

# PRESENTATION SUMMARIES & SPEAKER BIOGRAPHIES

Minnesota Ground Water Association  
Fall Conference 2022 – November 17, 2022

Heritage Center of Brooklyn Center

## Minnesota Mining and Water Resources



### Ted Anderson

Minnesota Department of Natural Resources

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### Overview of Minnesota's mining districts

#### Presentation

- Selected North American mines and critical minerals
- Selected mines and critical minerals of the Minnesota area
- Selected mining operations and mineral deposits of northeastern Minnesota

#### Education and Experience

Ted is a Professional Mining Engineer who moved south to the Iron Range from his hometown of International Falls, MN. He attended Michigan Tech where he received his B.S. Mining Engineering and initially moved to Chicago, IL to start his career in underground tunneling in the big city. That lasted six months...

He then moved towards home to northern Minnesota for an engineering job at a local taconite mine in Keewatin. From that initial job in the mine and a master's degree later, and over the next 20+ years on the Iron Range, he's worked in engineering, consulting, mine management, project startups, research & development, back into mine engineering and finally into his role at the MN Department of Natural Resources, Lands and Minerals as the Engineering & Mineral Operations Manager based out of Hibbing, where he's been over the last 5 years.

Ted enjoys Minnesota and all its seasons, although this one we're in now is not his particular favorite. Outside of work, he is a hack musician and operates a small hobby farm with his family. He especially has a passion for sustainability and the three fundamental ethics of permaculture design science: Earth Care, People Care and Fair Share.



## Peter Kang

University of Minnesota, Department of Earth and Environmental Sciences

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### Characterization, modeling, and remediation of fractured aquifers through cutting-edge research tools

#### Presentation

- Introducing the challenges of predicting transport processes in fractured aquifers
- Brief review of recent advances in fractured rock hydrogeology
- Application of cutting-edge characterization and modeling tools to a contaminated fractured aquifer site
- In-situ bioremediation of contaminated fractured aquifers using branching microbes
- Summary and future work

#### Education

Ph.D. (Hydrology), Massachusetts Institute of Technology, 2014

M.A. (Hydrology), Massachusetts Institute of Technology, 2010

B.A. (Civil & Environmental Engineering), Seoul National University, 2008

#### Experience

2018-present: McKnight Land-Grant Assistant Professor and the Gibson Chair of Hydrogeology, University of Minnesota – Twin Cities

2015-2018: Researcher, Korea Institute of Science and Technology

2014-2015: Postdoctoral associate, Massachusetts Institute of Technology

#### Affiliations

American Geophysical Union (AGU)

International Society for Porous Media (InterPore)

Minnesota Ground Water Association (MGWA)



**James S. Aiken, P.G. (Presenting)**  
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**Kirsten A. Pauly, P.E., P.G. (Coauthor)**  
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## **Assessing potential effects from mine dewatering at a proposed aggregate mine site using groundwater and surface water modeling**

### **Presentation**

In Minnesota, new mine development or expansion requires environmental review which for certain projects may require an Environmental Impact Statement (EIS). Groundwater models can be used during the process to help demonstrate whether dewatering from a mining project will affect adjacent water well users or natural resources. However, assessing whether a forecasted change in groundwater is “significant” is often arbitrary and can lead to incorrect assumptions by the public and responsible government units (RGU). Although a large effort goes into constructing these models so that they demonstrate a professional standard of care, less effort is typically applied to help stakeholders interpret the results. This presentation includes a case study for an aggregate mine site that proposed dewatering of the Prairie du Chien Group and partial dewatering of the underlying Jordan Sandstone. An essential step of the EIS development was to clearly define and separate the “effects of dewatering” from “impacts of dewatering” as predicted by the model to arrive at a determination of whether the forecasted effects are in fact a “significant” impact in the context of Minnesota Rules. Several innovative modeling methods were used to quantify the results holistically, including use of a simple water balance model for surface waters connected to groundwater and use of well construction information to define acceptable drawdown levels in nearby private wells. A key takeaway is that even a dramatic reduction in water levels may not necessarily have a significant effect on water resources or wells, particularly if those effects can be reasonably mitigated through actions of the proposer.

### **Education**

Jim has an MS (Hydrogeology and Glacial Geology) from the University of Wisconsin - Madison and BS (Geology) also from University of Wisconsin-Madison via Gustavus Adolphus College in St. Peter, MN

Kirsten has a BA (Geology) from Colorado College and an MS (Civil Engineering) from the University of Minnesota

### **Experience**

Jim has been an environmental consultant for over 30 years and 23 years at Barr. His practice spans a wide range of interests, starting with his MS thesis on groundwater modeling and contaminant transport in heterogeneous outwash deposits at gravel pits in Wisconsin. Since then, he has completed hundreds of soil and groundwater investigation/remediation projects, landfill permitting investigations; many mine permitting and dewatering projects often involving environmental review and several large EIS. He is currently engaged in PFAS investigations in Minnesota, Michigan, Missouri and North Dakota, geologic storage efforts involving hydrogen production as well as coal combustion residual projects in the Great Plains and Midwest.

Kirsten has been an environmental consultant for nearly 40 years, starting her career as an intern at Sunde Engineering in 1982. In 2005, she became a managing partner and acting President of Sunde Engineering. Kirsten’s specialties include work in the aggregate mining industry including resource evaluations, mine planning, reclamation, permitting, and hydrologic modelling. Kirsten also specializes in environmental review and has completed a number of EAWs and EISs for mining and other commercial and industrial use projects.



## **Erika Herr**

Minnesota Department of Natural Resources

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### **DNR Lands and Minerals mining hydrology program**

#### **Presentation**

- Overview of Mining Hydrology Program
  - Technical
  - Regulatory
- Mesabi Iron Range Mining
  - Brief History
  - Landscape Changes
- Mining-Related Water Appropriation
  - Taconite Mining
  - Peat Mining
- Hill Annex Mine Pit
- Canisteo Mine Pit

#### **Education**

M.S. Environmental Science; Mankato State University, Mankato, MN

B.S. Environmental Studies (emphasis in Hydrogeology); Bemidji State University, Bemidji, MN

#### **Experience**

Erika has worked for the DNR for over 21 years and is currently the Mine Permitting and Coordination Supervisor with the Division of Lands and Minerals. She has worked as a hydrologist with DNR's Division of Lands and Minerals and the Division of Ecological and Water Resources and has 12 years of mining hydrology experience.



## **Chris Schuler**

University of Minnesota, Department of Earth and Environmental Sciences  
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### **Deep subsurface life in Soudan Formation groundwaters**

#### **Presentation**

- Introduction to deep biosphere research
- Chemistry of Soudan Formation groundwaters
- Soudan in a regional context: Canadian Shield Brines
- Evidence of life and microbial metabolisms in Soudan boreholes

#### **Education**

BS: (Chemistry) Carnegie Mellon University, 2016

#### **Experience**

Research & Teaching Assistant, University of Minnesota Twin Cities, 2018 – Present  
Research Associate, Wolfe Laboratories, 2016 – 2018



## **Kurt Carlson**

Minnesota Pollution Control Agency

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### **A pair of permitting perplexities: Sulfate implementation strategy and functional equivalency**

#### **Presentation**

The Minnesota Pollution Control Agency (MPCA) will need to address two developing situations that are likely to significantly impact National Pollutant Discharge Elimination System (NPDES) permits and State Disposal System (SDS) permits. Those two situations are: implementation of a sulfate permitting strategy and determinations of whether an indirect discharge from a point source to waters of the United States is the functional equivalent of a direct discharge. Wild rice, susceptible to harm from elevated sulfate concentrations, is important because it is part of the ecosystem, has deep cultural significance, is a source of food, and has economic value. Within the last decade or so, a series of court cases led to a precedent-setting US Supreme Court decision in 2020 that may have national impacts to NPDES permits. The MPCA's presentation will explore the history, current status, and potential future developments for sulfate and functional equivalency.

#### **Education**

MS: (Geology hydro/environmental option) Western Michigan University, Michigan

BS: (Geology hydro/environmental option) University of Minnesota – Duluth

BA: (Chemistry) University of Minnesota – Duluth

BA: (German) University of Minnesota – Duluth

#### **Experience**

Kurt is a hydrogeologist and permit writer with the Minnesota Pollution Control Agency in the Metallic Mining Unit and provides hydro reviews for other permit writers. Prior to coming to the MPCA, he worked as an environmental consultant in Michigan, Wisconsin, Minnesota, and Alaska. At the MPCA, he spent approximately three years in Solid Waste and 1 ½ years in Metallic Mining.



## **Cara Santelli**

University of Minnesota, Department of Earth and Environmental Sciences  
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**Uncovering hidden sulfur biogeochemical cycles in a sulfate-impacted riparian wetland and stream in northeastern Minnesota** (Co-authors: Crystal Ng, Josh Torgeson, Carla Rosenfeld, Aubrey Dunshee, Kelly Duhn, Riley Schmitter, Patrick O'hara)

### **Presentation**

- “Cryptic” or “hidden” cycling of elements
- Fate of sulfur in wetland and stream sediments
- Sulfate reduction and anaerobic sulfide oxidation
- Coupling of sulfur and iron and carbon cycle
- Hyporheic flux influence on biogeochemistry dynamics

### **Education**

Postdoctorate: Environmental Geochemistry) Harvard University

PhD: (Marine Geomicrobiology) Massachusetts Institute of Technology – Woods Hole Oceanographic Institution Joint Program in Oceanography

BS: (Geology) University of Wisconsin, Madison

### **Experience**

Cara is an Associate Professor in the Department of Earth and Environmental Sciences and the BioTechnology Institute at the University of Minnesota. Cara is a geomicrobiologist who examines the impact of microbial activity on wide-ranging geological and environmental processes. In addition to answering key questions on the mechanisms, metabolic pathways, and geochemical impact of mineral-metal-microbe interactions, her research seeks to inform and improve strategies for remediating pollutants to improve the health of water and soil environments. Her work also seeks to advance environmental justice through community based participatory research that prioritizes and addresses the voices of communities.



## **Lucinda Johnson**

Natural Resources Research Institute

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**Developing technologies for mitigating sulfate in Minnesota's waters** (Co-authors: Meijun Cai, ChanLan Chun, Igor Kolomitsyn)

### **Presentation**

- Topic 1
- Topic 2

### **Education**

### **Experience**