POSTERS

No Longer 'Out of Sight, Out of Mind' – Making Groundwater Science Visible to Citizens and Clients

Minnesota Ground Water Association
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Hennepin County Bedrock Collapse Project

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Abstract

Using historical archives, field records of infrastructure construction, and limited site investigation in areas where bedrock is shallowly buried, we will identify areas that are more susceptible to bedrock collapse for Hennepin County Emergency Management.

We prioritize shallow bedrock areas (depths of 0-50' first, then 51-100' per Retzler, 2018) because they are more susceptible to cave- and sinkhole-forming processes. Downtown Minneapolis, Nicollet Island, West River Parkway, and MSP International Airport are priority areas for study, but additional areas where sinkholes may occur will be identified and investigated.

Access to as-built records is crucial. Dating back to the late 19th century, these depict engineering details that may identify areas that are prone to collapse or wash out. Schiek's Cave is one example of many. While these records are common, looking at them as a group provides insights that would otherwise be missed.

Once this information is gathered and interpreted, a conceptual model will be presented. The conceptual model will be compared with geophysical logs of wells and borings to determine if it can be applied to the rest of Hennepin County where construction records and direct observations are not available.

Once complete, this investigation will identify risk to both public and private property, similar to FEMA flood risk maps, and allow stakeholders to take action to mitigate that risk.

Streamlining the Workflow for Irrigation Water Quality Assessments

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Abstract

An irrigation water quality assessment tool has been developed that aggregates and maps diverse datasets to reduce staff work time and improve accuracy. Irrigation assessments require gathering and processing many datasets, which can be difficult for non-technical GIS users. Using this tool to aid with unification and visualization of the data needed to perform water quality assessments allows MPCA staff to quickly and accurately calculate effluent limits for MN wastewater treatment plants to protect irrigation water quality. The tool standardizes workflows, improves accuracy, increases confidence and ensures wastewater treatment plants do not receive unneeded compliance costs while also protecting the environment. The current process takes three to five hours to complete manually but using this tool the effluent limit calculation process is completed in under 7 minutes, saving over 1000 staff hours per year.

The data analyzed was obtained from a variety of sources including the United States Department of Agriculture, United States Geological Survey, Minnesota Department of Natural Resources and the MPCA, and is found in an assortment of formats such as JSON, vector, raster, delimited text, web services and relational databases. Python and ESRI spatial tools are used to aggregate the information into one location, modify the data and process it via reformatting, calculations and queries. Python modules used to build this tool include arcpy, json, pandas and sqlite3. Creation of this functional tool to assess irrigation water quality simplifies the water assessment staff's experience by producing an easily understood report that can be included in permit documents.

Critical Thinking: Don’t Be Trapped by Bias and Fallacies

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Abstract

Why are there more barriers than motivators when community discussions focus on water? What makes people ignore or reject facts and ignore advice that will protect their health and welfare? What are water resource managers supposed to do when facts don’t matter?

The Minnesota Well Owners Organization (MnWOO) has been encountering cognitive biases and fallacies that drive people to make unreasonable conclusions about their drinking water. Again, and again surveys and water professionals report comments about water that are not supported by fact. Too often, the falsehoods are designed to influence others.

Water professionals need to develop tools to combat the fallacies and negative biases that drive the choices of uninformed or misinformed stakeholders. MnWOO thinks water professionals need to study critical thinking, logic, and targeted communication to be effective in an era of “fake news.”.

Environmental advocates and water professionals can directly benefit from knowing the vocabulary of critical thinking and of understanding the logical arguments and rhetorical tools that can be used to defend against fallacies and bias. MnWOO has been using new learning tools developed by schoolofthought.org, an international charity offering free educational resources on critical thinking.

The School of Thought Your Bias Is and Your Fallacy Is posters are used to start a community conversation about the impact of cognitive biases in water management. We are asking water advocates to share your stories about the barriers you have witnessed from people who suffer cognitive bias. MnWOO is collecting stories about the barriers to water stewardship.

Protecting Private Well Users' Health

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Abstract

This research focuses on the soil characteristics, groundwater supply, and watershed in the Little Rock Creek area. The original aim was to collect data on soil properties to better understand infiltration in the watershed. The recent impairment of the creek has led to research on the water quality and quantity within the Anoka Sand-Plain aquifer. Sustainability of the aquifer is critical for the citizens that rely on it for irrigation. The results are based on data and samples from two 1 meter deep soil profiles. Each profile exhibits 3 distinct horizons. The Ap horizon is 0.28 meters thick, the Bt1 horizon is 0.33 meters thick, the Bt2 horizon is 0.18 meters thick. The soil is all categorized as sand based on hydrometer tests. The percentage of clay decreases with depth while the amount of silt increases with depth. The particle size ranges from medium to fine sand. Infiltration tests were not conducted because of heavy precipitation and all calculations are done based on grain size distribution. The low percentage of clay in all horizons along with a high porosity suggests that the infiltration rate is high which reduces the water retention.

Using a C.A.M.P. Dashboard to Drive Community Engagement

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Abstract

Community leaders require an easier on-ramp to become engaged in the complexities of groundwater science. A C.A.M.P. Dashboard provides a quick view of their aquifer cross-section, shared users and trends, and observation well data. Providing the right dose of information enables communities to ask "the next good question" based on their groundwater needs.

As a social science model, CAMP (Community-based Aquifer Management Partnership) can be used to map the direction of a community's effort and guide public and private entities on the extent they need to work together. To measure social science outcomes, "working together" is defined on the continuum of [C0] not connected, [C1]

communicating, [C2] coordinating, [C3] cooperating, or [C4] collaborating. Based on the 20 CAMPs initiated, degrees of local and state agency interaction relative to a community's water supply system are C0 (40%), C1 (15%), C2 (30%), C3 (15%), and C4 (0%).

The CAMP provides a means to measure social-based outputs, and hence, a means to manage expectations and outcomes. It reveals the status of the aquifer (physical science) and the degree of engagement (social science).

By taking a more measurable approach, social science efforts become less abstract, and more logical, tangible, and transparent. CAMP has shown that although interested parties are not opposed to working closer together, communication and coordination does not occur as often as one may expect. Accounting for how parties work together on a common goal has the effect of creating closer working relationships in co-managing shared aquifer resources.

Arsenic in Scott County

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Scott County

Abstract

In order to provide greater education to the residents of Scott County in regards to drinking water, research of common groundwater contaminants in Minnesota was performed to available data sets covering the Scott County area. The data was then mapped in order to visually represent areas of the County that may be more prone to certain contaminants. The data represented private wells across the County and was acquired either from the Minnesota Department of Health requirements for testing for nitrate and arsenic for any new well construction, along with well test kits the County has made available for purchase to County residents. Analysis of the data revealed areas of Scott County may be prone to see elevated levels of arsenic in private wells. Post cards were mailed to select townships suggesting testing their well water for arsenic. In a short time over 200 arsenic tests have been completed by residents, with 38% revealing levels of arsenic over the MCL. For reference, in 2018 the County had a total 173 tests total, only 9 of those were for arsenic. Upon receiving a result over the MCL residents are receiving letters directing them to further education and advising them to install a treatment device in order to remove the arsenic from their drinking water. With these results Scott County expects to send more post cards and provide more education opportunities to Scott County residents directing them to routinely test their well water as recommended by the MDH.

What's Under My Neighborhood?
(formerly known as the Groundwater Contamination Mapping Project)

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Abstract

For most people, groundwater is a resource that is out of sight and out of mind. Maps showing areas where groundwater is polluted will help build public knowledge and appreciation that is needed to protect and conserve this valuable resource. The Minnesota Pollution Control Agency (MPCA) collects much groundwater data from remediation sites, but it is typically stored in paper and electronic files that are not easily accessible. What's Under My Neighborhood seeks to move this data into a standardized data management system that can be accessed through a web-based, interactive map. This will help to manage and protect the largest source of drinking water in the state and also save government agencies, businesses, and Minnesota citizens' time and resources. While not every site is able to be mapped, about 100 active Superfund sites are part of this project, and a site story will accompany them detailing the site history and important remediation events. Funding for this project was provided by the Minnesota Environment and Natural Resources Trust Fund as recommended by the Legislative-Citizen Commission on Minnesota Resources (LCCMR). The web application will be live by June 30, 2020.