



# PROCEEDINGS

for

## **“Groundwater – Surface Water Interactions: Implications for Water Management and Water Quality in Montana”**

**Montana Section American Water Resources Association  
2025 Conference  
October 8<sup>th</sup> - 10<sup>th</sup>, 2025  
Hilton Garden Inn  
Great Falls, Montana**

### **Contents**

Thanks to Planners and Speakers  
Full Meeting Agenda  
About the Keynote Speakers

This information is also available on the MT AWRA website, [www.montanaawra.org](http://www.montanaawra.org)

# THANKS TO ALL WHO MAKE THIS EVENT POSSIBLE!

## The AWRA Officers

Sara Edinberg, President – Montana Bureau of Mines and Geology, Butte, MT

Ron Breitmeyer, Vice President – Carroll College, Helena, MT

Danika Holmes, Treasurer – Montana Department of Natural Resources and Conservation, Helena, MT

Troy Blandford, Secretary – Montana State Library, Helena, MT

Nancy Hystad, Executive Secretary – Montana State University, Bozeman, MT

## Montana Water Center

Stephanie Ewing, Director

Whitney Lonsdale, Assistant Director

## Special thanks go to:

Stan Bradshaw for providing legal review of our new bylaws

Russ Gates for organizing the Hydrophile run

Sarah Church, Emilie Henry, Casey Lewis, Megan Moore, Stephanie Murphy, and Sale Rhodes for organizing and running the Wednesday Morning Workshop

And thanks to the conference presenters, field trip leaders, moderators, student judges, and many volunteers – this conference would not be possible without you!



Sara Edinberg  
President



Ron Breitmeyer  
Vice President



Danika Holmes  
Treasurer



Troy Blandford  
Secretary



Whitney Lonsdale



Nancy Hystad  
Executive Secretary

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**REGISTRATION**

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8:00 AM - 6:00 PM      Registration available at the Hilton Garden Inn. Preconference registration is preferable and is available through the MT AWRA website.

**MORNING WORKSHOP**

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9:30 AM – 11:30 AM      **From Campfires to the Capitol: Communicating Science to Varied Audiences** - Join us for a morning workshop on communicating science to different audiences. Learn strategies to identify different types of audiences and share your knowledge to increase utility, adoption, and engagement.

**AFTERNOON**

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12:00 PM - 5:00 PM      **Field Trip - Belt, MT and Giant Springs State Park** - Depart the Hilton Garden Inn promptly at 12 pm. Learn about the history and impacts of coal mining in Belt, and tour the new water treatment plant that treats mining-impacted groundwater that otherwise discharges into Belt Creek. The final stop will be at Giant Springs State Park, where we will discuss the prominent Madison Limestone aquifer and its connection to Giant Springs.

Sack lunch provided to all field trip attendees. (Space is limited to the first 50 registrations)

5:30 PM                      **Hydrophile 5k Walk/Run** - Departs from the Hilton Garden Inn and finishes at Annie's Taproom (carpooling available); details and route maps on pages 12 & 13.

6:00 PM                      **Happy Hour at Annie's Taproom** - 112 Central Ave in downtown Great Falls. Dinner on your own; a food truck will be available during happy hour.

**STUDENT/PROFESSIONAL SOCIAL HOUR** (breakfast provided to registered student attendees)

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7:30 AM – 8:15 AM This is a focused chance for students to learn about career opportunities and connect with agency and private sector water professionals. Advance registration required.

**REGISTRATION**

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8:00 AM Registration, coffee, and conversation (breakfast will not be provided)

**OPENING DAY PLENARY SESSION**

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8:30 AM **WELCOME WITH INTRODUCTIONS, LOGISTICS, AND ANNOUNCEMENTS**  
Sara Edinberg – Montana AWRA President

8:45 AM **A MESSAGE FROM THE MONTANA WATER CENTER**  
Dr. Stephanie Ewing – Director, Montana Water Center

9:00 AM **LEGISLATIVE UPDATE**  
Toni Henneman – Deputy Research Director, Montana Legislative Services Division

9:40 AM **KEYNOTE SPEAKER**  
**Dr. Don Rosenberry, Research Hydrogeologist, Emeritus, U.S. Geological Survey.**  
*The Societal Relevance of Groundwater-Surface Water Exchange: Not Just for Scientists Anymore*  
The pursuit of science has its own merit and relevance to society, but for most citizens the connection is abstract and remote. When our science is applied to specific water-resource problems, though, the public begins to understand the worth of what we do. Anyone who lives near a wetland, lake, or ocean, or next to a stream or river, is affected by the interface between groundwater and surface water. Several examples of how and why this interface is important to the public, and to the management of our water resources, are presented. Problems range from too much water to too little, from finding the source of contaminants to what to do about getting rid of them. In almost all instances, groundwater-surface-water exchange was a bigger part of the story than had previously been realized.

10:35 AM **SECRETARY NOMINEE INTRODUCTIONS**

10:50 AM **HENDERSON AWARD ANNOUNCEMENT**

11:00 AM **BREAK** with refreshments

**TECHNICAL SESSIONS** (Blue text indicates student presenters.)

**Session 1 (Concurrent)**  
**Hydrology & Biogeochemistry**

*Moderator: Matthew Swarr, University of Montana*

11:40 AM **Canceled**

12:05 PM **Emma Tate**, *Montana State University*  
Novel microorganisms contribute to nitrate attenuation and methane consumption across riparian geochemical gradients in an agricultural landscape of central Montana

12:30 PM **LUNCH** provided to all registered attendees

**Session 3 (Concurrent)**  
**Hydrology**

*Moderator: Alan English, MBMG*

1:30 PM **Jeff Dunn**, *WGM Group*.  
Water budget analysis for a rapidly developing headwaters community

1:55 PM **Hannah Haugen**, *Montana DNRC*.  
Time-traveling plant sweat: The search for more accurate ET estimates

2:20 PM **Madeleine Festin**, *University of Montana*.  
Geodetic investigation of evapotranspiration in the Sierra Nevada

2:45 PM **John Lunzer**, *Montana DNRC*.  
Irrigators Only Dot Com: Feeling loamy? Missing a deep connection with your aquifer? Come check out the Gold Creek Return Flow Pilot Study and learn about how you can reconnect with your aquifer

3:05 PM **Break & Poster Set-Up**

**Session 2 (Concurrent)**  
**Groundwater & Managed Aquifer Recharge**

*Moderator: Payton Gardner, University of Montana*

11:40 PM **Ginette Abdo**, *Montana Bureau of Mines and Geology*. Evaluating Managed Aquifer Recharge (MAR) in Montana

12:05 PM **Alzada Roche**, *WGM Group*.  
Managed Aquifer Recharge in the Gallatin Valley – Partnering with Middle Creek Ditch Company to identify project opportunities along the ditch network

12:30 PM **LUNCH** provided to all registered attendees

**Session 4 (Concurrent)**  
**Groundwater**

*Moderator: Stephanie Ewing, Montana State University*

1:30 PM **Camela Carstarphen**, *Montana Bureau of Mines and Geology*. Groundwater mapping in Lincoln and Sanders counties: Study area introduction, data collection, and role that long-term data sets play in answering local concerns

1:55 PM **Matthew Swarr**, *University of Montana*.  
Extreme winter precipitation drives recharge of mountain groundwater

2:20 PM **Amy Yoder**, *Sheridan County Conservation District*. The Clear Lake Aquifer in Sheridan County, Montana

2:45 PM **Thomas Palin**, *Montana DNRC - Board of Water Well Contractors*. An overview of the Montana Board of Water Well Contractors

3:05 PM **Break & Poster Set-Up**

**TECHNICAL SESSIONS** (Blue text indicates student presenters.)

**Session 5 (Concurrent)  
Modeling**

*Moderator: Liddi Meredith, MBMG*

- 3:20 PM **Todd Blythe**, Montana DNRC. Has your modeling lost its spark? Rekindling the modeling flame in the Upper Yellowstone River basin and beyond
- 3:45 PM **Brett Oliver**, Montana Bureau of Mines and Geology. Combining NHD plus HR and LiDAR for improved streambed elevation estimates in agricultural, suburban, and urban areas
- 4:10 PM **Hayley Oakland**, Montana State University. Implications of function choice in modeling hyporheic exchange
- 4:35 PM **Kurt Zeiler**, Montana Bureau of Mines and Geology. Preliminary predictive simulation of land use change impacts on groundwater recharge west of Billings, MT

**Session 6 (Concurrent)  
Groundwater (continued)**

*Moderator: Christina Eggensperger, WET*

- 3:20 PM **Payton Gardner**, University of Montana. Estimating intermediate-scale groundwater net exchange using synoptic environmental tracer sampling
- 3:45 PM **Carl Krause**, Montana State University. Understanding patterns in pesticide detection across a non-irrigated agricultural landscape
- 4:10 PM **Tyler Storey**, Montana Bureau of Mines and Geology. Seasonal groundwater-elevation variations and potentiometric surfaces in the Tobacco Valley near Eureka, Montana
- 4:35 PM **Matthew Swarr**, University of Montana. Geodetic constraints on mountain bedrock aquifer flow and diffusivity

6:00 - 9:00 PM **Poster Session & Evening Social:** Heavy appetizers & drinks

## AWRA 2025 POSTER PRESENTATIONS

ECOLOGY

**Benjamin Colman**, University of Montana. Immersing students in ecosystems through virtual reality

**Fin Malone**, Montana Climate Office, University of Montana. Forest vulnerability: An investigation of mountain topography, hydroclimate, tree growth, and hydraulic traits

GROUNDWATER

**Hezekiah Afolabi**, Montana State University. Soil moisture-driven irrigation scheduling to reduce pesticide leaching in semi-arid agricultural systems

**Daniel Buckley**, Montana Bureau of Mines and Geology. Seasonal groundwater dynamics of Montana aquifers

**Camela Carstarphen**, Montana Bureau of Mines and Geology. Hydrogeologic framework of Gallatin and Madison counties

**Camela Carstarphen**, Montana Bureau of Mines and Geology. The Montana Bureau of Mines and Geology live and interactive GIS Data Hub site

**Cole Denver**, Montana Bureau of Mines and Geology. Watered with wisdom: Managed Aquifer Recharge in Montana

**Jenna Dohman**, Montana Bureau of Mines and Geology. Irrigation and groundwater in the Greenfields Irrigation District (Fairfield, MT)

**John Fitzpatrick**, University of Montana – Western. Identification of buried channels via electrical methods in northeastern Montana

**Russell Krantz**, University of Montana. Using multiple environmental tracers to understand groundwater net exchange and quality in the Upper Clark Fork

**Hendrick Moore**, MSU Extension Water Quality. Implementing new data and methods to keep Montana Well-Educated

**Michael Richter**, Montana Bureau of Mines and Geology. Enhanced groundwater monitoring in Big Sky, MT

**Kyla Schrauben**, MSU Extension. Evaluating soil water sensor performance across soil types

**Rachel Suhs**, Missoula Valley Water Quality District. At what data resolution R trends meaningful? A groundwater level analysis

HYDROLOGY

**Marina Barbosa Santos**, University of Montana. Hydrologic connectivity in a gravel-bedded river: UAV and SWOT observations from the Clark Fork River

**Toby Dunn**, Montana Climate Office. Patterns and drivers of effective precipitation across Montana's semi-arid landscapes

**Raeya Gordon**, Montana DNRC. Groundwater recharge on irrigated fields

MANAGEMENT AND RESTORATION

**James Madison**, Montana Bureau of Mines and Geology. Water use and consumption in Montana

WATER QUALITY

**Johanna Blake**, U.S. Geological Survey. Legacy and prospect: Critical mineral insights from the Upper Clark Fork River

**Banani Bonny**, Ohio University. Comparative study of arsenic adsorption: AMD-recovered iron vs. bayoxideE33

**Josie Grigsby**, Montana Technological University. Hydrogeochemistry of natural acid rock drainage in the Tobacco Root mountains, Montana

**Gabrielle Jawer**, MSU Extension Water Quality. The highs and lows of dissolved oxygen: A case study in the Jack Creek tributary of the Madison River

**Nicklas Kiekover**, Montana State University. Characterizing risk from emerging contaminants to Montana's public water supplies

**James Swierc**, Aaniiih Nakoda College. Water quality impacts to Fort Belknap Indian Reservation groundwater resources from the Landusky Mine in the Little Rocky Mountains, north-central Montana, 20 years after mine closure

**Jeremy Wood**, Gallatin River Task Force. Tracking long-term nutrient levels in Big Sky

**TECHNICAL SESSIONS** (Blue text indicates student presenters.)

7:30 AM Registration Opens - Gather early for Coffee and Conversation with Colleagues (breakfast will not be provided)

**Session 7 (Concurrent)**  
**Water Quality**

*Moderator: Kim Snodgrass, WET*

8:00 AM **Adam Sigler**, Montana State University.  
Leveraging agricultural irrigation infrastructure to protect groundwater resources

8:25 AM **Brianna Elizondo**, Flathead Lake Biological Station. Volunteer water quality monitoring in Kootenai River country

8:50 AM **Scott Patterson**, Montana DNRC.  
Surface water – groundwater interaction at public water systems

9:10 AM **BREAK** with refreshments

**Session 9 (Concurrent)**  
**Water Quality (continued)**

*Moderator: Christy Meredith, Montana DEQ*

9:20 AM **Matt Smith**, Montana Bureau of Mines and Geology. Geologic and hydrologic controls on salinity in intermittent prairie streams of central Montana – Distinguishing natural salinity processes from potential oilfield impacts

9:45 AM **Joe Griffin**, Montana Technological University.  
How many hydrogeologists can dance on the head of a pin: Examining the controversial history of groundwater management at the Butte Superfund site using more than 35 years of stream and groundwater data

10:10 AM **Alex Johanson**, Montana Bureau of Mines and Geology. An overview of the Fox Hills - Hell Creek aquifer study, eastern Montana

10:30 AM **BREAK** with refreshments

**Session 8 (Concurrent)**  
**Collaboration & Communication**

*Moderator: Ashley Peterson, Montana DNRC*

8:00 AM **Madison Boone**, Montana State University.  
Understanding social learning in collaborative water resources research: A case study of the Upper Clark Fork Working Group

8:25 AM **Janelle Groff**, Flathead Lake Biological Station.  
Empowering pesticide stewardship: MT PSPP's outreach strategy to protect Montana's waters

8:50 AM **Madison Chavez**, Montana State University.  
Water protection in the Native world: A case study at Chief Plenty Coups State Park

9:10 AM **BREAK** with refreshments

**Session 10 (Concurrent)**  
**Ecology**

*Moderator: Abbie Ebert, Montana DEQ*

9:30 AM **Rachel Malison**, Flathead Lake Biological Station. Comparative vulnerability of riverine benthic and aquifer stoneflies in large alluvial river floodplains

9:55 AM **Brooke Bain-White**, University of Montana.  
Paleolimnological records provide no evidence of long-term eutrophication of three lakes in Glacier National Park (Northern Rocky Mountains) despite ongoing environmental changes

10:20 AM **Jacob McArtor**, Flathead Lake Biological Station. Metal concentrations in streams vary with time since fire

10:30 AM **BREAK** with refreshments

**TECHNICAL SESSIONS** (Blue text indicates student presenters.)

**Session 11 (Concurrent)**  
**Water Quality (continued)**

*Moderator: Adam Sigler, Montana State University*

10:40 AM **Adam Sigler**, Montana State University. Health risks from consuming Montana groundwater, 20 years of private well testing, and new programming

11:05 AM **Kelsey Jencso**, Montana Climate Office. A progress report on the Montana Mesonet

11:30 AM **Christy Meredith**, Montana Dept. of Environmental Quality. Investigating patterns of nitrogen and phosphorous on the Gallatin River near Big Sky: Implications for algae patterns and water quality modeling

11:55 AM **Meghan Robinson**, Montana State University. Seasonal soil cracking and dynamic nitrate concentrations control deep percolation and leaching in an irrigated system

12:15 PM **Closing Plenary:** New Officer, Student Awards, Next Year's Location

**Session 12 (Concurrent)**  
**Management & Restoration**

*Moderator: Rachel Malison, Flathead Biological Station*

10:40 AM **Marisa Sowles**, Geum Environmental Consulting. River Ranch Restoration on the Yellowstone River

11:05 AM **Adam Johnson**, Confederated Salish and Kootenai Tribes. CSKT Bison Range: Interactions between the Jocko River and the adjacent shallow aquifer prior to channel-floodplain restoration

11:30 AM **Cassie Roberts**, Whitefish Lake Institute. Management of boat gas constituents in Whitefish Lake: 20 years later

11:55 AM **Chloe Czachor**, Flathead Lake Biological Station. Informing Pesticide Stewardship: MT PSPP's monitoring of pesticides in Montana waters

## KEYNOTE SPEAKER

### **DR. DON ROSENBERRY, RESEARCH HYDROGEOLOGIST, EMERITUS, U.S. GEOLOGICAL SURVEY**



Dr. Don Rosenberry is a research hydrogeologist now serving as an emeritus with the U.S Geological Survey and as an affiliate professor with the Colorado School of Mines. He specializes in groundwater-surface-water exchange in lake, wetland, estuarine, and fluvial settings. He also conducts research on wetland hydrology, water budgets of lakes and wetlands, and hyporheic processes. His research is focused at the sediment-water interface with an emphasis on understanding processes that control exchanges between groundwater and surface water. Dr. Rosenberry's interests stem from his formative years at Bemidji State University on the shore of Lake Bemidji, the University of Minnesota on the banks of the Mississippi River, and the University of Colorado through which Boulder Creek flows.

## SPECIAL SPEAKERS

### **MONTANA WATER CENTER UPDATE**

#### *Dr. Stephanie Ewing, Director, Montana Water Center*

Stephanie Ewing is the Director of the Montana Water Center, and a professor in the Department of Land Resources and Environmental Sciences at Montana State University. She directs the Soil Biogeochemistry Laboratory and Environmental Analytical Laboratory and is broadly interested in soil-groundwater-surface water connections with an emphasis on water quality related to land use. As Montana Water Center Director, she is interested in championing collaborative approaches to water related research across the Montana University System and Montana's diverse network of water resource professionals.

### **LEGISLATIVE UPDATE**

#### *Toni Henneman, Deputy Research Director, Montana Legislative Services Division*

Toni has worked with the Legislative Services Division since 2018, first as a Research Analyst and most recently as Deputy Research Director. She was first assigned to local government policy, focusing on land use planning, housing, special districts, fire protection, and local finance topics. She has staffed both the House and Senate Local Government Committees, the House Fish, Wildlife, and Parks Committee, and the Local Government Interim Committee. In 2025, she transitioned to water policy and staffed the Senate Natural Resources Committee and the Water Policy Interim Committee.

## HENDERSON AWARD

To be announced at the conference!

## HYDROPHILE 3-Mile run

This year's Hydrophile 3-(ish) mile run will be a choose your own adventure starting in front of the conference hotel on 14th St SW and ending at the venue for the evening social – Annie's Taphouse at 112 Central Ave. The following links represent the two recommended options, but runners are encouraged to be creative if they want a more scenic rout or feel like they have found a faster option. Both of the suggested routes are approximately 3.3 miles and utilize a pedestrian path to go under 6th St SW.

The run will start at 5:30 pm sharp unless the field trip runs significantly past 5, then we will modify as needed with an update as soon as the field trip returns to the hotel. There will be a vehicle at the start so people can stash personal items that will be available at the finish. Runners are responsible for arranging a ride back to the hotel.

Route A: <https://www.mapmyrun.com/routes/view/6608097186>





