

State of Illinois
JB Pritzker, Governor

Illinois Environmental Protection Agency
John J. Kim, Director



Illinois Groundwater Protection Program Biennial Report

The State of Illinois recognizes the essential and pervasive role of groundwater in the social and economic well-being of the state, and its vital importance to the general health, safety, and welfare of its citizens.

--Illinois Groundwater Protection Act

***Prepared by the
Interagency Coordinating Committee on Groundwater***

December 2019



**Illinois Environmental
Protection Agency**
Bureau of Water



ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

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January 2020

The Honorable JB Pritzker
Governor, State of Illinois

The Honorable Members
of the Illinois General Assembly

I am pleased to provide the 16th Biennial Report of the Illinois Groundwater Protection Program, which has been prepared pursuant to Section 4(b)(8) of the Illinois Groundwater Protection Act. The Act created a comprehensive, prevention-based policy focused on protecting the beneficial uses of groundwater and preventing degradation.

The biennial report provides a policy perspective on groundwater quality and quantity planning, protection, and management in Illinois. The Interagency Coordinating Committee on Groundwater prepared the report with input from the Groundwater Advisory Council and the four-priority regional groundwater protection planning committees.

The Biennial Report may be downloaded from the following website:
<https://www2.illinois.gov/epa/topics/water-quality/groundwater/wellhead-protection/Pages/report.aspx>

Sincerely,

A blue ink signature of John J. Kim, consisting of a stylized 'J' and 'K' followed by a horizontal line.

John J. Kim
Director

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LIST OF ACRONYMS

Board	Illinois Pollution Control Board
CWS	Community Water Supply
EPA	Environmental Protection Agency
GAC	Groundwater Advisory Council
GMZ	Groundwater Management Zone
GWQS	Groundwater Quality Standards
HTEM	Helicopter-based Time-domain Electromagnetics
ICCG	Interagency Coordinating Committee on Groundwater
IDA	Illinois Department of Agriculture
IDNR	Illinois Department of Natural Resources
IDPH	Illinois Department of Public Health
IGPA	Illinois Groundwater Protection Act
mg/L	Milligrams per Liter
NCPWS	Non-Community Public Water Supply
PRI	Prairie Research Institute
USGS	United States Geological Survey

EXECUTIVE SUMMARY

Illinois continues to implement a program to protect and restore groundwater. The Illinois Groundwater Protection Act, adopted in 1987, established an Interagency Coordinating Committee on Groundwater to report biennially to the Governor and General Assembly on groundwater quality and quantity, as well as the state's enforcement efforts.

The intended purpose of this 2019 Biennial Report is to:

- Provide a comprehensive status report on the implementation of the Illinois Groundwater Protection Act; and
- Provide environmental and programmatic indicators to help measure and demonstrate program performance.

Since the inception of the Illinois Environmental Protection Act in 1970, it has been the policy of the State of Illinois to restore, protect, and enhance its groundwater as a natural and public resource.

Since the inception of the Illinois Environmental Protection Act in 1970, it has been the policy of the State of Illinois to restore, protect, and enhance its groundwater as a natural and public resource. Groundwater has an essential and pervasive role in the social and economic well-being of Illinois, and it is vitally important to the general health, safety, and welfare of its citizens. Groundwater resources should be utilized for beneficial and legitimate purposes. Waste and degradation should be prevented, and groundwater resources should be managed to maximize benefits to the state.

The major highlights of the groundwater protection program during this reporting period included Illinois Environmental Protection Agency participation in the Mahomet Aquifer Protection Task Force. This Task Force was created by Public Act 100-0403 to address the issue of maintaining the clean drinking water of the Mahomet Aquifer. Task Force members were required to conduct a study of the Mahomet Aquifer to:

- Develop a state plan to maintain the groundwater quality of the Mahomet Aquifer;
- Identify potential and current contamination threats to the water quality of the Mahomet Aquifer;
- Identify actions that might be taken to ensure the long-term protection of the Mahomet Aquifer; and
- Make legislative recommendations for future protection of the Mahomet Aquifer.

The Groundwater Section of the Illinois Environmental Protection Agency's Bureau of Water has spent a significant amount of resources providing technical support to the Task Force during 2018 to help them achieve common objectives. A final report, "Mahomet Aquifer Protection Task Force: Findings and Recommendations" was published on December 21, 2018. For further detail, see <https://www2.illinois.gov/epa/topics/community-relations/sites/mahomet-aquifer-task-force/Pages/default.aspx>.

In support of Illinois' Nutrient Loss Reduction Strategy, the Illinois Environmental Protection Agency proposed, and U.S. Environmental Protection Agency funded, a real-time groundwater monitoring well project near Havana, Illinois. Data collection started on this well in March of 2017. Parameters being monitored include nitrate, specific conductance, pH, dissolved oxygen, temperature, and water level. The goal of the research is to better understand the groundwater/surface water interactions, and potential nutrient loading to surface water in the Illinois River basin.

The Illinois Environmental Protection Agency participated in private well monitoring efforts in relation to a natural gas release from the Manlove Natural Gas Storage Field that leaked a natural gas plume of contamination into the overlaying aquifers in the Mahomet Sole Source Aquifer. Illinois Environmental Protection Agency staff worked in conjunction with the Illinois Department of Public Health and Champaign County Health Department to sample 29 private drinking water supply wells in proximity of the natural gas plume.

In another potential groundwater contamination incident, the Illinois Environmental Protection Agency and the DuPage County Health Department worked together to identify private wells, obtain access agreements, develop a sampling plan, and sampled more than 55 private wells at residences in Willowbrook, Illinois, where emissions of ethylene oxide were a concern.

CHAPTER I. INTERAGENCY COORDINATING COMMITTEE ON GROUNDWATER AND GROUNDWATER ADVISORY COUNCIL OPERATIONS

The Illinois Groundwater Protection Act (IGPA) required the creation of the Interagency Coordinating Committee on Groundwater (ICCG). The ICCG is required to report biennially to the Governor and General Assembly on groundwater quality and quantity and the state's enforcement efforts related to groundwater. In summary, the ICCG is responsible for:

- Reviewing and coordinating the state's policy on groundwater protection;
- Reviewing and evaluating state laws, regulations, and procedures that relate to groundwater protection;
- Reviewing and evaluating the status of the state's efforts to improve the quality of the groundwater, the state enforcement efforts for protection of the groundwater, and make recommendations in improving the state's efforts to protect the groundwater;
- Recommending procedures for better coordination among state groundwater programs and local programs related to groundwater protection;
- Reviewing and recommending procedures to coordinate the state's response to specific incidents of groundwater pollution and coordinating dissemination of information between agencies responsible for the state's response;
- Making recommendations for and prioritizing the state's groundwater research needs; and
- Reviewing, coordinating, and evaluating groundwater data collection and analysis.

The ICCG is chaired by the Director of Illinois Environmental Protection Agency (EPA) and is comprised of members from ten state agencies/departments that have some jurisdiction over groundwater. The ICCG continues to review and update an Implementation Plan and Regulatory Agenda pursuant to the IGPA.

The IGPA also required the creation of the Groundwater Advisory Council (GAC). Established in 1988, the GAC continues to be integral to development and implementation of effective groundwater protection programs in Illinois. The GAC is comprised of nine members who represent public, industrial, agricultural, environmental, and local government interests. The IGPA mandates that the council members be appointed by the Governor to serve three-year terms. The GAC is responsible for:

- Reviewing, evaluating, and making recommendations regarding state laws, regulations, and procedures that relate to groundwater protection;
- Reviewing, evaluating, and making recommendations regarding the state's efforts to implement the IGPA and protect groundwater;
- Making recommendations relating to the state's needs for groundwater research; and
- Reviewing, evaluating, and making recommendations regarding groundwater data collection and analyses.

Two joint ICCG/GAC meetings were held during the 2018 reporting period. These meetings included:

- Discussions on a pilot real-time nitrate monitoring effort being conducted with the United States Geological Survey (USGS);
- The review and development of recommendations pertaining to draft updates to the Illinois Groundwater Quality Standards (GWQS);
- Discussions regarding potential coal ash disposal regulations;
- Desaturation of northeastern Illinois sandstone aquifers; and
- Updates on regional water supply planning efforts with the Illinois Department of Natural Resources (IDNR).

In addition, the GAC held a public outreach meeting on September 24, 2018, regarding amendments to the GWQS (35 Ill. Adm. Code 620) and new proposed requirements for community water supplies (CWS) to develop and implement source water protection plans pursuant to 35 Ill. Adm. Code 604 Subpart C. While the proposed amendments have yet come to resolution, the GAC fulfilled its role in hosting the meeting to open public dialogue. Furthermore, the GAC Chair, at the request of the Illinois EPA and the Mahomet Aquifer Protection Task Force, prepared and gave a presentation at a June 1, 2018 Task Force meeting about his grass roots involvement in implementing groundwater protection and his experience with how these tools have worked or not worked.

CHAPTER II. GROUNDWATER EVALUATION PROGRAM

Probabilistic Groundwater Monitoring Network

During 2018, Illinois EPA continued the implementation of the CWS Probabilistic Monitoring Network consisting of approximately 350 CWS wells. The network wells were selected by a random, stratified probability-based approach using a 95 percent confidence level. This random, stratified selection process included nearly 3,000 CWS wells resulting in final selection of the fixed station wells (see Figure 1). Further, to improve precision and accuracy, the random selection of the CWS wells was stratified by depth, aquifer type, and the presence of aquifer material within 50 feet of land surface. Illinois EPA used geological well log and construction log detail to perform this process. The goal of the Probabilistic Network is to represent contamination levels in the population of all active CWS wells. To prevent spatial or temporal bias, 17 random groups of 21 wells, with alternates, were selected from all the fixed station wells. To further assure maximum temporal randomization within practical constraints, the samples from each sample period are collected within a three-week timeframe. The Probabilistic Network wells have been sampled within a fixed three-week time frame every other year since 1996. Samples are analyzed for inorganic chemicals, synthetic organic pesticides, and volatile organic/aromatic compounds.

This Probabilistic Network is designed to:

- Provide an overview of the groundwater conditions in the CWS wells;
- Provide an overview of the groundwater conditions in the principle aquifers (e.g., sand and gravel, Silurian, Cambrian-Ordovician, etc.);
- Establish baselines of water quality within the principle aquifers;
- Identify trends in groundwater quality in the principle aquifers; and
- Evaluate the long-term effectiveness of the IGPA, Clean Water Act, and Safe Drinking Water Act program activities in protecting groundwater in Illinois.

Illinois EPA rotates every two years from the Probabilistic (fixed station) Monitoring Network to special intensive or regional monitoring studies. Illinois EPA can concentrate on specialized monitoring at high priority areas during alternate years.

More information on the design of the CWS Probabilistic Monitoring Network can be found at
<https://www2.illinois.gov/epa/Documents/iepa/water-quality/watershed-management/tmdls/2016/303-d-list/iwq-report-ground-water.pdf>.

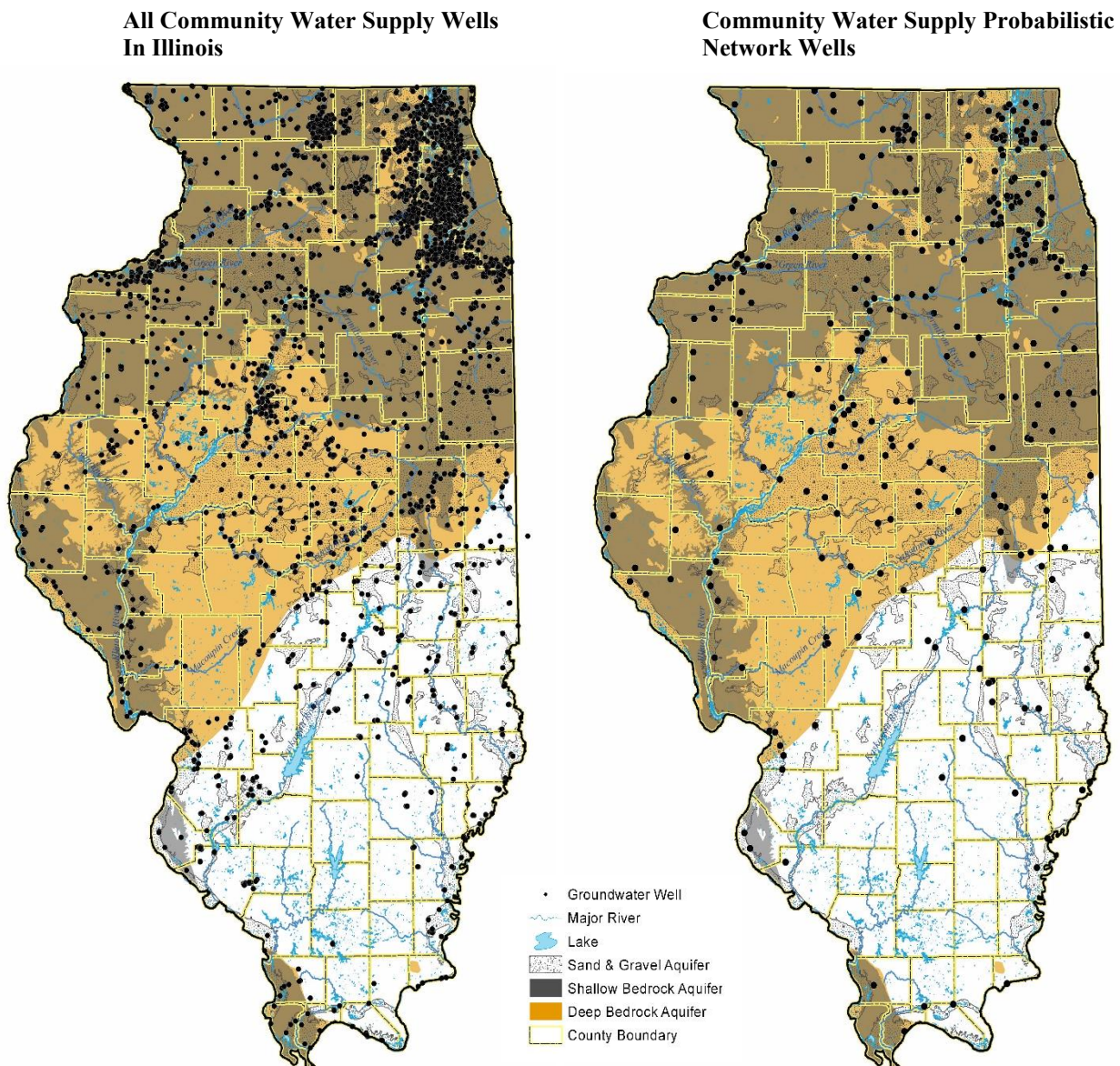


Figure 1. Active Community Water Supply Wells and Community Water Supply Probabilistic Network Wells

Mahomet Aquifer Protection Task Force

The Illinois EPA provided a significant amount of support to the Mahomet Aquifer Protection Task Force during 2018, participating in over 27 meetings. To help support and track progress of the Task Force, the Illinois EPA developed a web page that contains all of the meeting agendas, presentations, minutes and other relevant information, see <https://www2.illinois.gov/epa/topics/community-relations/sites/mahomet-aquifer-task-force/Pages/default.aspx>.

The Mahomet Aquifer Protection Task Force was created by Public Act 100-0403 to address the issue of maintaining the clean drinking water of the Mahomet Aquifer. In addition, the Mahomet Aquifer has been designated by the U.S. EPA as a Sole Source Aquifer. This is Illinois' only aquifer with such a designation.

The Mahomet Aquifer is one of Illinois' most important groundwater resources, serving as the primary source of drinking water for more than 500,000 people in 15 Illinois counties and providing an estimated 220 million gallons of water per day to communities, agriculture, industry, and rural wells. In 2017, the Illinois General Assembly created the Mahomet Aquifer Protection Task Force to identify gaps in existing aquifer-protection regulations and efforts, specifically by:

- Developing a state plan to maintain the groundwater quality of the Mahomet Aquifer;
- Identifying current and potential contamination threats to the water quality of the Mahomet Aquifer;
- Identifying actions that might be taken to ensure the long-term protection of the Mahomet Aquifer; and
- Making legislative recommendations for the protection of the Mahomet Aquifer.

The Task Force provided their Findings and Recommendations in a report published on December 21, 2018. The Task Force investigated and considered various actions, including legislative actions, to ensure the long-term protection of the Mahomet Aquifer and made the following prioritized recommendations to the General Assembly and the Governor:

1. Provide \$19.8 million to the Prairie Research Institute (PRI) to use helicopter-based time-domain electromagnetics (HTEM) technology to more accurately map and characterize the Mahomet Aquifer to aid in identifying the connections with other aquifers and surface waters;
2. Use HTEM and other techniques to identify areas where the Mahomet Aquifer is recharged;
3. Integrate data collected via HTEM into next-generation groundwater flow models.
4. Develop and implement source water protection plans pursuant to 35 Ill. Adm. Code 604 Subpart C, after the effective date of adoption, for the community water supplies determined to be susceptible to groundwater contamination;
5. Implement the recommendations outlined for each identified threat and potential threat and provide additional funding (\$1 million for one-time equipment acquisition and an additional \$2.3 million annually) to PRI to deploy state-of-the-art monitoring networks and create the analytical capability to identify emerging contaminants of concern;
6. Improve education and outreach regarding the Mahomet Aquifer such that all stakeholders are better informed about water resources, water demand, and water supply planning and management, particularly when plans are made, reviewed, and updated;
7. Develop a group with a mission similar to the Mahomet Aquifer Protection Task Force that is a blend of other select individuals that serve in a quasi-government or government capacity to provide leadership, administrative stature, or process for regional water supply;

8. Plan cooperative research and data collection, analysis, management, and exchange by academic institutions, units of government, the private sector, and other stakeholders;
9. Use the established water supply planning process to review and update regional and local water supply plans at least every five years; and
10. Ensure comprehensive use reporting by consistently and fully funding the Illinois Water Inventory Program.

Real-Time Groundwater Monitoring Research in the Mahomet Aquifer

The Illinois Department of Agriculture (IDA) is the lead state agency for the regulation of pesticide use in Illinois. Like many states, Illinois is voluntarily implementing the U.S. EPA-recommended provisions of pesticide management plans to protect groundwater. In June 2000, under the leadership of the IDA, the Pesticide Subcommittee of the ICCG approved the *Illinois Generic Management Plan for Pesticides in Groundwater* (IDA 2000). In addition to sampling the monitoring well network wells for pesticides, the IDA has sampled them for nitrates as N biennially over the past 14 years. Analyzing the frequency of nitrates in these wells has led to the IDA being able to determine nitrate “hot spots.” The results of these sampling events demonstrate the frequency of IDA wells with detections over the GWQS for nitrate of 10 milligrams per liter (mg/L). There are several wells that have had five or more detections over the GWQS. These hot spots also correspond to areas with extensive center pivot irrigation and possibly fertigation. The most significant hot spot area is referred to as the Havana Lowlands, located at the Western end of the Mahomet Aquifer. Since October 2000, IDA has sampled 32 wells in the Havana Lowlands and related area on a biennial schedule for a total of 212 times. The results of this sampling indicate that:

- 99 of 212 (46.6 %) samples analyzed in that area had Nitrate-N concentrations greater than the numerical Class I GWQS of 10 mg/L;
- 9.2 mg/L of Nitrate-N is the median value of the area; and
- The individual well with the highest detected concentrations of Nitrate-N ranged from 18 to 48 mg/L with a median value concentration of 32 mg/L.

These high nitrates in groundwater are important in consideration of Illinois’ Nutrient Loss Reduction Strategy (see <https://www2.illinois.gov/epa/topics/water-quality/watershed-management/excess-nutrients/Pages/default.aspx>). This is especially true in terms of the USGS finding that some of the highest loads of nitrates to the Mississippi River were during low flow conditions, which may indicate that during these periods a large nutrient load is being transported to the River via groundwater discharge. The Illinois River, which discharges into the Mississippi River, could have a substantial influence on Mississippi River nitrate concentrations. The median concentration of nitrate in a USGS super gage located downstream of the Havana Lowlands in the Illinois River at Florence is 6 mg/L.

As a result of these findings, the Illinois EPA proposed, and U.S. EPA funded, a real-time groundwater monitoring well project near Havana, Illinois. Data collection started on this well in March of 2017. Parameters being monitored include nitrate, specific conductance, pH, dissolved oxygen, temperature, and water level. The goal of the research is to better

understand the groundwater/surface water interactions, and potential nutrient loading to surface water.

During the first year of the project, discrete data was also collected in Quiver Creek surface water for comparison with the well data. Quiver Creek is located near the real-time monitoring well and flows to the Illinois River. Following the first year of data collection, a need was identified to better characterize water quality and hydrologic dynamics across the Quiver Creek flood plain, and in Quiver Creek. For this effort, a transect of shallow and deep piezometers was installed laterally across the floodplain and in the stream. During visits to service the well, water quality and water level information are collected in the piezometers, and in Quiver Creek. The data collection and analysis will be reported on in fiscal year 2020.

The data collection has helped tremendously with fostering relationships and communication among Illinois EPA, the Illinois Farm Bureau, local agricultural stakeholders, and the USGS. One of the concerns from the agricultural community regarding the research is making conclusions based on a relatively short period of data collection. Continuing the data collection at the real-time monitoring well would lead to a more robust data set that covers environmental extremes and helps gain better understanding of the dynamics in the aquifer over time. Additional data will help build trust within the agricultural community, while providing confidential useful monitoring data for the Illinois Nutrient Loss Reduction Strategy.

Natural Gas Leak Investigation

A well owned by The Peoples Gas Light And Coke Company (McCord #2), that was injecting natural gas into the Manlove Natural Gas Storage Field at a depth of 4,000 feet below land surface into the Mt. Simon Aquifer into the Mahomet Dome structure leaked a natural gas plume of contamination into the overlying aquifers in the Mahomet Sole Source Aquifer. The mechanical integrity of the McCord #2 well failed and natural gas rose to the surface and has contaminated some portion of Class I: Potable Resource Groundwater in the Sole Source Aquifer and multiple private water supply wells from sampling conducted by Peoples Gas. As a result, the Illinois EPA initiated an investigation to independently sample and assess a subset of wells classified by Peoples Gas as: 1) contaminated, 2) sampled but not contaminated, 3) biogenic glacial gas, and 4) not contacted in the radial vicinity of the release.

The Illinois EPA contracted with a commercial laboratory capable of conducting isotopic finger-printing used to distinguish thermogenic gas. To help accomplish this purpose, Illinois EPA staff worked in conjunction with the Illinois Department of Public Health (IDPH) and Champaign County Health Department to sample 29 private drinking water supply wells in proximity to McCord #2. The Illinois EPA found six private wells that were contaminated. The case has been referred for enforcement and the Illinois EPA is working on development of a groundwater management zone (GMZ) with the Illinois Attorney General's Office, IDNR, IDPH, and Peoples Gas.

Private Water Well Assessment Near Sterigenics Facility

Due to the concerns of residents and local officials of possible contamination of ethylene glycol and emissions of ethylene oxide from the Sterigenics facility in Willowbrook, the Illinois EPA and the DuPage County Health Department worked together to identify private wells, obtain access agreements, develop a thorough sampling plan, and develop a Quality Assurance Project Plan. In December 2018, the Illinois EPA collected more than 55 samples from residences where Illinois EPA obtained access agreements. These samples were taken on the morning of December 13, 2018, from an outside faucet (or spigot) and sent to independent certified laboratories for analysis. The sampling and lab analysis were conducted at no cost to the homeowner. The results of well sampling near the Sterigenics facility showed no signs of groundwater contamination.

CHAPTER III. GROUNDWATER QUALITY REGULATIONS

Review and Designation of Class III: Special Resource Groundwater Areas

Under the Illinois Pollution Control Board (Board) GWQS (35 Il Adm. Code 620), all groundwater in Illinois is organized under a four-tiered resource-based classification system. Class III: Special Resource Groundwater is:

- Demonstrably unique (e.g., irreplaceable sources of groundwater) and suitable for application of a water quality standard more stringent than the otherwise applicable water quality standard; or
- Vital for a particularly sensitive ecological system.

Part 620 contains an expedited review and designation process for groundwater that contributes to a dedicated nature preserve. The Illinois EPA confirms the technical adequacy of a request to designate these Class III areas. The Illinois EPA then prepares a proposal for the Board to review and designate after a public review process. As of the end of 2018, the Illinois EPA has approved the technical adequacy and the Board has designated 26 Class III Special Resource Groundwater areas at Dedicated Nature Preserves, as illustrated in Figure 2.

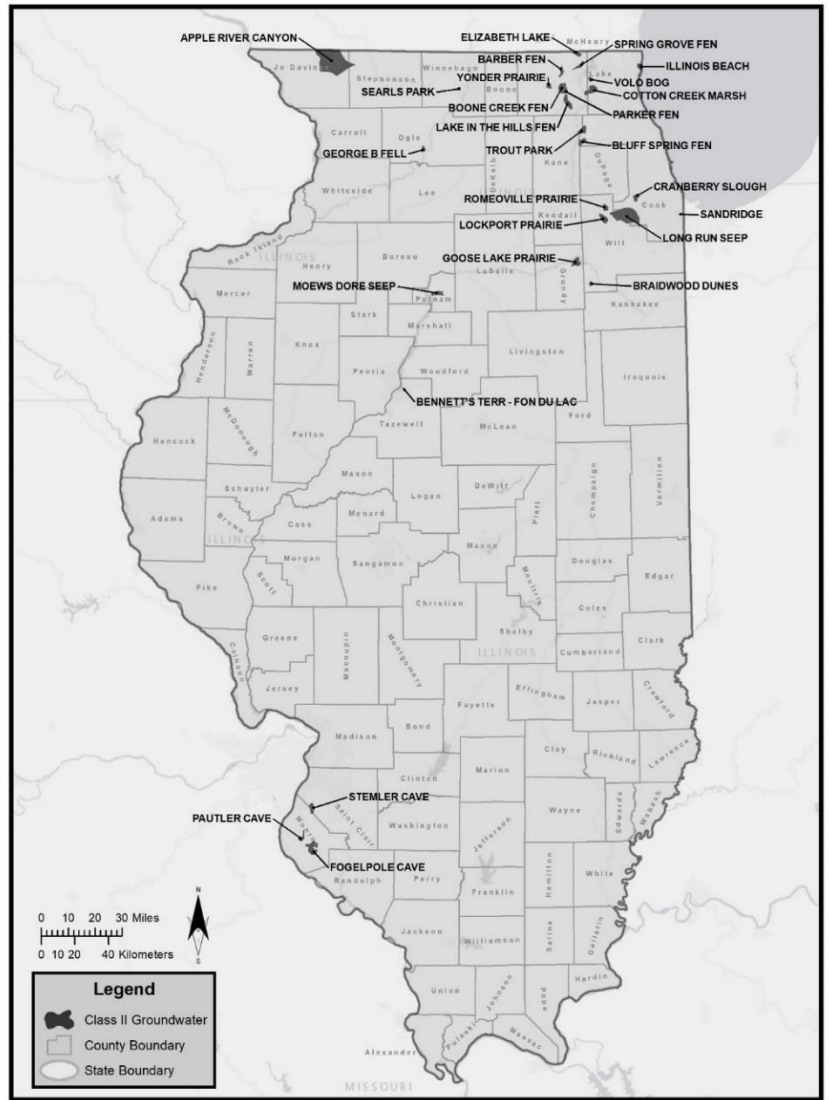


Figure 2. Class III: Special Resource Groundwater for Dedicated Nature Preserve Designations

Groundwater Management Zone Approvals

A person who has caused, threatened or allowed a release of a contaminant that exceeds the Board's GWQS regulations can come back into compliance by mitigating an impairment to the groundwater under what is referred to as a GMZ. The Groundwater Section of the Illinois EPA's Bureau of Water reviews and approves GMZs primarily for the Bureau of Water, but also for the Illinois EPA's Bureau of Land, Illinois Emergency Management Agency's Division of Nuclear Safety, IDNR (i.e., Office of Mines and Minerals and Division of Oil and Gas), and in many cases with the Office of the Illinois Attorney General.

In 2018, the Illinois EPA reviewed and approved one GMZ and is currently negotiating six additional GMZs with the parties responsible for groundwater contamination.

GMZ proposals that the Illinois EPA reviews include the following:

- Identification of any contaminants released to groundwater;
- Description of how groundwater has been and will be monitored to determine the rate and extent of the release, and if the release has migrated off the facility/site;
- A schedule for investigation of the extent of the release, if it has not already been completed;
- The results of available soil testing and groundwater monitoring associated with investigation of the release, includes locations and depths of samples, as well as any monitoring well construction details with well logs; and
- Proposed remedy, include:
 1. A detailed description of all possible remedies considered, the actual remedy selected, and reasons why that remedy was selected over the others considered.
 2. The results of groundwater contaminant transport modeling or calculations showing how the selected remedy will achieve compliance with the cleanup objective.
 3. A description of the fate and transport of contaminants with the selected remedy over time.
 4. A statement of how groundwater at the facility/site will be monitored following implementation of the remedy to ensure that the cleanup objective has been obtained.

In 2018, the Groundwater Section of the Illinois EPA's Bureau of Water reviewed and approved one GMZ and is currently negotiating six additional GMZs with the parties responsible for groundwater contamination.

CHAPTER IV. WELLHEAD PROTECTION PROGRAM

Maximum Setback Zone Program

Under Section 14.3 of the Illinois Environmental Protection Act, counties and municipalities utilizing any CWS well are authorized to establish a maximum setback zone, up to 1,000 feet, around their well(s). The law established minimum setback zones of either 200 or 400 feet. Establishing maximum setback zones has the following benefits to water supplies:

- Prevention of contamination by siting restrictions up to 1,000 feet;
- Regulation of existing and new potential sources of contamination;
- Provides an awareness of the sensitivity of the zone to contamination problems;
- Proves local control and authority for wellhead protection; and
- Requires the application of the most stringent remedial cleanup objectives within 1,000 feet of a community well.

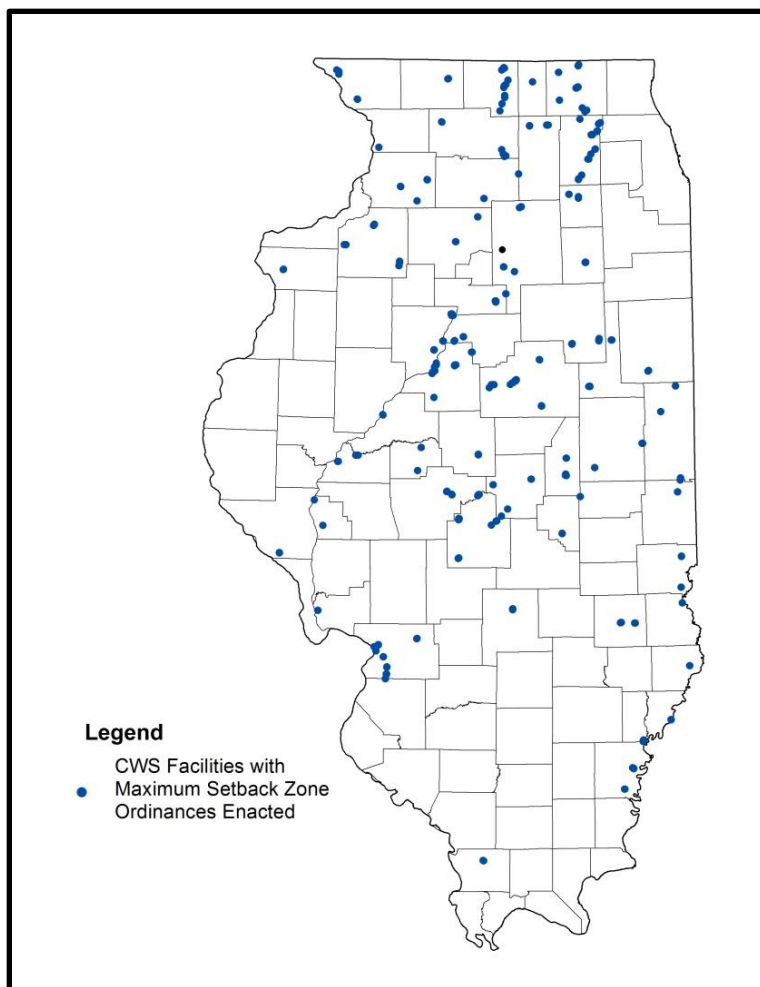


Figure 3. Maximum Setback Zones Adopted

The Illinois EPA and a Source Water Protection Specialist with the Illinois Rural Water Association have provided maximum setback zone technical assistance and educational information during CWS site visits and at professional conventions. As illustrated in Figure 3, a total of 121 CWSs with a total of 376 active wells have maximum setback zone protection. No additional maximum seatback zones were established in 2018.

CHAPTER V. REGIONAL GROUNDWATER PROTECTION PLANNING PROGRAM

Priority Regional Groundwater Protection Planning Regions Summary

The Illinois EPA was required to establish a regional groundwater protection planning program. Since 1991 the Illinois EPA, in cooperation with the IDNR, has designated four priority groundwater protection planning regions, see Figure 4. These regional designations considered the location of recharge areas that were identified and mapped by IDNR. Further, the Director of Illinois EPA established a regional planning committee for each Priority Groundwater Protection Planning Region. Each regional planning committee is responsible for the following:

- Identifying and advocating for region-specific groundwater protection matters;
- Monitoring and reporting the progress made within the region regarding implementation of protection for groundwater;
- Maintaining a registry of instances where the Illinois EPA has issued an advisory of groundwater contamination hazard within the region;
- Facilitating informational and educational activities relating to groundwater protection within the region; and
- Recommending to the Agency whether there is a need for regional protection pursuant to regulated recharge area.

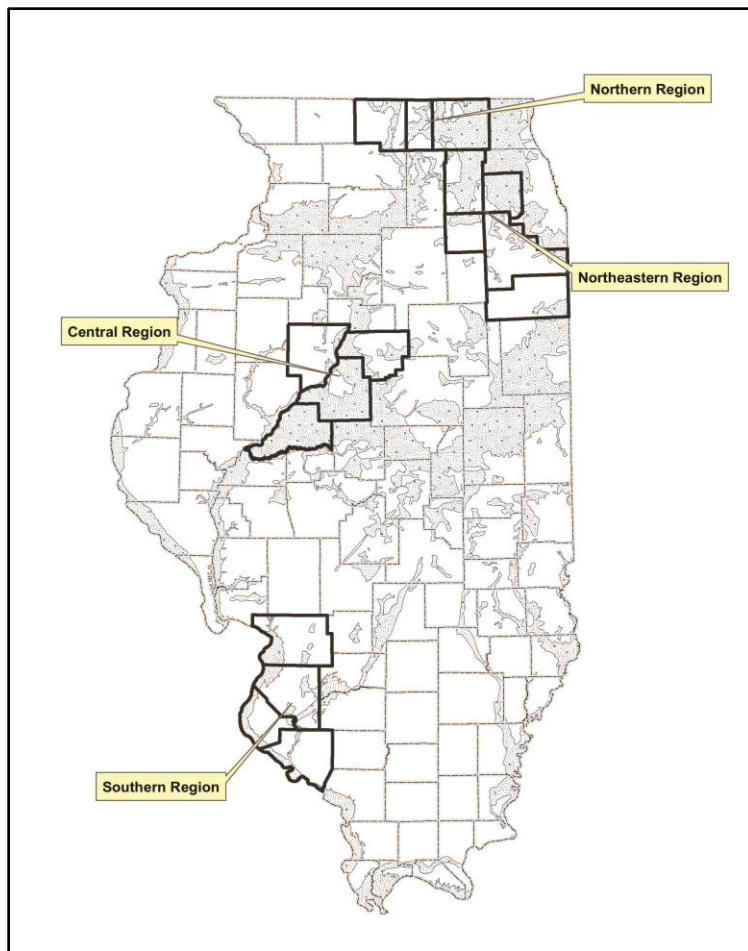


Figure 4. Priority Groundwater Protection Planning Regions

Illinois EPA continues to work very closely with the regional priority groundwater protection planning committees to establish groundwater protection programs at the local level. Although each region has specific priorities and areas of concern, their general mission statements all have common goals and objectives. Integration of wellhead protection

programs has been, and will continue to be, implemented for CWS wells in Priority Groundwater Protection Planning Regions. There are indicators that show CWS groundwater protection progress within the Priority Groundwater Protection Planning Regions.

In general, the first step of developing a CWS groundwater protection program involves determining the recharge area for CWS wells in unconfined aquifers utilizing existing aquifer property data. In Illinois, the recharge area is based on a five-year time of travel delineation. The second step involves determining the potential sources, potential routes, and the land use zoning within these recharge areas. The third step involves establishing a local team of stakeholders to develop a groundwater protection strategy, and most importantly, taking the necessary measures to implement these activities to protect groundwater resources. The last step is the development of a local emergency-planning document that addresses natural disasters, chemical contamination, and physical disruptions that threaten the supply and distribution network of the public water supply.

During the past two years, Illinois EPA and members of the priority groundwater protection planning committees have met with local stakeholders to encourage the development of groundwater protection programs and to implement activities to protect CWS recharge areas. The following information provides a summary of community outreach programs that the regional committees have targeted for groundwater protection efforts.

Northern Groundwater Protection Planning Region (Winnebago, Boone, and McHenry Counties) – The Northern Groundwater Protection Planning Committee have assessed their efforts, and provide the following summary of these actions:

- The 24th annual **Youth Groundwater Festival** was held March 7, 2018, at Rock Valley College in Winnebago County. Over 500 4th and 5th grade students from ten area schools from Boone and Winnebago Counties attended the free festival. Activities included: Groundwater Flow Model, Enviroscape model, “Dripial Pursuit”, and Water Testing. These presentations enabled students to identify where drinking water comes from, how “above ground” activities impact groundwater, common contaminants in drinking water, a few screening methods for water testing, observations of microorganisms through a microscope, and modern methods of water supply protection. Approximately 100 people volunteered to help and/or financially supported the Youth Groundwater Festival, including members of the Northern Committee, teachers and students enrolled in Rock Valley College science classes, and various state and local government agencies, water departments, and several environmental groups and associations.
- Annually, approximately 440 students attend the free **STEM (Science Technology Engineering and Math) Groundwater Festival** held at the Soil and Water Conservation District’s Dean Street facility located at the headwaters of the Kishwaukee River and at Heineman Middle School in Algonquin. Students move through hands-on education stations addressing topics such as: watching what happens when pollution and rainwater enter the ground beneath your feet using the

groundwater model; problem-solving groundwater contamination and investigating soil chemistry while learning about how water is naturally cleaned by the soil. Other hands-on activities include: discovering how to best mitigate storm water hazards such as flooding and nonpoint source pollution, sampling a stream for water chemistry and insect indicator organisms known as benthic macroinvertebrates, determining the relationship of groundwater, surface water, and vegetation leading to biodiversity within the watershed, and examining the water cycle through hands-on activities. The day starts off with students bringing their own water from a local site and “mixing” the waters in the Celebration of the Waters ending in a hands-on discovery of the distribution of water on the planet

- The Northern Committee continues to help support the cost of the disposal of barrels used in county **Unused and Expired Medications Collections** for many of the committee sponsored events. These events are in cooperation with Keep Northern Illinois Beautiful.
- On September 12, 2018, the Northern Committee participated in a **Groundwater Field Trip and Water Forum** starting at McHenry County College. Mr. Jason Thomason, Principal Research Scientist and Geologist with the Illinois State Geological Survey was the main speaker. There were 49 attendees and it started out with a mini Groundwater Festival. Participants of the field trip started at the McHenry County Soil and Water Conservation District on Dean Street and had an overview of the hydrology, viewing a soil core, Groundwater Model, Enviroscope and a power point presentation.
- The Northern Committee continues to work with organizations from Winnebago, Boone and McHenry Counties in the **Well Sealing Program** to properly abandon wells that are no longer used and/or are susceptible to groundwater contamination. There have been 263 wells abandoned since the program began in 2001, having two additional wells abandoned last year in McHenry County. The Northern Committee purchases bentonite and provides to well owners, at cost, thereby using the income to purchase additional bentonite.

Northeastern Groundwater Protection Planning Region (Kane, Kendall, DuPage, Will, and Kankakee Counties) – The Northeastern Groundwater Protection Planning Committee have assessed their efforts, and provide the following summary of these actions:

- The **Annual Field Day** is typically geared toward local and regional water operators and local environmental health departments to assist in obtaining professional development credits. The Committee members often reach out to the public to provide information on topics related to their use of groundwater. Members of the Northeastern Committee from Kankakee County will plan the event for 2019. Other members may act as speakers to present on various topics, e.g., current rulemaking in Illinois, best management practices, and local private well management programs.

- The Committee provides Bentonite as part of **Well Sealing Assistance** for abandoned water wells in the region. Fees for sealing the well can be waived by regional health departments and/or paid by the Committee. The Northeastern Committee has developed a brochure to promote this activity. This brochure explains well sealing and is distributed at public events; it is also available at the health departments in each county. Further, **Well Sealing Demonstrations** have been successfully held at locations in the region with more to be planned in the near future. Private citizens, local government representatives, and public health/groundwater protection personnel are targeted to advance hands-on experience in well sealing efforts.
- Many Northeastern Committee members participated in **Community Outreach Library and Presentations** by promoting groundwater awareness through the following events:
 1. Posting information such as Illinois EPA and committee brochures in public places such as libraries, county, and township buildings;
 2. Community events such as the Kendall County Natural Resource Tour;
 3. County health department well education efforts in Will, Kendall, Kane, and DuPage Counties;
 4. School group meetings in Kankakee, Kane, and Will Counties;
 5. Earth Day and Arbor Day celebrations; and
 6. Continued updates to a Facebook page for the Northeastern Committee
- The Northeastern Committee has made available various **Educational Materials** including groundwater flow models, an Enviroscope, a display board showing an interactive water cycle, and other printed materials. The Committee also purchased various giveaways (recycled pens, pencils, note pads, etc.) to increase the public awareness of our groundwater protection endeavors.
- The Northeastern Committee has also developed an **Informational Brochure** that explains our work and how we can help communities in the region. This brochure is updated on an “as needed” basis and is available at our members’ health departments and at public events. The Northeastern Committee also maintains **Lending Libraries** that are regularly updated and available for public use. The libraries include information (publications, videos, books, activities, a display board and groundwater models) for citizens, professionals, and educators. Current inventory and the need for additional resources are regularly reviewed. Committee members continuously participate in fairs and events and usually give demonstrations on the groundwater models or the Enviroscope tabletop hydrologic model.
- The Northeastern Committee co-hosts each autumn an informational and training **Snow and Ice Removal Seminars** for public and commercial applicators of road salt. Last year’s event was held with the assistance of the Conservation Foundation, the Lower DuPage River Watershed Coalition, and the Lower Des Plaines Watershed Group. The program was expanded and improved over the years to include the science

of road salt impacts and hands-on training with salt trucks. Certification in de-icing operations is also provided.

Central Groundwater Protection Planning Region (Peoria, Tazewell, Woodford and Mason Counties) – The Central Groundwater Protection Planning Committee have assessed their efforts, and provide the following summary of these actions:

- The **Clean Water Celebration** is a two-day event held each spring at the Peoria Civic Center in Peoria, Illinois. The largest event of its kind in the world, students learn how to make a difference by protecting water-our most precious resource. There's nothing like it anywhere. The Clean Water Celebration is a truly unique event, a model developed in Peoria for the world. These events are a joint project of the Sun Foundation, Illinois American Water, the Central Committee and various other community members. The Central Committee provided students with promotional pencils at the event to answer questions that each exhibitor asks at their booth and promoted "Skip the Straw". Skip the Straw is a call to action to reduce the use of plastic straws.
- On October 11, 2018, Tazewell County Health Department held an **Annual Environmental Education Day**. This is an event geared to all Tazewell County fifth grade students and usually around 400 students participate. Stations for student participation included hands on activities such as making edible aquifers and jungles in a jar, recycling relays, etc. Participating sponsors represented include Illinois EPA, Forest Park Nature Center, Peoria County Sustainability, Ameren Illinois, Heart of Illinois Bee Keepers, Trees Forever, Illinois American Water, and U.S. Fish & Wildlife Service. The Central Committee is planning for another Environmental Education Day for October 10, 2019.
- The Central Committee promoted **Groundwater Awareness Week** which was March 10-16, 2018. Groundwater is essential to the health and well-being of humanity and the environment. Whether you're on a public water system or a private well, whether you are a health care official, policy- maker, regulator, an environmentalist or a groundwater professional, we are trying to get everyone involved in protecting this vital resource. The Central Committee promoted Groundwater Awareness Week on social media. The Committee also purchased nitrate test strips to offer screenings of private well water and free water testing. The Central Committee promotes this event every year.
- Household leaks can waste more than 1 trillion gallons of water annually nationwide, so each year we investigate the drips during **Fix a Leak Week**. 2018 Fix a leak week was March 19-25, 2018. To help consumers save water, the U.S. EPA's WaterSense program promotes ways to identify and repair dripping faucets, running toilets, and leaky showerheads. In most cases, fixture replacement parts can be installed by do-it-yourselfers and pay for themselves in no time. The Central Committee posted on

social media sites and Fix a Leak Kits were distributed in Peoria, Tazewell, Woodford and Mason Counties. The Committee promotes this event annually.

Southern Groundwater Protection Planning Committee (Madison, Monroe, St. Clair, and Randolph Counties) – The Southern Groundwater Protection Planning Committee have assessed their efforts, and provide the following summary of these actions:

- The Southern Committee's **Annual Field Day** was held at Southern Illinois University at Edwardsville and concentrated on student participation and careers in groundwater/water production, and protection. The field day included multiple guest speakers and topics ranging from composting, value of trees, and the National Resources Conservation Service Pathways Program. The Committee, along with approximately 50 other attendees, toured the Edwardsville Watershed Nature Center.
- As part of its **Well Sealing Assistance**, the Southern Committee offers up to \$250 to assist with the sealing of private wells. For the past ten years bentonite has been provided free of charge, to approved individuals, wanting to seal a private well in the four-county region. The Southern Committee continues to target the public, government representatives, and professionals in the industry to aid in well-sealing efforts.
- The Southern Committee continues to promote and sponsor the National Great River Research and Education Center and the annual **Lewis & Clark Water Festival**. The mission of this festival is to advance water education to local and regional school teachers and children by participating in hands-on water education activities during the event. The event participation garners approximately 20 school teachers and 500 fifth grade students annually. The funds provided by the Southern Committee are used to aid teachers in promoting water quality, canoeing and fishing activities, and logistical support during the festival.

CHAPTER VI. BASIC AND APPLIED GROUNDWATER RESEARCH PROGRAM

The IGPA requires an ongoing program of basic and applied research be conducted that assists with decisions to be made on sound scientific principles. The PRI in consultation with the Illinois EPA, ICCG, and the GAC develop and administer an ongoing program of basic and applied research relating to groundwater. Information generated from this program will be made available to local governments seeking technical assistance from the PRI. During 2018 PRI published the following:

1. Kelly, W.R., S.V. Panno, K.C. Hackley, D.R. Hadley, and D.H. Mannix, 2018. Paleohydrogeology of a Paleozoic sandstone aquifer within an intracratonic basin: Geochemical and structural controls. *Journal of Hydrology*. 565(2018):805–818. DOI: 10.1016/j.jhydrol.2018.09.004.
2. Panno, S.V., Z. Askari, W.R. Kelly, T.M. Parris and K.C. Hackley, 2018. Recharge and groundwater flow within an intracratonic basin, Midwestern U.S. *Groundwater*. 56(1):32–45. DOI: 10.1111/gwat.12545.
3. Meyer, S.C., B. Dziegielewski, Z. Zhang, D. Abrams, and W.R. Kelly, 2018. Water Demand in the Middle Illinois Water Supply Planning Region, 2010-2060. Illinois State Water Survey, Contract Report 2018-06, Champaign, IL, 184 p. <https://www.ideals.illinois.edu/handle/2142/102366>.
4. Kelly, W.R., and S. Kuykendall, 2018. Sensible Salting in the Chicago Region Fact Sheet. Northwest Water Planning Alliance and Illinois State Water Survey, Contract Report 2018-11, Champaign, IL, 2 p. <https://www.ideals.illinois.edu/handle/2142/102061>.
5. Kelly, W.R., D.B. Abrams, H.V. Knapp, Z. Zhang, B. Dziegielewski, D.R. Hadley, G.S. Roadcap, D.H. Mannix, Y. Lian, S.C. Meyer, and J.F. Thomason, 2018. Water Supply Planning: Middle Illinois Assessment of Water Resources for Water Supply: Final Report. Illinois State Water Survey Contract Report 2018-02, Champaign, IL, 116 p. <https://www.ideals.illinois.edu/handle/2142/101848>.
6. Abrams, D.B., G.S. Roadcap, D.H. Mannix, and D.R. Hadley. The Illinois Groundwater Flow Model 2018.0. Illinois State Water Survey Contract Report 2018-04, Champaign, IL. <https://www.ideals.illinois.edu/handle/2142/102968>.
7. Abrams, D.B. and H.M. Haitjema. 2018. How Aquifer Characteristics of a Watershed Affect Transit Time Distributions of Groundwater. *Groundwater*. 56(4): 517-520.

8. Mannix, D.H., D.B. Abrams, D.R. Hadley, and G.S. Roadcap. 2018. Conceptualizing leakage and storage contributions from long open interval wells in regional deep basin flow models. *Hydrological Processes*. 33(2): 271-282. doi.org/10.1002/hyp.13324.
9. Hadley, D.R., Krueger, J.A., Roadcap, G.S., Healy, C.R., 2018, Mapping the Distribution of Water Use in Illinois: ESRI Press, Redlands, CA, ESRI Map Book Series Vol. 33.
10. Roadcap, G.S., 2018. Anomalous groundwater pressure responses in the Mahomet Aquifer near the Manlove Gas Storage Field. Prairie Research Institute White Paper, Champaign, IL, 6 p.
11. Locke, R., G. Roadcap, A. Stumpf, H. Leetaru, W. Kelly, and R. Winkel, 2018. An Introductory Guide to the Mahomet Aquifer and Natural Gas Storage in East-Central Illinois. Prairie Research Institute, Champaign, IL, 18 p.
12. Abrams, D.B. and S. Ahrendt. 2018. Animating the potentiometric surface of a heavily irrigated aquifer. 2018 GSA Annual Meeting in Indianapolis, IN.
13. Abrams, D.B. and S. Ahrendt. 2018. Moving toward a real-time model of groundwater/ surface water interactions in two heavily irrigated systems. 2018. International Environmental Modeling Software Symposium in Ft. Collins, CO.
14. Abrams, D.B., G.S. Roadcap, D.H. Mannix, and D.R. Hadley. 2018. The Evolving Nested Illinois Groundwater Modeling Architecture (ENIGMA): Automated withdrawal updates for a groundwater flow model. 2018 International Environmental Modeling Software Symposium in Ft. Collins, CO.
15. Hadley, D.R., Abrams, D.B., “Revisiting one of the largest aquifer tests in history: Implications for fault zone hydrogeology and the declining groundwater supply of northeastern Illinois” GSA North Central Section Meeting, Ames, IA, April 17th, 2018.
16. Panno, S.V., W.R. Kelly, J. Scott, W. Zheng, R. McNeish, N. Holm, T. Hoellein, and E.L. Baranski. Microplastics in Karst Groundwaters of Illinois. Geological Society of America Annual Meeting, Indianapolis, IN, Nov. 4-7, 2018.

17. Panno, S.V., B.L. Baranski, and W.R. Kelly. Sponge Farm: A New Way of Thinking for Agriculture in Illinois' Driftless Area, Jo Daviess County, Northwestern Illinois. Fresh Water: Design Thinking for Inland Water Territories Symposium. University of Illinois at Urbana-Champaign Department of Landscape Architecture, Sept. 13-15, 2018.
18. Panno, S.V., W.R. Kelly, J. Scott, W. Zheng, R. McNeish, N. Holm, T. Hoellein, and E.L. Baranski. Microplastics and PPCPs Occurrence in Karst Groundwaters of Illinois. Emerging Contaminants in the Aquatic Environment Conference, Champaign, IL, June 5-6, 2018.

In addition to the Illinois State Geological and Water Surveys, the ICCG invites the USGS to participate in all the ICCG/GAC meetings. The following provides a list of USGS publications in 2018:

1. Kay, R.T., Gahala, A.M., and Bailey, C., 2018, Assessment of water resources in areas that affect the habitat of the endangered Hine's emerald dragonfly in the Lower Des Plaines River Valley, Illinois: U.S. Geological Survey Scientific Investigations Report 2018–5074, 104 p., <https://doi.org/10.3133/sir20185074>.
2. Romanok, K.M., Kolpin, D.W., Meppelink, S.M., Focazio, M.J., Argos, M., Hollingsworth, M.E., McCleskey, R.B., Putz, A.R., Stark, A., Weis, C.P., Zehraoui, A., and Bradley, P.M., 2018, Concentrations of lead and other inorganic constituents in samples of raw intake and treated drinking water from the municipal water filtration plant and residential tapwater in Chicago, Illinois, and East Chicago, Indiana, July–December 2017: U.S. Geological Survey Open-File Report 2018–1071, 10 p., <https://doi.org/10.3133/ofr20181071>.
3. Romanok, K.M., Kolpin, D.W., Meppelink, S.M., Argos, M., Brown, J.B., DeVito, M.J., Dietze, J.E., Givens, C.E., Gray, J.L., Higgins, C.P., Hladik, M.L., Iwanowicz, L.R., Loftin, K.A., McCleskey, R.B., McDonough, C.A., Meyer, M.T., Strynar, M.J., Weis, C.P., Wilson, V.S., and Bradley, P.M., 2018, Methods used for the collection and analysis of chemical and biological data for the Tapwater Exposure Study, United States, 2016–17: U.S. Geological Survey Open-File Report 2018–1098, 79 p., <https://doi.org/10.3133/ofr20181098>.
4. Gahala, A.M., 2019, Hydrologic influences on water levels at Three Oaks Recreation Area, Crystal Lake, Illinois, April 14 through September 27, 2016: U.S. Geological Survey Scientific Investigations Report 2019–5105, 22 p., <https://doi.org/10.3133/sir20185105>.

CHAPTER VII. GROUNDWATER QUALITY PROTECTION **RECOMMENDATIONS AND FUTURE DIRECTIONS**

The following groundwater protection efforts initiated in 2018 will continue in 2019 and 2020 based on the results of the self-assessment and environmental indicators. In some tasks, the priority may be shifted due to funding constraints.

Interagency Coordinating Committee on Groundwater Operations

- Continue to review and update the Implementation Plan and Regulatory Agenda.
- Continue to assist the GAC in the review and development of recommendations pertaining to groundwater quality and quantity issues.
- Continue the policy discussion concerning the integration of wellhead protection areas with Tiered Approach for Corrective Action Objectives.
- Continue investigation into the ability of IDPH to track and register groundwater monitoring wells.
- Initiate educational efforts on addressing and preventing increasing chloride trends.
- Initiate evaluation of Mahomet Aquifer Task Force recommendations.
- Initiate evaluation of Per- and Polyfluoroalkyl Substances (PFAS).
- Continue coordinating on regional groundwater quantity planning and climate resiliency.

Groundwater Advisory Council Operations

- Conduct policy-related meetings in order to review and make recommendations regarding groundwater issues and policies.
- Provide input to programs, plans, regulatory proposals, and reports, as appropriate.

Groundwater Evaluation Program

- Continue to conduct basic and applied groundwater research programs that allow decisions to be made on sound scientific principles.
- Continue to update source water assessment fact sheets with information from Right-to-Know, Groundwater Rule evaluations, and field inspections.
- Continue ambient groundwater monitoring programs at Illinois EPA and IDA pursuant to the Act, IGPA and State Pesticide Management Plan, respectively.
- Continue with the pilot assessment of nitrates in groundwater and its impact on surface water in relation to Illinois Nutrient Loss Reduction Strategy and publish a report of research with the USGS in 2019.
- Publish a Groundwater Quality Report including an emphasis on the Mahomet Aquifer.

Groundwater Enforcement Cases

- Provide expertise in groundwater water related enforcement cases.

Groundwater Quality Regulations

- Continue with proposed changes to the GWQS and continue efforts of protecting future beneficial uses of drinking water.
- Illinois EPA will be working to implement Senate Bill 9 (Coal Ash Act) to develop and propose regulations to the Board and to obtain federal approval of a permit program for coal combustion residual surface impoundments.

Wellhead Protection Program

- Continue to participate in the Board rulemaking process for adopting proposed regulations requiring the development of source water protection planning.
- Continue to integrate groundwater into watershed plans.

Regional Groundwater Protection Planning Program

- Continue to assist and advocate local groundwater protection, education, and marketing.

Groundwater Technical Review of Bureau of Water Permits

- Provide input on protective design and appropriate groundwater monitoring systems.

Groundwater Management Zones - Bureau of Water Permits

- Review and approve corrective action and closure under a GMZ.