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SUMMARY

I completed my Ph.D. in Geosciences (Contaminant Hydrogeology specialization) in August 2025, gaining over four years of experience in contaminated site investigation, groundwater monitoring and sampling, tracer experiments, environmental data analysis, and numerical and analytical modeling. My research integrates data-driven, science-based methods to characterize and predict contaminant transport in soil and groundwater, contributing to risk-based cleanup, environmental protection, and sustainable water-resource management. I am skilled in aquifer test interpretation, hydrogeologic data integration, and computational modeling to support site characterization and remedial design in collaboration with federal agencies**,** advancing science-informed environmental decision-making that safeguards public health and national environmental security**.**

EDUCATIONAL BACKGROUND

(1) Graduate Program: Jan. 2021-Aug. 2025
Institution: University of Wisconsin-Milwaukee, Milwaukee, WI
Department: Geosciences
Degree and Major (2021-2025): **Doctor of Philosophy (Ph.D.)** in Geosciences
CGPA: 3.88/4

(2) Graduate Program: Nov. 2017-Jun. 2019
Institution: University of Dhaka, Dhaka, Bangladesh
Department: Geology
Degree and Major: **Master of Science (M.S.)** in Petroleum Geology
CGPA: 3.33/4

(3) Undergraduate Program: Jan. 2013-Nov. 2017
Institution: University of Dhaka, Dhaka, Bangladesh
Department: Geology
Degree and Major: **Bachelor of Science (B.S.)** in Geology
CGPA: 3.34/4

RESEARCH INTERESTS

Hydrogeology, Groundwater Contamination, Groundwater Flow and Transport Modeling, Hydro geochemistry, Geology

PROFESSIONAL EXPERIENCES

1. **Quantitative Hydrogeologist** – INTERA, Inc (Full time, Oct. 01, 2025 - Present)

- ***Responsibilities:*** Based in the Richland, WA office, contributing to advancement of the DOE Hanford Plateau-to-River (P2R) Groundwater Model by improving groundwater flow and contaminant transport simulations (U, Tc-99, I-129, tritium, CCl_4), integrating updated field data,

and performing iterative model refinements to enhance predictive accuracy and support science-based remedial decision-making across the Central Plateau.

2. **Research Assistant** – Dept. of Geosciences, UW-Milwaukee (Jan. 2021- Aug. 2025)

- ***Project Name:*** Tracer Testing and Isotopic Analyses in Conjunction with Field-based Experiments of Periodic Flooding Events and Subsequent Mobilization of Uranium in Groundwater (Funded by **United States Department of Energy Office of Legacy Management contract #DE-LM0000421** with Navarro Research and Engineering, Inc., through March 30, 2021, and contract **#89303020DLM000001** with RSI EnTech, LLC, after April 1, 2021)

  Project Description: Historical milling operations and associated tailings disposal on surface by the mills caused surface and groundwater contamination at the Riverton, Wyoming, Processing Site (Site). This contamination increases especially after recharge events, e.g., flooding, even after the source of contamination was removed. The objective was to understand the mechanisms responsible for contaminant migration during the recharge events by conducting filed experiments, simulating the floods, at the site.

  Responsibilities: Performed tracer field experiments for two months; collected groundwater and soil samples; analyzed on-site groundwater and soil samples; curated data. Please refer to 'Field Works' section. (**Data** publicly available at DOE LM Data)

  Media Mention: https://www.energy.gov/lm/articles/collaboration-university-students-helps-remedial-efforts-lm-site

- ***Project Name:*** Residual Uranium Mineralogy at a Former Mill Tailings (Funded through The Geological Society of America, **Grant no. 13597-22**)

  Project Description: Residual solid-phase uranium (U) from former mill tailings contributes to persistent concentrations of U in groundwater at a U.S. Dept. of Energy field site in Riverton, WY. The objective was to visually look for solid-phase uranium from samples collected above the water table and to quantify the type and elements associated with U using Scanning Electron Microscopy (SEM) and Energy-dispersive X-ray Spectrometry (EDS).

  Responsibilities: Operated SEM-EDS to identify solid-phase U associations, curated data and images, analyzed results. This **paper** is published and available at https://www.osti.gov/biblio/2580768

- ***Project Name:*** Collaborative Research: Enhanced Biogeochemical Flushing of Uranium in Groundwater (Funded through **National Science Foundation, Grant no. 2229869**)

  Project Description: The overarching goal of this research is to understand how to better understand the biogeochemical processes and reactions that control the mobility of uranium in contaminated aquifers. The specific objectives of the research are to determine flow and reactive transport parameters to support the implementation and validation of a uranium transport/mobilization model using analytical and finite difference numerical modeling and available uranium mobilization data from single-well tracer experiments.

  Responsibilities:

  (a) Analyzed environmental and hydrologic datasets using Python (NumPy, Pandas, Matplotlib, SciPy), applying statistical techniques (temporal moments, PCA, kriging-ArcMap) to identify

patterns, trends, and anomalies. Created high-quality data visualizations for scientific reports, presentations, and publications using Python, and Adobe Illustrator. The **paper** is published and available at https://doi.org/10.1016/j.jconhyd.2024.104391

(b) Organized, archived, and documented large field experimental datasets, ensuring strict QA/QC protocols and metadata standards. Coordinated with DOE contractors during hydrologic fieldwork to maintain consistent and accurate data handling.

(c) Performed analytical contaminant transport modeling to analyze contaminant (uranium and chloride) mechanisms from vadose zone to groundwater during floods. This **manuscript** is currently in preparation (Expected May 2026).

3. **Internship -** Graduate Research Intern at U.S. Geological Survey, Upper Midwest Water Science Center, Madison, WI (Aug. 2024 – Jan. 2025)
(Funded through **NSF INTERN GRANT**, **Grant no. 2229869**)

Responsibilities:

(a) Developed open and reproducible groundwater modeling workflows (MODFLOW 6, FloPy, pyEMU) in Python, calibrated with PEST and PEST++.

(b) Shared hydrologic data analysis and modeling scripts, and workflows through GitHub to enhance community access and reproducibility.

(c) Applied calibration techniques for pumping tests and groundwater flow models using PEST and PEST++ and provided technical guidance on parameter estimation.

4. **Teaching Assistant** - Department of Geosciences, UW-Milwaukee (Jan. 2021- Jun. 2025):

Courses Taught:

(a) Physical Hydrogeology- GEO SCI 463G (Fall 2022),

(b) Chemical Hydrogeology-GEO SCI 464G (Spring 2023 and Spring 2024), and

(c) Introduction to the Earth: GEO SCI 100 (Spring 2021, Spring 2023, Spring 2024, and Summer 2025)

Responsibilities:

(a) Trained 20 undergraduate and graduate students in each of two weekly classes on environmental data interpretation, aquifer testing, and groundwater sampling.

(b) Co-developed and delivered instructional materials to support data-driven content communication both online and in-person settings.

5. **Mentorship**

Project: Spatial Footprint of Uranium Above Water Table, Author(s): Jena Choi, Rakiba Sultana, Charles Paradis, Publication: UWM Undergraduate Research Symposium. 2023. Funded by Support for Undergraduate Research Fellows (SURF) grant

Responsibilities:

(a) Guided undergraduate on lab procedure for water sampling events (May 2021)

(b) Co-supervised two high school students from Nicolet High School in Glendale with mapping in ArcGIS (Jan-April 2021)

6. Collaborative Research

(a) Contributed to experimental data analysis on salt wicking and flushing in porous media with the Laboratory for Flow and Transport Studies in Porous Media, UW-Milwaukee; **paper** published in http://dx.doi.org/10.1016/j.jconhyd.2025.104686

(b) Co-developed a research proposal with Dr. Xavier Comas (currently Professor at Department of Earth and Environment, Florida International University) investigating salinity impacts on peat soil structure and carbon loss in the coastal Everglades.

FIELD WORKS

Two-month (July-August 2021) hydrogeological fieldwork in Riverton, Wyoming, U.S.A. in collaboration with U.S. Department of Energy (DOE) Legacy Management.
Funded by United States Department of Energy Office of Legacy Management contract **#DE-LM0000421** with Navarro Research and Engineering, Inc., through March 30, 2021, and contract **#89303020DLM000001** with RSI EnTech, LLC, after April 1, 2021. Activities included operating field experiments, collecting and analyzing groundwater samples. The collected data is publicly available in DOE report, Report no. LMS/ESL/43015

PEER-REVIEWED PUBLICATIONS (Google Scholar)

(5) **Sultana, R.**, Wallace, C.D., Tigar, A.D., Wahl, T.W., Hoss, K.H., Johnson, R.H., Paradis, C.J., 2025. Mechanisms for Contaminant Transport in the Vadose Zone During Infiltration Events. In prep for Journal of Contaminant Hydrology. *(in preparation)*

(4) Hasan, A.B.M.R., **Sultana, R.**, Paradis, C.J., Pillai, K.M., 2025. Experimental investigation of upward and downward cycling of salt contaminants in the vadose zone. Journal of Contaminant Hydrology 104686. https://doi.org/10.1016/j.jconhyd.2025.104686.

(3) Paradis, C.J., **Sultana, R.**, Dangelmayr, M.A., Johnson, R.H., Kent, R.D., 2025. Breakthrough Curve Separation Using Applied Solute Tracers. Groundwater gwat.13480. https://doi.org/10.1111/gwat.13480

(2) **Sultana, R.**, Johnson, R.H., Tigar, A.D., Wahl, T.J., Meurer, C.E., Hoss, K.N., Xu, S., Paradis, C.J., 2024b. Contaminant mobilization from the vadose zone to groundwater during experimental river flooding events. Journal of Contaminant Hydrology 265, 104391. https://doi.org/10.1016/j.jconhyd.2024.104391

(1) **Sultana, R**., Dangelmayr, M.A., Paradis, C.J., Johnson, R.H., 2024a. Combining fission-track radiography and scanning electron microscopy to identify uranium host phases. Environ Earth Sci 83, 56. https://doi.org/10.1007/s12665-023-11373-5

CONFERENCE PROCEEDINGS (Google Scholar)

(9) **Sultana, R.**, Johnson, R., Paradis, C., 2024. Uranium mobilization from the vadose zone to groundwater during experimental river flooding events. Presented at Department of Geosciences-UW Milwaukee Symposium 2024. (Poster Presentation)

(8) **Sultana, R.**, Johnson, R., Paradis, C., 2023. Determining the primary source and mobilization mechanisms of uranium during recharge events under natural-flow conditions. Presented at Department of Geosciences-UW Milwaukee Symposium 2023. (Poster Presentation)

(7) **Sultana, R.**, Owen, H., Paradis, C., Johnson, R., 2022. Microscale visualization and elemental analysis of solid-phase uranium geochemistry on contaminated sediments using fission track technology. Presented at the GSA Connects 2022 meeting in Denver, Colorado, p. 379607. https://doi.org/10.1130/abs/2022AM-379607 (Oral Presentation)

(6) **Sultana, R.**, 2022. Characterization of Possible Uranium Association with Evaporite Minerals using Scanning Electron Microscope. Presented at Department of Geosciences-UW Milwaukee Symposium 2022. (Oral Presentation)

(5) **Sultana, R.**, Hoss, K., Meurer, C., Hatami, J., Johnson, R., Tigar, A., Paradis, C., 2021. Surface infiltration of river water to groundwater to simulate periodic flooding events at a uranium-contaminated site. Presented at the GSA Connects 2021 in Portland, Oregon, p. 366575. https://doi.org/10.1130/abs/2021AM-366575 (Oral Presentation)

(4) Hoss, K., **Sultana, R.**, Meurer, C., Hatami, J., Tigar, A., Johnson, R., Paradis, C., 2021. Mass transport of halide and benzoate tracers to characterize groundwater velocity, dispersivity, and matrix diffusion in a uranium-contaminated aquifer. Joint 55th Annual North-Central / 55th Annual South-Central Section Meeting - 2021, p. 362907. https://doi.org/10.1130/abs/2021NC-362907

(3) Hoss, K., **Sultana, R.**, Meurer, C., Hatami, J., Tigar, A., Johnson, R., Paradis, C., 2021. Direct river water to groundwater recharge experiments to elucidate mass transport mechanisms of uranium. GSA Connects 2021 in Portland, Oregon, p. 366307. https://doi.org/10.1130/abs/2021AM-366307

(2) Paradis, C., Meurer, C., Hatami, J., Hoss, K., **Sultana, R.**, Tigar, A., Johnson, R., 2021. Single-well injection-drift test to characterize groundwater velocity and dispersivity. Joint 55th Annual North-Central / 55th Annual South-Central Section Meeting - 2021, p. 362716. https://doi.org/10.1130/abs/2021NC-362716

(1) **Sultana, R.**, 2021. In-Situ Flooding Experiments to Elucidate Mass Transport Mechanisms of Uranium in Groundwater: A Case Study of Riverton, Wyoming. Presented at Department of Geosciences-UW Milwaukee Symposium 2021. (Oral Presentation)

PROFESSIONAL SERVICE

(1) Peer Reviewer (2025) - **Physics and Chemistry of the Earth (Elsevier)** (3)

(2) Guest lecture (2025) - Modelling Techniques for Hydrogeology (graduate-level course), Workflow for simulating steady-state and transient pumping test using MODFLOW6 and FloPy (1)

RESEARCH FUNDINGS

(1) Non-Academic Research Internships for Graduate Students (INTERN) Grant, **$37,918** (2024-25), Supplementary Funding to Standard Grant: **Grant no. 2229869**
Internship Host Organization: United States Geological Survey Upper Midwest Water Science Center, Madison, WI

(2) GSA (Geological Society of America) Graduate Student Research Grant with Specialized Awards: John T. and Carol G. McGill Research Award, **$2700** (2022-23), Research: Residual Uranium Mineralogy at a Former Mill Tailings Site. Grant #: 13597-22
(3) National Science and Technology Fellowship (NST), Awarded by The Ministry of Science and Technology, Government of Bangladesh, **$500** (2018-19), Research: Environmental Impact and Its Mitigation due to Waste Disposal by Crude Oil Processing at Eastern Refinery Limited, North Patenga, Chittagong, Bangladesh

AWARDS and SCHOLARSHIPS

(1) UW-Milwaukee Department of Geosciences Research Excellence Award 2025, **$1400**
(2) UW-Milwaukee Department of Geosciences Award 2024, **$500**
(3) UW-Milwaukee Chancellor's Graduate Student Award, **$4,000**
(4) UW-Milwaukee Nelson Cherkauer Lasca Legacy Scholarship 2022 and 2023, **$7000**
(5) UW-Milwaukee Geosciences Department Student Conference Travel Award (DSCTA), **$200**
(6) UW-Milwaukee Graduate Student Travel Award 2021 and 2022, **$700**
(7) GSA (Geological Society of America) Connects Travel Grant 2021-2022, **$300**

SUMMARY OF GRADUATE COURSEWORK COMPLETED (course name/summary)

(1) Physical Hydrogeology: Investigation of the groundwater occurrence, its correlation with surface water, aquifer characteristics, encompassing the principles of well hydraulics, assessment of water quality, and groundwater legislation
(2) Chemical Hydrogeology: Chemical processes inherent to groundwater systems, their alteration due to anthropogenic activities and pollution, as well as attempts to regulate them incorporating wet labs and geochemical modeling
(3) Contaminant Hydrogeology: Transport and fate of contaminants within aquifers, aquitards, and variably saturated zones
(4) Environmental Surface Hydrology: Land-atmosphere interactions, modeling of runoff generation, and water movement in the vadose zone
(5) Modelling Techniques for Hydrogeology: Finite difference and finite element techniques for groundwater flow and contaminant transport
(6) Biological Electron Microscopy: Theoretical foundations, principles of design, and operational mechanisms of Scanning Electron Microscope (SEM) coupled with Energy-Dispersive X-ray Spectrometry (EDS), alongside the techniques for preparing geological specimens
(7) Scanning Electron Microscopy Laboratory: Operating Hitachi S-4800 Ultra High-Resolution Cold Cathode Field Emission (FE)-SEM equipped with a Bruker Quantax EDS system
(8) X-ray Analytical Methods: Theory, and operating principles of X-ray Diffraction (XRD) and X-ray Fluorescence (XRF); chemistry, and mineralogy to produce, use, and interpret XRD and XRF data with hands-on training in sample preparation and operating the analytical instruments
(9) Seminar in the Geological Sciences: Development and preparation for entering into workforce

INTERDISCIPLINARY EXPERIENCE

ReSTORE Summer School, University College Dublin, Ireland, 4 July 2022-8 July 2022 (Funded by University College Dublin, Ireland)

TECHNICAL SKILLS

(1) **Programming & Data Science:** Python (NumPy, Pandas, Matplotlib, SciPy, FloPy, pyEMU), R, Jupyter Notebooks, GitHub
(2) **Modeling & Software:** MODFLOW 6, PEST++, Groundwater Vistas, PHREEQC, ArcGIS, Surfer, Adobe Illustrator, Mortimer HPC (file transfer, job configuration)
(3) **Field Methods:** Tracer infiltration experiments, groundwater monitoring, water quality sampling, data wrangling and visualization of field datasets (Riverton, WY infiltration tests)

EXTRA-CURRICULAR ACTIVITIES

(1) Member at American Geophysical Union (AGU) (2024-2025) - Membership ID: 24068
(2) Member at Geological Society of America (GSA) (2024-2025) - Membership ID: 9291281
(3) President at Society of Petroleum Engineers (SPE) - Dhaka University Chapter (2017-18), Membership ID: 4792366

TRAINING

Responsible Conduct of Research Training, June 2024, Collaborative Institutional Training Initiative (CITI Program), Record no: 63332382