Section

4

Collaborative Transboundary Governance in EPA Region 5

During the project period, Freshwater explored opportunities for collaboration across jurisdictions, including municipalities, states and Tribal nations in EPA Region 5 for improved groundwater governance through the following activities:

- meeting with EPA on the new ruling to protect treaty-reserved rights in ceded territories;
- working with the Minnesota Groundwater Association (MGWA) to feature groundwater specialists from the Region at their conference on sustainable groundwater management;
- co-hosting an interstate meeting with the Minnesota Department of Natural Resources (DNR) for groundwater technical staff from across Region 5;
- reviewing groundwater ordinance language;
- reviewing existing transboundary agreements and identifying best practices;
- discussing site-selection and design considerations for high-volume water users with engineering firms;
- meeting with citizen groups about their ability to engage in groundwater governance.

Description of Geographic Challenge

Every person, agricultural enterprise, and industry uses water. Yet water, a shared, common-pool resource, is often an afterthought in site selection and planning processes. The Great Lakes region is perceived as being water-rich and states promote this asset to attract water-intensive industries.[1] While it is true that the region hosts usable groundwater, the supply is not limitless, evenly distributed, and in places it is being depleted in decades. Use is clearly not sustainable in areas with large cones of depression or where streams, wetlands, and lakes are seasonally impacted. Areas that lack bedrock aquifers and rely on glacial sediment for groundwater are less likely to support large population centers and water-intensive industry long-term. Where glacial aquifers are at the surface, the need for irrigation can stress connected surface waters.[2] There are other unique local challenges from over-pumping such as salt intrusion, [3] PFAS and pollutant plume migration, and mobilization of geogenic contaminants like arsenic, manganese, and radon.

The adequacy of groundwater to sustain existing and new users requires evaluation on a case-by-case basis using an appropriate level of detail to describe local hydrogeologic conditions; a comprehensive summary of current use; a groundwater monitoring network; and future-scenario modeling that includes climate impacts.

This section reviews the results of the activities listed above as they apply to existing gaps, best practices, and barriers for management, conservation, and sustainable use of groundwater.

Applying Groundwater Quantity to EPA's Rule on Water Quality Standards to Protect Treaty-Reserved Rights: A Discussion with the EPA

Freshwater and Great Lakes Indian Fish and Wildlife Commission (GLIFWC) staff requested a meeting with those who worked on the rule on water quality standards (WQS) to protect treaty-reserved rights (TRR Rule).[4] Region 5 staff close to the topic also attended (supervisors, tribal coordinators, water quality standards coordinator, and tribal water standards specialists). The objective was to better understand how the EPA's TRR Rule might play out in practice, especially in surface waters with a strong

1 Davis, Jon. "Big Data Centers, Big Rewards for States?" CSG Midwest, November 18, 2024. https://csgmidwest.org/2024/11/18/big-data-centers-big-rewards/.

2 "Central Sands Lakes Study." Central Sands Lakes Study | Wisconsin DNR, May 2021. https://dnr.wisconsin.gov/topic/Wells/HighCap/CSLStudy.html

3 Walters, Alex. "Salt Level Rising in Michigan Groundwaters, Endangering Crops, Homes." Bridge Michigan, April 15, 2024. https://www.bridgemi.com/michigan-environment-watch/salt-level-rising-michigan-groundwaters-endangering-crops-homes.

4 Water Quality Standards Regulatory Revisions To Protect Tribal Reserved Rights, EPA-HQ-OW-2021-0791; FRL-8599-02-OW § (2024).

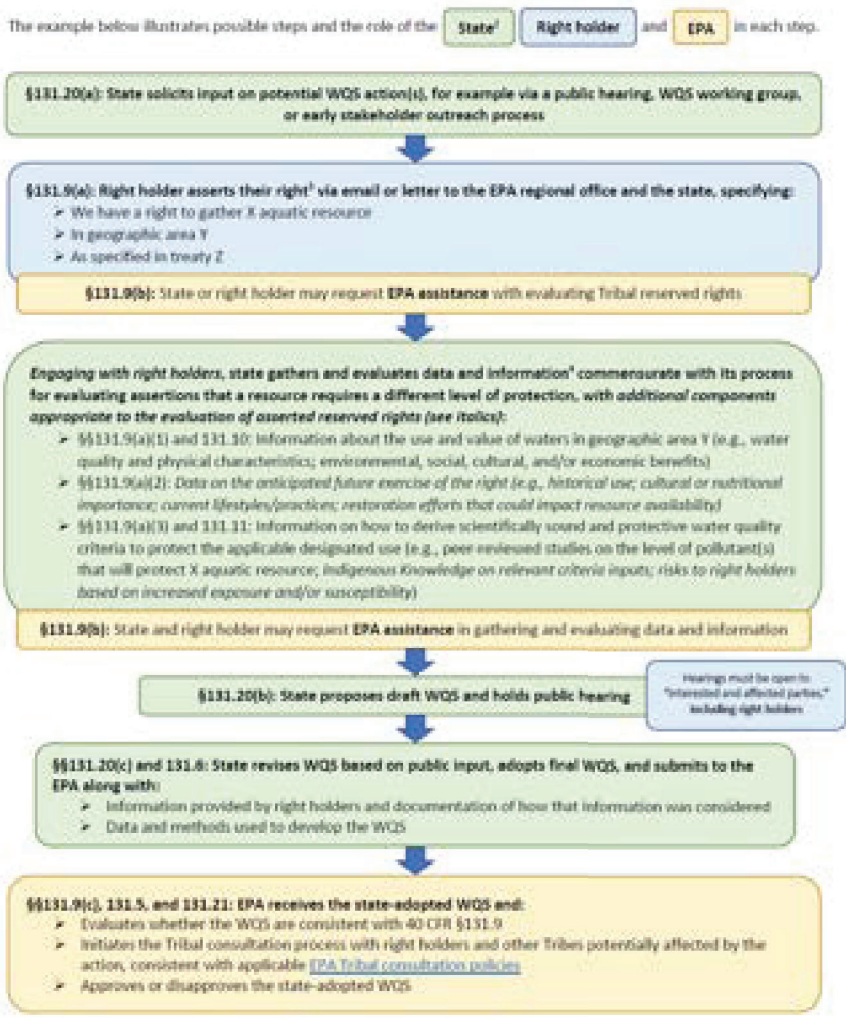

Figure 4.1. EPA Regulatory Revisions for TRR Rule with an Example Implementation Scenario

1 - This example implementation scenario does not impose legally binding requirements on the U.S. Environmental Protection Agency (EPA), states, Tribes, or the regulated community, nor does it confer legal rights or impose legal obligations upon any member of the public. The EPA regulations referenced in this document contain legally binding requirements. This example implementation scenario does not change or substitute for any Clean Water Act (CWA) provision or EPA regulation. The example provided here may not apply to a particular situation based upon the circumstances. This document is not intended to bind any EPA decisionmakers as they review WQS under CWA section 303(c). Notwithstanding anything in this document, each WQS action must be evaluated on a case-by-case basis in accordance with the CWA and the EPA's implementing regulation at 40 CFR part 131.

2 - Pursuant to 40 CFR 131.3(j), "states" include the 50 states, the District of Columbia, Guam, the Commonwealth of Puerto Rico, Virgin Islands, American Samoa, the Commonwealth of the Northern Mariana Islands, and Indian tribes that the EPA determines to be eligible for purposes of the WQS program.

3 - A decision not to raise a right in a specific WQS context does not amount to a general waiver or disclaimer of that right in the WQS context or in other contexts, including with respect to other state or federal actions that may impact Tribal reserved rights. Additionally, a decision not to raise a right during a specific state WQS development process does not preclude the right holder from raising that reserved right during another WQS development process or during another process addressing expressed Tribal interests, as long as the assertion relates specifically to WQS.

4 - There may be circumstances where data and information are not available in a specific state WQS development process, such as where additional time is needed to gather data and evaluate the results. In such cases, the triennial review process exists to ensure that any new information that was not previously addressed is considered and incorporated in a future WQS revision, as appropriate. In the interim, the state, the right holder, and the EPA should discuss next steps for a future WQS revision to address the new information, as needed, as well as how the right could be protected until that future WQS revision occurs.

groundwater connection. The intent was to explore the applicability of the TRR Rule to the following scenarios, especially where treaty territories cross state boundaries.

I. Groundwater-fed streams and springs have cooler, more stable temperatures and differing water chemistry from surface water. Cold-water fish and the organisms they depend on are potentially at risk if groundwater is depleted. Could the TRR Rule be used if enough groundwater was extracted to warm groundwater-fed streams?

II. Healthy wild rice beds have been linked to areas of groundwater upwelling. Could the TRR Rule be deployed if groundwater withdrawal impacted wild rice viability?

III. In a reverse scenario – where shallow aquifers have been breached by pipeline emplacement- cold upwelling groundwater into tannic (acidic) surface-water bodies has the potential to change pH and temperature creating unfavorable habitat for bog plants and life. Could the TRR Rule be used to protect those waters from harmful groundwater discharge?

The process for implementation of the TRR Rule as outlined by the EPA is portrayed in Figure 4.1.[5]

Every three years, states take part in the triennial review process where current WQS are assessed, developed, updated, and revised, and the state solicits comments.[6] [7] Tribes with TAS status are authorized to establish and enforce WQS within reservation boundaries. There is also potential for Tribal WQS to have occasional upstream, off the reservation impact if the point source could compromise those standards.[8] As such, the TRR Rule is intended for Tribes without TAS or for areas where Tribal WQS are not currently in place. The proposed implementation scenario would likely take multiple years. As of this report, questions remain about the level of consultation with Tribes that will be exercised by each state. According to this proposed process, consultation with Tribes will not happen early or frequently. Instead, states will follow the status quo in conjunction with public comment periods and formal review processes.

Treaty-Reserved Rights Rule's Application to Groundwater

The TRR Rule was designed to apply to surface water, not groundwater and to clarify EPA's role in assisting tribes with surface-water-quality standards. A surface-water standard can be quantity-, quality-, temperature-, or contaminant-based. Surface water can be protected for the use of recharging groundwater used as a drinking-water source or in support of a treaty-reserved right. EPA staff acknowledge that surface water and groundwater connections have not been explored thoroughly in Region 5 compared to other water-scarce parts of the country. The TRR Rule would allow Tribes to assert rights for consideration to the EPA related to surface water interaction with groundwater.

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5 U.S. Environmental Protection Agency. WQS Regulatory Revisions to Protect Tribal Reserved Rights: Example Implementation Scenario, April 2024. https://www.epa.gov/system/files/documents/2024-05/tribal-reserved-rights-final-rule_fact-sheet_508.pdf.

6 "Triennial Review." Illinois Environmental Protection Agency, 2025. https://epa.illinois.gov/topics/water-quality/standards/triennial-review.html.

7 **Note:** The triennial review process is every three years for each state. Not every state conducts its triennial review on the same year.

8 "TAS for the Water Quality Standards Program, EPA 820-F-17-019." EPA Office and Science and Technology, September 2017. https://www.epa.gov/.

Implementation of the TRR Rule could require designating the use of a surface-water feature by using a criterion that would ensure protection if interaction with groundwater occurs. An assertion could also focus on a use impacted by surface-water impairments that require groundwater recharge. For example, there are designated uses for surface water that involve treaty-reserved rights to gather manoomin or fish. Changes in groundwater quantity can impact aspects of surface-water chemistry like dissolved oxygen, salinity, or temperature. To the extent that waters under review with the TRR Rule are supported by adequate groundwater, they could be subject to an updated standard. The volume of cold water needed to maintain an existing thermal standard is dependent on the air temperature as well as groundwater temperature and volume. Citing a thermal standard could require documentation of any change in temperature to a cold-water stream that was a result of climate versus groundwater volume or temperature change.

Tribal Rights for Interstate Ceded Territories

States receive delegated authority from the EPA to administer federal environmental programs, like the Clean Water Act's WQS program, which sets standards within the state borders. Tribes who have applied for and been approved for Treatment as a State (TAS) also have that same delegated authority, similar to a state, to manage and implement federal environmental programs for their Tribe within their reservation boundaries.[9] A Tribe must apply for and be approved for TAS status for each environmental program separately.[10] States have assumed delegated authority and have the individual authority to set WQS and submit revisions to the EPA.

The general practice in Region 5 has been to extend consultation to all of those in the treaty area. For example, consultation in the 1837 Treaty Territory would include Wisconsin and Minnesota Tribes. There has not been formal interstate coordination in Region 5, but members of state agencies discuss border-spanning issues frequently. Parties can request EPA engagement to negotiate a solution across states and Tribes if needed, but ultimately the authority lies in the state's process.

The TRR Rule has already faced legal challenges. As of summer 2024, a group of twelve western states has alleged the TRR Rule exceeds EPA's Clean Water Act authority.[11] The initial lawsuit was answered with a motion to intervene served by 12 Tribes, including seven Tribes from Region 5 and accompanied by comments from Great Lakes Indian Fish and Wildlife. Despite the EPA's assurances otherwise, the TRR Rule may further be challenged for effectively limiting existing water rights. The geographic extent of Tribal reserved water rights for fishing may have significant effects on water quality standards and the granting or denial of pollutant discharge permits throughout the U.S.; particularly in states where multiple federally recognized Tribes hold reserved rights to aquatic or aquatic-dependent resources.

For additional details, including a potential scenario for how the TRR Rule may be used during a state triennial review, see Appendix A.

9 Treatment as a State is also known as Treatment as a Sovereign in Indian Country.

10 U.S. Environmental Protection Agency. "Tribal Assumption of Federal Laws - Treatment as a State (TAS)." EPA, January 14, 2025. https://www.epa.gov/tribal/tribal-assumption-federal-laws-treatment-state-tas.

11 State of Idaho v. EPA. Case 1:24-cv-00100-DLH-CRH (https://www.epa.gov/system/files/documents/2024-06/complaint-idaho-et-al-v-epa-tribal-reserved-rights-rule-5.28.24.pdf May 28, 2024).

Summary of MGWA Conference Impact

The Minnesota Ground Water Association (MGWA) is a non-profit, volunteer organization which promotes public policy and scientific education about groundwater. The organization sponsors two conferences each year on timely issues concerning policy and the scientific aspects of groundwater that are attended by approximately 400 water professionals. The theme of the conference in the fall of 2024 was groundwater sustainability. Freshwater worked with the MGWA Board to extend speaker invitations to groundwater specialists in the western Great Lakes region, including Minnesota, Wisconsin, and Illinois. This resulted in useful information exchange at the meeting and during the small-group technical staff meeting described in more detail later.

Minnesota

It is within the statutory authority of the Minnesota DNR to permit groundwater allocations based on the availability of water for future generations, the support of ecosystems, the protection of drinking water sources and to preserve water quality. There is a great difference in groundwater availability across Minnesota and the DNR models its groundwater management approach based on those groundwater provinces (Fig. 4.2).[12]

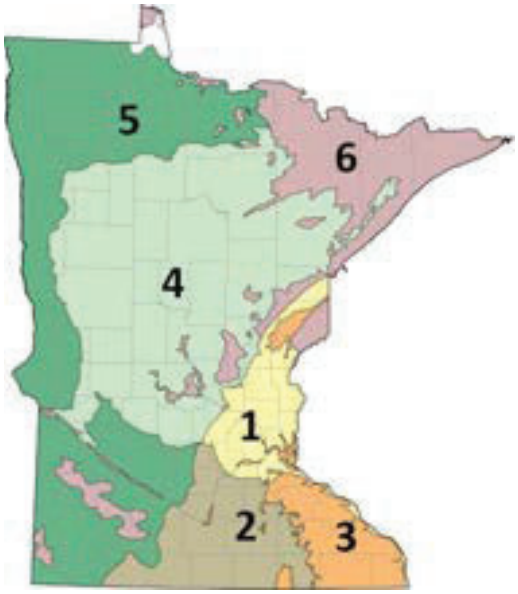

Figure 4.2. Groundwater Provinces of Minnesota

A qualitative, geology-based assessment of groundwater availability from high (1) to low (6). Source: Minnesota Department of Natural Resources[13]

In Groundwater Province 5, the western edge of Minnesota with portions of the northwest and southwest regions, livestock watering accounts for 10% of water use, consuming on average 100 million gallons per year and that number doubled between 2021 and 2023. Clustered animal operations can lead to groundwater decline. The DNR requires monitoring and modeling in places where aquifer knowledge and water was scant. In some scenarios, a 25% decline was determined to be too great.[14] It may take longer to determine the availability of groundwater in Groundwater Province 5 because there is less information about the distribution and volume of available water.

12 "Minnesota Groundwater Provinces 2021." Minnesota Department of Natural Resources, February 6, 2025. https://www.dnr.state.mn.us/waters/groundwater_section/mapping/provinces.html.

13 *Ibid*

14 Considine, Ellen, Jennifer Rose, and Amanda Yourd. "MGWA: Groundwater Resilience in the Upper Midwest: Sustainability Vision 2050." Brooklyn Center, MN, 9:30-10:27, 2024. https://www.mgwa.org/conferences/mgwa-2024-fall-conference-wrap-up/

Another management approach is a Water Allocation Plan that establishes a maximum yearly volume and leaves the specifics of water sharing up to the high-capacity users in the area.[15] If end users cannot agree, then the DNR gets involved. In Groundwater Province 5, that volume is approximately 200 MG/yr.[16] DNR can help identify where there may be potential for conflict and if a decline in public water supply occurs, can work with communities and appropriators to limit pumping. However, it takes time to develop such a plan.

In the Twin Cities metropolitan area (Groundwater Province 1), there is more groundwater and hydrogeologic information available. However, there is greater potential for well interference between high-capacity users and the numerous domestic wells on the urban edge. For example, pumping by the City of Blaine, a northwest suburb, caused interferences for 47 private wells in Blaine and the nearby City of Ham Lake from 2021 to 2023, a period of significant drought.[17] During 2022, the city used 1.7 billion gallons of water, five times more than all the other high-volume water users in the area combined.[18] During periods of drought, when water levels are already low, people tend to increase water usage (e.g. watering the lawn). It was people's reaction to drought during a time of already low water levels that created the conditions for well interference in this scenario.[19]

The Minnesota DNR has the responsibility to protect ecosystems that rely on groundwater discharge[20], including wetlands. Calcareous fens rely on constantly upwelling groundwater to support the calcium-loving plants and have special protections in Minnesota statute, so the DNR takes a cautious approach with permit applicants within two to three miles of fens.[21] Water levels in sentinel wells near one fen in Groundwater Province 1 showed a drawdown of 0.2 feet during a pump test and that amount of water-level change would have degraded the fen, so an appropriation permit was denied.[22] The determination of impact of a wells near calcareous fen may take two to three years.[23]

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15 "Guidelines for Suspension of Surface Water Appropriation …" Guidelines for Suspension of Surface Water Appropriation Permits, 18, June 2019. https://files.dnr.state.mn.us/natural_resources/climate/drought/drought_permit_suspension.pdf.

16 Considine, Ellen, Jennifer Rose, and Amanda Yourd. "MGWA: Groundwater Resilience in the Upper Midwest: Sustainability Vision 2050." Brooklyn Center, MN, 2024. https://www.mgwa.org/conferences/mgwa-2024-fall-conference-wrap-up/

17 "Blaine-Ham Lake Area Well Interference Investigation." Minnesota Department of Natural Resources, June 2023. https://www.dnr.state.mn.us/waters/watermgmt_section/blaine-ham-lake-well-interference.html.

18 Yourd, Amanda. "Fact Sheet: Blaine-Ham Lake Area Well Interference." Minnesota Department of Natural Resources, June 2023. https://files.dnr.state.mn.us/waters/watermgmt_section/appropriations/2023-06-21-blaine-ham-lake-gw-fact-sheet.pdf.

19 Considine, Ellen, Jennifer Rose, and Amanda Yourd. "MGWA: Groundwater Resilience in the Upper Midwest: Sustainability Vision 2050." Brooklyn Center, MN, 2024. https://www.mgwa.org/conferences/mgwa-2024-fall-conference-wrap-up/

20 Minnesota Statute 103G.223.

21 Minnesota Administrative Rules, 8420.0935 STANDARDS AND CRITERIA FOR IDENTIFICATION, PROTECTION, AND MANAGEMENT OF CALCAREOUS FENS.

22 Considine, Ellen, Jennifer Rose, and Amanda Yourd. "MGWA: Groundwater Resilience in the Upper Midwest: Sustainability Vision 2050." Brooklyn Center, MN, 2024. https://www.mgwa.org/conferences/mgwa-2024-fall-conference-wrap-up/

23 *Ibid*.

Metropolitan Council for 7 Counties Surrounding Minneapolis and Saint Paul

The Metropolitan Council (Met Council) has a water supply-planning process that provides access to data and context to assist in the local groundwater management and planning. In the Twin Cities metro area, The Met Council controls wastewater treatment for the metropolitan area, which includes both surface water and groundwater. Though a majority of the drinking water in the Minneapolis-Saint Paul center is surface water sourced from the Mississippi, groundwater from municipal wells is more common in suburban water supplies.[24] In the metropolitan area, water use in the summer is higher than in the winter and there is room for improvement in water-use efficiency and conservation.[25] By considering current supply and demands, Met Council can be more proactive than individual projects and cities where issues may arise from cumulative impacts.

Wisconsin

There are groundwater sustainability challenges in Wisconsin that include the presence of grandfathered-in, high-capacity wells in proximity to groundwater-dependent lakes, the variability of water availability and quality with geology, and quantity issues arising from recent drought conditions. Regulatory challenges have included uncertainty in the decision-making process, and the high number of requests for permits (the Wisconsin DNR receives 200 to 300 high-capacity well applications per year).[26]

The Wisconsin Geological and Natural History Survey (WGNHS) collaboratively co-manages a groundwater-level monitoring network with the U.S. Geological Survey (USGS) Upper Midwest Water Science Center, which can help identify long-term trends and distinguish pumping from climate impacts to help establish thresholds to avoid harm to ecosystems.[27] Monitoring wells and other field data are used in groundwater flow models to help build better conceptual understanding of groundwater-surface water connections. The modeled impact varies with pumping rate, aquifer properties, the presence of fractures, and general uncertainties about the conditions. Shallow lakes respond differently from deep lakes and streams tend to experience more impact than lakes.

Opportunities include working at the appropriate scale to manage an aquifer and proactively collaborating with agencies, institutions, and planning commissions at various levels of government; working with agricultural interests on irrigation planning to reduce stress on the system; focusing on cumulative impacts when reviewing water use and approving wells with conditions; making a water quality and groundwater database readily available, and developing a well interference process.

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24 "Wells & Drinking Water." Wells & Drinking Water | Scott County, MN, 2025. https://www.scottcountymn.gov/711/Wells-Drinking-Water.

25 "Water Supply Now and for the Future: Steps toward Sustainable Water Supplies." REPORT OF THE METROPOLITAN AREA WATER SUPPLY ADVISORY COMMITTEE TO THE MINNESOTA LEGISLATURE, 2017. https://metrocouncil.org/Wastewater-Water/Publications-And-Resources/WATER-SUPPLY-PLANNING/Water-Supply-Now-and-for-the-Future.aspx.

26 **Note:** State agencies are under the executive branch of the state government (the governor), but are bound by state statutes, administrative rules, and other legislative decisions enacted by the state legislature. State agencies are also bound to the decisions made by the judicial courts. As elections occur, the political opinions of the government branches may shift and sway. Civil servants in state agency positions must adjust certain behaviors and decisions with every election cycle to ensure compliance with statutes, court decisions, and other legalities.

27 "Groundwater-Level Monitoring Network." Wisconsin Geological and Natural History Survey, 2025. https://home.wgnhs.wisc.edu/water/groundwater-level-monitoring-network/.

Illinois

The Illinois State Water Survey (ISWS) is guided by the 2022 state water plan, a 7-year management strategy that includes surface water, groundwater, and public water-supply sources.[28] However, oversight of groundwater withdrawals has not been prioritized despite challenges with water supply in some regions. There is no statutory authority to limit usage of groundwater.[29] The current approach gives more control to local and regional planning groups to manage resource allocation. Ecosystem impacts are not being evaluated evenly.

The ISWS has developed predictive models of deep groundwater systems. The St. Peter is at risk of further drawdown and dewatering in the northwest suburbs of Chicago. This is driving some suburban communities to request connections to Lake Michigan water. Others seek that water because of PFAS contamination and the cost of treatment.

Local governments want to retain authority over water planning decisions and manage water locally. Planners are optimistic and have a strong belief in technological improvements that solve water scarcity problems or may be reading individual data points and not projecting far into the future. Lessons learned from participant engagement are that diverse kinds of engagement are needed early in the process to navigate questions and tradeoffs because by the time water concerns are evident, hydrogeologists often must deliver difficult news.

Some emerging focus areas in Illinois include water reuse in big infrastructure projects, building pipelines to store carbon in sedimentary rocks, and potable reuse of treated wastewater for irrigation. The state is also working to attract data centers, which can be large water consumers. Winter deicers are increasingly impacting water quality in shallow aquifers.

Groundwater Technical Staff Meeting Discussion

A group of water professionals from Minnesota, Wisconsin, and Illinois met the day after the MGWA conference to discuss their successes and challenges. Attendees included geologists, hydrologists, members of the Minnesota DNR, the Wisconsin DNR, the ISWS, the White Earth Division of Natural Resources, Minnesota's regional Met Council, the MGWA, and Freshwater staff. Guiding questions and group discussion are summarized below.

28 2022 Illinois State Water Plan. Illinois State Water Plan Task Force, December 2022. https://iwrc.illinois.edu/wp-content/uploads/2023/01/SWPTF_Report_Dec2022.pdf.

29 Securing Illinois' Groundwater Future: A Review of the 1983 Water Use Act and High-Capacity Well Review Process. Chicago Metropolitan Agency for Planning, December 2024. https://cmap.illinois.gov/wp-content/uploads/dlm_uploads/Securing-Illinois-Groundwater-Future.pdf.

What Groundwater Successes Have You Had and How Have They Been Achieved?

Illinois, Minnesota, and Wisconsin share information about existing wells publicly. Education and outreach are used to communicate technical information to the public and explain groundwater models with varying levels of success. Iterative engagement with stakeholders proved successful at generating local buy-in. This was contrasted with technical presentations given by modelers with little to no prior engagement which was more commonly met with confusion or resistance. People trained to communicate and facilitate are good to have on the team.

Partnerships which involve state agencies and local organizations generate real understanding about groundwater limitations, especially if the initial focus is on building relationships, deepening the understanding of problems, and incorporating locally based solutions. The groundwater technical staff meeting helped to disperse local knowledge, build trust, and resulted in new tools.

State agencies have been able to work with federal agencies to leverage technical tools that are not always available locally due to funding or the political climate. Sharing peer-reviewed technical tools for the region through the USGS publications series is a best practice for regional technical information dispersal.

What Groundwater Supply Challenges Have You Had?

Technical Capacity Challenges

Management challenges included a lack of trained professionals to fill staff openings, funding and budgetary constraints, and siloed approaches to groundwater management. Even if fully staffed, agencies simply cannot afford to run a groundwater model for every permit request. Minnesota receives about 400 groundwater appropriation permits to review annually and the groundwater technical team reviews 100 of these requests. Wisconsin and Michigan have models that are additive, so new wells are added to an existing model to assess their impact on surface water features and surrounding wells. Despite these models, it can be difficult to assess impact without a full-blown pump test and monitoring wells. The potential for stream depletion is really only assessing water table aquifers and cannot evaluate the sustainability of pumping from a confined aquifer. Attendees were looking for additional tools to conduct these assessments.

Water appropriation permit review took from 2-to-3-year across Minnesota, Wisconsin, and Illinois. Limited resources and technical staff contributed to the long review period but so did the internal structure of a department. Splitting the review and approval teams added time. The Wisconsin process has hydrogeologists in one department that meets weekly to make group decisions. Permit review can still take months to years; some permits have been in process for 10 years. Consultants have been used to perform technical reviews for permit applications; sometimes this is helpful but other times the work has to be redone so it does not end up saving time. Reviews may need to include considerations of water quality, from either introduced or geologic contaminants and this can also increase the timeline.

Funding for groundwater technical units is perceived as being inadequate and this contributes to staff shortages. Programs are typically funded by permit revenue with a typical high-capacity well application fee ranging from $125 to $500. This does not support more than a couple hours of a

professional's time. Some have a sliding scale within the Great Lakes Basin with a cap of $10,000. Fees are likely to increase as two conservative courts recently agreed on the importance of water.

State agencies are increasingly wary of lawsuits, and of issuing a permit which may result in a later lawsuit. Modeling teams are largely sheltered from political considerations, but they may be introduced unwittingly by which permits are elevated for review.

Water Supply Challenges

Groundwater supply challenges included declining aquifers, agricultural impacts, and encouraging water users to transition away from groundwater as a primary water source and toward surface water.

Declining aquifers and the geologic realities that limited groundwater availability were not always understood by water users, and their aversion to loss plays a role in their behavior. No one wants to give up what they have, and some go so far as to say that if some of the streams must go, then so be it. However, some states are seeing people move toward surface water because groundwater permits are too hard to obtain. Ideally people would be encouraged to see groundwater as a backup rather than the main supply.

Intensively irrigated areas in central Minnesota, central Wisconsin and along the Illinois River in Illinois are seeing seasonal impacts to surface waters and declining water quality. There is a lack of regulations for agricultural practices yet fear of future regulations. Even if a requirement to not harm a resource through groundwater withdrawal exists, this is not well defined by courts and every resource is different and must be considered in context of every application.

In areas with groundwater shortages, managed aquifer recharge might help with sustainability. However, recharge and reuse are complicated and have diverse actors influencing decisions and incomplete regulations. It is not a common tool used in the Midwest.

A more holistic One Water approach (surface water and groundwater considered as one) would help unify some processes. Unifying land-use planning and water-use planning and aligning them with population projections would lead to a more sustainable future. Different levels of the government may offer contradictory messages; cities complain that "you told us to grow" but now they are hearing "there's no water here to expand". This may result from different planning timelines and priorities of various groups. Within infrastructure spaces, most are focused on a 10- to 20-year water plan and the long-term life of infrastructure (100+ years).

Suburban expansion creates the potential for more well interference between high-capacity municipal wells and private wells. It may also result in development in the recharge areas for regional aquifers.

What Tools and Strategies Are Used Regularly to Complete Groundwater Work?

Attendees highlighted science education and iterative engagement as both strategy and tool in ongoing work. They also emphasized the need for diverse skill sets on teams including data visualization and science communicators. You must do the engagement first and then build the model that is asked for. Conversations with multiple stakeholders to resolve issues in problem areas are always going to be a challenge. The time and energy spent bringing the right people to the table is worth it and much better than convening them when a problem feels intractable.

Other tools included reuse and recharge, withdrawals from Lake Michigan, and utilizing grant funding creatively. There was discussion of management systems utilized by other states and the benefits to those systems, including groundwater management districts based around watersheds and permit and allocation systems with finite water budgets. Groundwater management districts based around surface watersheds are used in western states. An allocation system has been put in place and people in the region must work things out amongst themselves.

Some teams were able to utilize technology to be transparent about the timeline for permit review. A dashboard in Teams can allow a group to track all requested work including who is working on what permit.

Recommended Next Steps By and For the Assembled Group

- Aim for another meeting ahead of the Great Lakes Compact meeting on the technical day that precedes the meeting (late spring/early summer 2025).
- Engage with counterparts in states and tribes that were not able to be present.
- Collaborate where possible at the department level and build connections between agencies and departments.
- Just pick up the phone.

What Questions Do We Have For One Another?

- How do we effectively bring all those involved together for a concentrated conversation on a gnarly topic?
    - A Charette model was used for Minnesota's East Metro Area with the PFAS working group[30]
- Does the PFAS ban in Minnesota include unintentional PFAS?
    - Process- vs Product-sources of PFAS are treated differently in the current legislative language
- Are climate-change impacts on water treatment systems being considered?
- Are environmental justice impacts considered in your work?
- Where do our granular activated carbon (GAC) remains end up? What community handles disposal? What are the secondary and tertiary impacts?
- How do you negotiate appropriations between water users in a region that have already been permitted but are now facing insufficient water availability or water scarcity due to over withdrawal, well interference or drought?
- Are we trying to solve problems before they happen? Or do we just assume these things will occur in the future and plan to address problems after-the-fact? This shapes organizational response and organizational plan. For example:

30 "Public Participation Guide: Charrettes." EPA International Cooperation, October 29, 2024. https://www.epa.gov/international-cooperation/public-participation-guide-charrettes.

    - Existing land and existing water use?
    - Do environmental impact reviews simply get okayed?
    - Do developers ever get denied?
- Are we charging enough for water?
- Do people value their water appropriately?
- Who is missing or not in the room?
- Are we reinventing the wheel with these meetings? Should there be more of these meetings? How can they occur without tons of logistics burden?
    - Add-on to existing meetings and rotate states
    - These types of meetings are usually held at director or manager level rather than among technical staff; it is beneficial to have technical staff participate in these types of meetings to build understanding and collaboration

Model Ordinance Review

Drafting a model groundwater ordinance for a cluster of municipalities involves creating a comprehensive document that addresses the specific groundwater management needs and challenges of these areas. Considering the importance of groundwater for domestic supply (private and municipal wells), agriculture, industry, and the protection of natural resources, the ordinance should be designed to ensure sustainable use and protection of groundwater supported ecosystems. The framework can be adapted to the particular conditions and needs of specific areas. The involvement of local stakeholders, including residents, businesses, agricultural representatives, and environmental groups, is crucial in developing and implementing effective groundwater policies. Additionally, coordination with state and federal water management policies and regulations will ensure that local efforts are complementary, informed by current datasets, and aligned with broader water resource management goals.

A suggested structure with section headings and content outlines follows.

I. Preamble

    A. Explanation of the ordinance's purpose, its legal basis, and the importance of sustainable groundwater management.

II. Definitions

    A. Clear definitions of key terms used in the ordinance, such as "aquifer," "groundwater," "sustainable yield," "withdrawal," "contamination," and "conservation measures."

III. Groundwater Management Authority

A. Designation of the responsible local authority or authorities.

B. Description of their powers and duties in relation to groundwater management.

IV. Groundwater Use Permitting

A. Requirements for obtaining permits for new and existing wells.

B. Criteria for permit approval, including consideration of sustainable yield and existing water rights.

C. Process for reviewing and renewing permits.

D. Permitting may refer to existing county or state regulations.

V. Well Construction and Maintenance Standards

A. Specifications for well construction to prevent contamination.

B. Requirements for regular maintenance and inspection of wells.

VI. Groundwater Priority of Uses and Withdrawal Limits

A. Establishment of withdrawal limits based on aquifer characteristics, recharge rates, and sustainable yield assessments.

B. Special provisions for critical periods, such as droughts.

VII. Water Conservation Measures

A. Mandatory conservation practices for residential, agricultural, and industrial users.

B. Incentives for water-saving technologies and practices.

VIII. Monitoring and Reporting

A. Requirements for groundwater users to monitor and report their water use.

B. Provisions for the installation and maintenance of water meters.

IX. Protection of Groundwater Quality

A. Regulations to prevent contamination from industrial, agricultural, and other sources.

B. Requirements for the proper handling, storage, and disposal of hazardous substances.

X. Dispute Resolution

A. Procedures for resolving disputes related to groundwater use, permitting, and conservation measures.

XI. Penalties and Enforcement

A. Penalties for non-compliance with the ordinance.

B. Description of enforcement mechanisms.

XII. Amendments and Reviews

A. Process for amending the ordinance.

B. Schedule for regular reviews of the ordinance's effectiveness and the need for updates.

XIII. Severability

A. Statement that if any part of the ordinance is held invalid, the rest remains in effect.

XIV. Effective Date

A. The date when the ordinance comes into force.

Review of Existing Transboundary Agreements

The following are best practices from the international agreements reviewed in Appendix B: Legal Frameworks for Transboundary Groundwater Governance.

Transboundary agreements are both critical and necessary for groundwater governance to be effective but they are difficult to establish. There are preexisting laws and policies pertaining to the various regions involved, competing sociopolitical priorities and needs, and potentially differing hydrogeology and groundwater-dependent ecosystems. Within international legal frameworks there have emerged similar foundations, and it is these which provide recommendations for what should be included in a transboundary groundwater governance agreement.

A successful legal framework for groundwater governance typically includes the following:

- A definition of the terms used in the agreement for shared understanding and for future agreements
- Clarification of which waters and dependent systems are included, and which waters and dependent systems are not included in the agreement
- A clear geopolitical scope of agreement boundaries
- Establishment of a governance mechanism
- Establishment of a dispute resolution mechanism
- A mutual assurance and responsibilities including:
    - Agreement members are entitled to fair uses of agreement waters
    - Agreement members are obligated to prevent harm to agreement waters, including through preventive measures
    - Agreement members are responsible for shared management and protection
- Encouragement of cooperation between agreement members through the exchange of relevant

data and information, including planned activities with potential impact on agreement waters

Of the existing international legal agreements for transboundary water groundwater governance currently in use, some of the joint management frameworks utilized by those agreements include frameworks like integrated water resources management, agreements for shared waters, and regionally appropriate management for shared waters.

The Global Environment Facility Transboundary Waters Assessment Programme (GEF TWAP) is an indicator-based framework developed to identify and evaluate changes in water systems caused by human activities and natural processes are shared by two or more nations.[31] An indicator-based approach allows for a flexible framework that can be adapted to different water systems including groundwater, surface water, and large marine ecosystems. The GEF TWAP uses three different broad indicators to capture pressures and impacts: biophysical, socioeconomic, and governance. These are then categorized into lowest risk, low risk, moderate risk, high risk, and highest risk. These risk categories are used to address integrated areas with updated governance strategies.

In EPA Region 5, a similar joint management approach might include 1) share geological and hydrogeological knowledge and other technical monitoring data of groundwater between participating partners to support governance decision-making; 2) develop shared models based on relevant technical data; 3) establish efficient recharge systems or other adaptative management strategies for the ecosystem; 4) increase environmental education, social communication, and inclusive public and stakeholder participation practices.

Smaller jurisdictions, like municipalities or watershed districts, would benefit from a joint management practice that distributes the burden of gathering, monitoring, and maintaining data records. This would allow costs, infrastructure development, and upkeep to be disbursed between multiple units, as well as create a broader information network. When groundwater features cross geopolitical boundaries, members of a transboundary governance agreement should mutually benefit from participation.

Discussions with Infrastructure Planners About Data Centers and Other Large Industrial Groundwater Users

Developers balance trade-offs when citing and designing large industrial facilities including manufacturing, technology, industrial agriculture, or food and beverage facilities. The trade-offs include costs, early morning and late-night schedules, noise, energy, and then commonly lastly, water use. The key factors that influence siting and resource decisions are the dependability of the resource and the timeline and ease of getting permits balanced against their need to move fast and get systems online so they can start making revenue. Above all, industries need a water supply that they can depend on to maintain process water quantity and quality to reduce the risks of downtime. Whether the water is used in the final product or for cooling or irrigation, companies are looking for low water risk to their operations. They may want to be water efficient but have to balance this with the

31 "Transboundary Waters Assessment Programme (TWAP)." GEF TWAP, January 8, 2014. http://geftwap.org/twap-project.

speed of getting a permit and overall capital and maintenance costs of the alternative. Many times, groundwater is the default supply due to faster permits and better water quality, followed by surface water, and then water reuse. The cost of reusing wastewater is prohibitive in some places and the timelines for planning and getting permits are commonly long. Smaller wastewater utilities might not have a consistent volume of treated wastewater to reliably supply a large water user.

Technology is moving towards low- to no-water-use cooling systems, and it is helpful if companies are incentivized for this. Irrigation systems and industrial processes are more water efficient than they used to be. Often times, the specific process technology is a black box to the engineering design firm citing the facility; the designs are proprietary, and new technology and processes are constantly evolving. Designers try to accommodate future industrial processes that might reduce water demand.

Revenue that comes from new economic development projects and property tax income are a huge economic driver for a community and the state to attract new industries. Each deal is different depending on the company, internal goals, budgets, and timelines. Some developers will 'pay their own way' for infrastructure upgrades to sweeten a deal and build out infrastructure to other parts of the city.

In terms of siting facilities for long-term water supply, the engineering design firms interviewed were well versed in infrastructure design but were not fully aware of the local water supply picture. States know that some regions have excess water supply, some scarcity issues, and others water supply alternatives. Infrastructure designers are unaware of the detailed hydrogeologic setting or how this information might be used early on to help them site their facilities and reduce permit timelines. If there is a change in the water-supply source after the facility is operational, they need to match existing inputs with the extra costs and incur possible shutdowns.

State regulatory agencies are most frequently involved in siting of new industrial facilities during approval of water appropriation permits or in the review of an environmental impact statement if one is required. State agencies are typically not involved if a large water user is a power and water customer of the city. In these instances, businesses may not have detailed knowledge from state agencies in order to make the best long-term design decisions for their proposed site.

Ideally a state would proactively help cities identify good locations for large water users that local units of government and economic development teams could designate in their planning processes. States could do this by compiling helpful data on the water supply availability per region, across groundwater, surface water, or water-reuse sources. They might also work to create a generic review process for cities to consider when citing large-volume water users and provide more certainty with permitting. Finally, offering incentives for sustainability, co-location of industries with complementary inputs and outputs, and efficient permitting of circular water design features would result in better outcomes for both business costs and resource management.

Citizen Group Concerns

When and where stakeholder engagement is not prioritized, the city's planning process is not transparent, and the entry of a large water user into the area creates fear and distrust. Groups may form and engage in various ways that are somewhat dependent on the resources of the community members. This can perpetuate environmental injustices for under-resourced and rural communities. It also increases distrust in government institutions at all levels. For a business or local government, it adds extra time and costs to the development process.

When the course of action is not clear, and governance pathways not established, groups take varying routes to voice their feedback: through the legal system, by seeking media attention, by seeking attention from their elected officials, through a formal environmental review process, or by public protest. Frustration can lead to changes like new people running for local offices or systems being put in place. However, more commonly it leads to wasted effort, unnecessary anxiety, and unhappy residents.

Ideally the connection between a city's water authority and its role in sustainable regional planning would be understood by the community. There would also be transparency around the state's role in providing clear direction through laws and rules, in developing geologic and hydrogeologic knowledge, and delivering it in a timely manner to the city water supplier, economic development team, and Tribes where applicable, so they understand and use the information for sustainable development.