested have atrazine detections, while about 1 percent of wells contained atrazine over the groundwater enforcement standard of 3 µg/L. The approximately 5,500 wells tested by full gas chromatography showed detectable levels of atrazine in about 38 percent of the wells and levels over the enforcement standard in about 8 percent of the wells. The enforcement standard for atrazine includes parent atrazine and three of its breakdown products (metabolites).

More information on pesticides in Wisconsin groundwater can be found here:
<http://dnr.wi.gov/topic/groundwater/documents/GCC/GwQuality/Pesticides.pdf>

Nitrate

Nitrate is Wisconsin's most widespread groundwater contaminant and is increasing in extent and severity. Nitrate levels (as nitrate-N) in groundwater are below 1 milligram per liter (mg/L) where pollution sources are absent. Higher levels indicate a source of contamination such as agricultural or turf fertilizers, animal waste, septic systems, and wastewater. At least 90% of nitrate inputs into our groundwater originate from manure spreading, agricultural fertilizers, and legume cropping systems.

Concentrations of nitrate in private water supplies have been found to exceed the state drinking water standard of 10 mg/L. In 2005 and 2007, DNR aggregated and analyzed data from three extensive statewide groundwater databases. Most recent samples from 48,818 private wells showed 5,686 (11.6 %) equaled or exceeded the 10 mg/L standard. A 2007 DATCP survey estimated the proportion of private wells that exceeded the 10 mg/l enforcement standard for nitrate-nitrogen at 9.0%. . A 2012 survey of Wisconsin municipal systems found that 47 systems have had raw water samples that exceeded the nitrate drinking water standard (up from just 14 systems in 1999). This survey also showed that respondents had collectively spent over \$32.5 million on remedies; up from \$24 million as of 2004 and that 74 systems are experiencing increasing nitrate levels. Excessive nitrate levels have also forced the installation of treatment systems or the replacement of wells at hundreds of other smaller public drinking water systems. GCC member agencies are working on multiple initiatives to reduce nitrate inputs to groundwater and drinking water.

More information on nitrate in Wisconsin groundwater can be found here:
<http://dnr.wi.gov/topic/groundwater/documents/GCC/GwQuality/Nitrate.pdf>

Microbial agents

Microbiological contamination often occurs in areas where the depth to groundwater is shallow, in areas where soils are thin, or in areas of fractured bedrock. Microbial agents include bacteria, viruses, and parasites. These agents can cause acute illness and result in life-threatening conditions for young children, the elderly and those with chronic illnesses. In one assessment (Warzecha et.al., 1994), approximately 23% of private well water samples statewide tested positive for total coliform bacteria, an indicator

species of other biological agents. Approximately 3% of these wells tested positive for *E. coli*, an indicator of water borne disease that originates in the mammalian intestinal tract. The DNR recently began tracking total coliform detects in the raw water samples through its Drinking Water System database.

Viruses in groundwater are increasingly a concern as new analytical techniques have detected viral material in private wells and public water supplies. Research conducted at the Marshfield Clinic indicates that 4-12% of private wells contain detectible viruses. Other studies showed virus presence in four La Crosse municipal wells, in the municipal wells and wastewater system in Madison, and in five shallow municipal wells serving smaller communities.

Public and private water samples are not regularly analyzed for viruses due to the high cost of the tests. The presence of coliform bacteria has historically been used to indicate the water supply is not safe for human consumption. However, recent findings show that coliform bacteria do not always correlate with the presence of enteric viruses.

More information on microbial agents in Wisconsin groundwater can be found here:
<http://dnr.wi.gov/topic/groundwater/documents/GCC/GwQuality/MicrobialAgents.pdf>

Radionuclides

Naturally-occurring radionuclides, including uranium, radium, and radon are an increasing concern for groundwater quality, particularly in the Cambro-Ordovician aquifer system in eastern Wisconsin. The water produced from this aquifer often contains combined radium activities in excess of 5 pCi/L and in some cases in excess of 30 pCi/L. Historically, about 80 public water systems have exceeded a radionuclide drinking water standard, causing these communities to search for alternative water supplies or treatment options. The DNR has been working with these systems since 2003 to ensure that they develop a compliance strategy and take corrective actions. The vast majority of these systems are now serving water that meets the radium and gross alpha standards.

More information on radionuclides in Wisconsin groundwater can be found here:
<http://dnr.wi.gov/topic/groundwater/documents/GCC/GwQuality/Radionuclides.pdf>

Arsenic

Naturally occurring arsenic has been detected in wells throughout Wisconsin. DNR historical data show that about 4,000 public wells and over 3,000 private wells have detectable levels of arsenic. About 10% of these wells exceed the federal drinking water standard of 10 µg/L. Although arsenic has been detected in well water samples in every county in Wisconsin, the problem is especially prevalent in northeastern Wisconsin where increased water use has likely released arsenic from rocks and unconsolidated material into the groundwater. The State continues to proactively address arsenic concerns through well drilling advisories, health studies, well testing campaigns, and studies aimed at improving geological understanding and developing practical treatment technologies.

More information on arsenic in Wisconsin groundwater can be found here:
<http://dnr.wi.gov/topic/groundwater/documents/GCC/GwQuality/Arsenic.pdf>

CONDITION OF THE RESOURCE: Groundwater Quantity

Groundwater is available in sufficient amounts throughout most of Wisconsin to provide adequate water supplies for most municipal, industrial, agricultural, and domestic uses. What is frequently missed is that groundwater pumping always lowers water levels in aquifers and connected lakes, wetlands, and streams;

and always diverts flow to surface waters where groundwater would have discharged naturally. The amount of water level lowering and flow diversion is a matter of degree. At certain amounts of pumping in an area, aquifers can be perilously lowered, and streams, lakes and wetlands can dry.

Groundwater pumping shows a continued long term increase. Pumping estimates indicate an increase from 570 to 804 million gallons per day (Mgal/d) from 1985 to 2000. Groundwater use was estimated to be 983 Mgal/d in 2005, but much of the increase between 2000 and 2005 was due to a shift in how irrigation water use was estimated. New and improved pumping reporting will provide better information on pumping amounts and trends. The large increase of high capacity wells, especially in the Central Sands region of the state (parts of Portage, Waushara, Waupaca, Adams, and Marquette Counties), indicates pumping amounts will continue to expand.

Groundwater pumping issues have arisen in multiple regions of Wisconsin. Large scale drawdowns of the confined aquifer have been documented in the Lower Fox River Valley and southeastern Wisconsin. Surface water impacts have been well-documented in the Wisconsin Central Sands and Dane County. These impacts have included the drying of lakes and streams. Groundwater quantity legislation enacted in 2004 was the first step towards managing groundwater quantity on a comprehensive basis. The DNR began implementing a new rule, NR 820, regulating high-capacity wells in FY 08. The Great Lakes Compact, signed by Governor Doyle in 2008, requires Wisconsin to have water conservation goals within the Great Lakes Basin. Implementing legislation (2007 Wisconsin Act 227) is currently being implemented.

More information on groundwater quantity issues in Wisconsin can be found at the following links:

Issues and Problems

Water Use: <http://dnr.wi.gov/topic/groundwater/documents/GCC/GwQuantity/WaterUse.pdf>

Surface Water Impacts:

<http://dnr.wi.gov/topic/groundwater/documents/GCC/GwQuantity/SurfaceWaterImpacts.pdf>

Regional Drawdowns:

<http://dnr.wi.gov/topic/groundwater/documents/GCC/GwQuantity/RegionalDrawdowns.pdf>

Impact of Reduced Quantity on Groundwater Quality

<http://dnr.wi.gov/topic/groundwater/documents/GCC/GwQuantity/QuantityQuality.pdf>

Land use and high groundwater conflicts:

<http://dnr.wi.gov/topic/groundwater/documents/GCC/GwQuantity/LandUseHighGW.pdf>

Potential Management Solutions

Statewide Groundwater Level Network:

<http://dnr.wi.gov/topic/groundwater/documents/GCC/GwQuantity/GroundwaterLevelNetwork.pdf>

Wisconsin Stream Model:

<http://dnr.wi.gov/topic/groundwater/documents/GCC/GwQuantity/WIstreamModel.pdf>

Aquifer Storage and Recovery:

<http://dnr.wi.gov/topic/groundwater/documents/GCC/GwQuantity/ASR.pdf>

BENEFITS OF MONITORING AND RESEARCH PROJECTS

The GCC provides consistency and coordination among state agencies in funding Wisconsin's Groundwater Research and Monitoring Program to meet state agency needs. Approximately \$16.3 million has been spent by DNR, UWS, DATCP, and Commerce through FY 13 on 428 different projects dealing with groundwater or related topics. A list of all these projects is available on the GCC webpage (<http://dnr.wi.gov/topic/groundwater/documents/GCC/MonitoringResearch/AllProjects.pdf>). Projects

funded have provided valuable information regarding the Wisconsin's groundwater resources, helped evaluate existing regulatory programs, increased the knowledge of the movement of contaminants in the subsurface, and developed new methods for groundwater evaluation and protection. While the application of the results is broad, some areas where the results of state-funded groundwater research and monitoring projects have been successfully applied to groundwater problems in Wisconsin include:

- Pharmaceuticals, personal care products, and endocrine disrupting compounds
- The Atrazine Rule
- Groundwater monitoring at solid waste disposal sites
- Arsenic monitoring and research in Northeastern Wisconsin
- Groundwater movement in shallow carbonate rocks
- Developing new tools for groundwater protection
- Prevention and remediation of groundwater contamination
- Detection and monitoring of microbiological contaminants
- Groundwater drawdowns
- Comprehensive planning
- Rain garden design and evaluation
- Methylmercury formed in groundwater
- Evaluating Pumping Impacts

See this report's webpage (<http://dnr.wi.gov/topic/Groundwater/GCC/report.html>) under the "Benefits from Projects" tab for more information on some of these projects and how agencies have used the project results to improve the management of the state's groundwater resources.

RECOMMENDATIONS: DIRECTIONS FOR FUTURE GROUNDWATER PROTECTION

The 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.). In this section the GCC identifies its recommendations for future groundwater protection and management needs to state agencies, the Governor, the Legislature, and the citizens of Wisconsin. These recommendations include top priorities of immediate concern, on-going efforts that require continued support, and emerging issues that will need to be addressed in the near future.

Priority Recommendations

Evaluate the occurrence of viruses and other pathogens in groundwater and groundwater-sourced water supplies, and develop appropriate response tools. Recently, viruses and other microbial pathogens have been found in municipal and domestic wells, challenging previous assumptions about their occurrence. The legislature and agencies should support research to refine our understanding of pathogens in groundwater and their threat to human health. Agencies should also work with partners to increase awareness of waste disposal choices, their risks and costs. Background on the issue and the rationale for the recommendation are found at:

<http://dnr.wi.gov/topic/groundwater/documents/GCC/GwQuality/MicrobialAgents.pdf>

<http://dnr.wi.gov/topic/groundwater/documents/GCC/Benefits/DetectMonMicrobes.pdf>

<http://dnr.wi.gov/topic/groundwater/documents/GCC/AgencyActivities/DHSactivities.pdf>

Implement practices that protect groundwater from nitrate and other agricultural contaminants (pesticides, pharmaceuticals, and their degradates). Nitrate contamination that approaches unsafe levels in drinking water is a common occurrence in Wisconsin, posing an acute risk to infants and a chronic risk of serious disease in adults. In addition, pesticides are estimated to be present in one-third of private drinking water wells in Wisconsin. The health effects of pesticide exposure vary by pesticide. For example, one common herbicide has been linked to problems with cardiovascular and reproductive system difficulties. Areas of the state with a higher intensity of agriculture generally have higher frequencies of detections of pesticides and nitrate. Agencies should validate and promote practices that lead to efficient use of nitrogen, and careful or reduced use of pesticides, to protect drinking water sources. The legislature should support the implementation of these practices with appropriate funding mechanisms. Background on the issue and the rationale for the recommendation are found at:

<http://dnr.wi.gov/topic/groundwater/documents/GCC/AgencyActivities/DNRactivities.pdf>
<http://dnr.wi.gov/topic/groundwater/documents/GCC/AgencyActivities/DATCPactivities.pdf>
<http://dnr.wi.gov/topic/groundwater/documents/GCC/GwQuality/Nitrate.pdf>
<http://dnr.wi.gov/topic/groundwater/documents/GCC/GwQuality/Pesticides.pdf>
<http://dnr.wi.gov/topic/groundwater/documents/GCC/Benefits/PharmPCPeds.pdf>

Support the sustainable management of groundwater quantity and quality in the state to ensure that water is available to be used to protect and improve our health, economy, and environment now and into the future. This includes:

- supporting an inventory of information on the location, quantity, and uses of the state's groundwater;
- supporting targeted research and modeling of the impact of groundwater withdrawals on other waters of the state; and
- supporting proactive regional groundwater planning in areas with limited groundwater resources where increased groundwater use and development/population growth pressures are leading to water availability and sustainability issues related to groundwater and surface water resources.

Background on the issue and the rationale for the recommendation are found at:

<http://dnr.wi.gov/topic/groundwater/documents/GCC/Report/WIgroundwaterLaw.pdf>
<http://dnr.wi.gov/topic/groundwater/documents/GCC/AgencyActivities/DNRactivities.pdf>
<http://dnr.wi.gov/topic/groundwater/documents/GCC/GwQuantity/WaterUse.pdf>
<http://dnr.wi.gov/topic/groundwater/documents/GCC/GwQuantity/RegionalDrawdowns.pdf>

Ongoing Recommendations

Without ongoing attention to the following needs, Wisconsin cannot address the priority recommendations (see above) or begin to understand emerging issues (see below).

Support implementation of the 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.). The strategy has been incorporated into the DNR Water Monitoring Strategy but needs are constantly evolving as new problems emerge. For example, food processors, homeowners, municipalities, and well drilling contractors need more information about the origin and extent of naturally occurring contaminants such as arsenic and other heavy metals, acidic conditions, sulfate, total dissolved solids, radium and uranium. Wisconsin should continue to encourage research efforts that will provide information for addressing these issues. State agencies, the university, and federal and local

partners should continue to implement and modify this strategy to efficiently meet monitoring objectives. Background on the issue and the rationale for the recommendation are found at:

<http://dnr.wi.gov/topic/groundwater/documents/GCC/Benefits/Drawdowns.pdf>

<http://dnr.wi.gov/topic/groundwater/documents/GCC/GwQuantity/GroundwaterLevelNetwork.pdf>

<http://dnr.wi.gov/topic/groundwater/documents/GCC/GwQuantity/QuantityQuality.pdf>

<http://dnr.wi.gov/topic/groundwater/documents/GCC/GwQuality/Arsenic.pdf>

<http://dnr.wi.gov/topic/groundwater/documents/GCC/GwQuality/Radionuclides.pdf>

Continue to catalog Wisconsin's groundwater resources. Management and protection of Wisconsin's groundwater resources requires publically-accessible and up-to-date data in order to foster informed decisions, not only on state policy matters but also for sound business decisions on siting or technology investments. State agencies and the University should continue to collect, catalog, share, and interpret new data about Wisconsin's groundwater so that it can be used by health care providers, people seeking business locations, as well as homeowners and local governments.

Continue to support applied groundwater research. Numerous years of state budget cuts and increased costs have reduced the number of groundwater research projects that are funded each year (see <http://dnr.wi.gov/topic/groundwater/documents/GCC/MonitoringResearch/AllProjects.pdf>). Continued cuts will hamper the State's ability to address critical groundwater monitoring and research needs in the future. Research is necessary to identify and test cost-effective groundwater protection strategies that can prevent groundwater problems before they need to be remediated at a much greater cost. State agencies and the Legislature should work to restore adequate funding to answer the key groundwater questions facing Wisconsin water suppliers and to seek partnerships to leverage additional research support.

Emerging Issues

Frac sand mining. Since 2010, unprecedented growth of the frac sand mining and processing industry has occurred in West-Central Wisconsin; growth is expected for another decade. The potential impact of this industry on groundwater resources has not been comprehensively evaluated to avoid problems and plan for restoration. Wisconsin agencies and the legislature should support research and field investigations to understand how this industry might impact groundwater, and should partner with industry to rapidly develop and adapt best-management practices for mining and long-term site restoration.

Metallic mining. During 2011 a proposed iron mine in northern Wisconsin generated significant public discussion. Several lead, zinc, and copper mines have also been proposed around the state. These proposed mines are located in sparsely-populated regions where background information on groundwater resources is often incomplete. Workers, residents, and mining operators will require substantial supplies of water for drinking and processing ore. The state should support background data collection and groundwater assessments to inform both public debate and technical discussions about potential mining.

Dairy industry expansion and concentration. Since 2010, several animal feeding operations that house thousands of animals have been sited or proposed in Wisconsin. These operations require large quantities of groundwater and must also dispose of large volumes of animal waste. Wisconsin should support policies and research that allows for effective siting and efficient operation of these facilities while protecting groundwater quality and quantity. Background on the issue and the rationale for the recommendation are found at:

<http://dnr.wi.gov/topic/groundwater/documents/GCC/AgencyActivities/DNRactivities.pdf>

<http://dnr.wi.gov/topic/groundwater/documents/GCC/AgencyActivities/DATCPactivities.pdf>

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 affect the groundwater supply. These may include biological or chemical contamination issues or increased demand for groundwater by agricultural, municipal, and commercial users. More work is needed to determine the range of possible climates in Wisconsin's future. Work is also needed on feedback mechanisms between climate and groundwater to fully characterize possible changes to Wisconsin's groundwater resource. This research will help identify drought response and long-term management strategies for Wisconsin's groundwater supply.