

Brendan J. Moran

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CURRENT POSITION

Postdoctoral Research Associate

February 2022 – Present

EDUCATION

University of Massachusetts

Ph.D., Hydrogeology

M.Sc., Hydrogeology

St. Lawrence University

B.S., Geology & Environmental Studies

Amherst, MA

January 2022

January 2018

Canton, NY

May 2010

RESEARCH EXPERIENCE

University of Massachusetts

Research Assistant/Associate; Advisor: Dr. D. Boutt & Dr. L.A. Munk

Amherst, MA

2015- Present

I investigate lithium brine-bearing aquifer systems and the hydrogeological & climatological dynamics of the arid regions in which they exist. We work to solve the many challenging and still unresolved questions involving the functioning of the basin and local scale hydrology in these systems and integrate this knowledge with water availability and use impacts. Much of our work has focused on the critically important Salar de Atacama and Salar del Hombre Muerto systems but has now expanded to include all major lithium deposits worldwide.

- I Utilize an array of geochemical, hydrophysical, remote sensing, and numerical modeling techniques to develop a sophisticated process-based understanding of the groundwater system and complex interactions with the hydroclimate and anthropogenic influence.
- I seek to advance our understanding of natural water cycles and transport to improve our ability to effectively develop critical raw materials while also protecting critical water and ecosystem resources.
- I'm currently the lead researcher/project lead on three projects composed of 3-6 person teams. I also plan, organize and lead regular 2-week field expeditions.

TECHNICAL SKILLS

- *Coding/Software:* ArcGIS Pro, GEE/JavaScript, Python/Jupyter, MATLAB, R, GWB, PHREEQC, COMSOL, MODFLOW, Adobe Illustrator
- *Research:* Numerical hydrological modeling, Solid geological modeling, Inverse hydrogeochemical modeling, Remote environmental sensing, Stable and radiogenic isotope tracers, basin-scale and core-scale stratigraphic, and hydrostratigraphic assessment.
- *Field:* Organized and led multiple large-scale sampling campaigns, taught multiple field and classroom courses, evaporite and oil deposit core logging, and associated geological exploration.

- *Laboratory:* Hydrogeochemical and Isotopic analysis using Cavity Ring-Down Spectroscopy, Ion chromatography, ICP-MS, and ICP-OES. Conducted titrations and processed waters for ^3H and $^{87}\text{Sr}/^{86}\text{Sr}$ analysis.

PROFESSIONAL EXPERIENCE

TRC Environmental Corp.

2013 – 2014

Environmental Geologist

- Conducted investigations into chemical contamination associated with Oil & Gas refining, drilling, and production; characterized scope and designed action plans.
- Designed and conducted groundwater monitoring for LNAPL, DNAPL, and other chemical contamination; measured and tracked concentrations of TPH, VOCs, SVOCs, and metals
- Collected, synthesized, and analyzed data from more than 12 sites, resulting works include:
 - > Characterization of groundwater & contaminant plume flow regimes & chemical parameters
 - > Forward modeling of contamination plumes and distribution of Chemicals of Concern
 - > Determined an appropriate cleanup plan - i.e. SVE systems, soil removal, engineered systems, etc.
 - > Monitoring and Remediation Plans, Phase I, Phase II, and Soil Management Plans (SMPs)

Horizon Well Logging, LLC

2011 – 2013

Lead Field Geologist & Geosteering Geologist

- Provided real-time synthesis and analysis of geological and geophysical information, created and interpreted graphical logs for the geology team. This included detailed rock and gas sample analysis to produce stratigraphic interpretation in real-time to direct drilling, natural gas monitoring, and characterization during and after drilling.
- Worked closely with Shell Oil, Seneca Resources, and ConocoPhillips lead geologists to produce exploratory rock cores in several data-poor regions; analyzed and interpreted stratigraphy and structure in the Marcellus Shale, Eagle Ford Shale, and Permian Basin
- Trained and supervised dozens of new field geologists and was promoted to lead the team working for our most valued and lucrative clients due to personal requests by their senior geologists.
- Excelled in an intensive two-week Geosteering training course using SES modeling.

Veolia Environmental Services

2011

Environmental Scientist

- Extensive experience dealing with EPA & state regulations, sampling, waste characterization, disposal, and safety. Analyzed and processed lab products and refined procedures.

TEACHING EXPERIENCE

University of Massachusetts

Amherst, MA

Co-Instructor for Geo-Sci 587: Hydrogeology

Spring 2018

Head Teaching Assistant for Geology 101: The Earth

Fall 2016

Teaching Assistant for Geology 101: The Earth

Fall 2015 and Fall 2017

Teaching Assistant for Geo-Sci 587: Hydrogeology Spring 2016 and Spring 2017
Teaching Assistant for Geology 103: Oceanography Fall 2018

GRANTS & AWARDS

Outstanding Geology Teaching Assistant Award 2018
UMass-Amherst Graduate School Fieldwork Grant 2019-2020
AAPG Foundation - 2020 Donald F. Towse Memorial Grant 2020
Leo M. Hall Memorial Fund 2020
Joseph Hartshorn Endowed Graduate Scholarship in Quaternary Geology 2020
Andrew D. Wiess Memorial Scholarship 2019

COMMUNITY/PROFESSIONAL SERVICE

R.W. Bromery Fund to Support Minorities in Geosciences – Committee Member 2020
Massachusetts High School Science & Engineering Fair – Judge 2020
Envirothon at UMass Amherst – Safe Water Supply panel speaker 2019
Skype-a-scientist – Guest Scientist 2018-2019

PROFESSIONAL TRAINING

UN Global Sustainable Solutions Winter School 2020 – selected participant
Isotope Tracers in Catchment Hydrology 2020 – graduate course & international workshop
Isenberg Business Foundation Series 2019 – MBA affiliated seminar, selected participant

PROFESSIONAL AFFILIATIONS

Northeast Climate Adaptation Science Center (NE CASC) - Fellow
American Geophysical Union
Geological Society of America
The International Association of Geochemistry
National Ground Water Association

REFERENCES (MORE AVAILABLE UPON REQUEST)

Dr. David Boutt – Professor, U. of Massachusetts-Amherst
Dr. Lee Ann Munk – Professor, University of Alaska-Anchorage
Dr. Joshua Fisher – AC4 Director, Columbia University

PEER-REVIEWED PUBLICATIONS

Corkran, D., Boutt, D. F., Munk, L. A. **Moran, B. J.**, McKnight, S. V., Kirshen, A., Jenckes, J. (2023-In Review). Constraints on groundwater abstraction impacts in lithium brine systems. *Nature Geoscience*.

McKnight, S. V., Jenckes, J., Boutt, D. F., **Moran, B. J.**, Munk, L. A., Corkran, D., Kirshen, A., (2023-In Review). Hydrological Signatures in Wetlands of the Lithium-rich Andes. *Nature Water*.

Moran, B. J., Boutt, D. F., Munk, L. A. & Fisher, J. (2023-In Review). Extreme Partitioning of Relic and Contemporary Waters in Arid Environments. *Nature Communications Earth & Environment*. <https://doi.org/10.21203/rs.3.rs-2738963/v1>

McKnight, S. V., Boutt, D. F., Munk, L. A., & **Moran, B.** (2023). Distinct hydrologic pathways regulate perennial surface water dynamics in a hyperarid basin. *Water Resources Research*, 59, e2022WR034046. <https://doi.org/10.1029/2022WR034046>

Moran, B. J., Boutt, D. F., McKnight, S. V., Jenckes, J., Munk, L. A., Corkran, D., & Kirshen, A. (2022). Relic groundwater and prolonged drought confound interpretations of water sustainability and lithium extraction in arid lands. *Earth's Future*, 10, e2021EF002555. <https://doi.org/10.1029/2021EF002555>

Frau, D, **Moran, B.J.**, Arengo, F, Marconi P, Battauz, Y, Mora, C, Manzo, R, Mayora, G, Boutt D.F. (2021). Hydroclimatological Patterns and Limnological Characteristics of Unique Wetland Systems on the Argentine High Andean Plateau. *Hydrology*; 8(4):164. <https://doi.org/10.3390/hydrology8040164>

Boutt, D. F., Corenthal, L. G., **Moran, B. J.**, Munk, L. A., & Hynek, S. A. (2021). Imbalance in the modern hydrologic budget of topographic catchments along the western slope of the Andes (21–25°S): implications for groundwater recharge assessment. *Hydrogeology Journal*. <https://doi.org/10.1007/s10040-021-02309-z>

Munk, L. A., Boutt, D. F., **Moran, B. J.**, McKnight, S. V., & Jenckes, J. (2021). Hydrogeologic and geochemical distinctions in freshwater-brine systems of an Andean salar. *Geochemistry, Geophysics, Geosystems*, 22, e2020GC009345. <https://doi.org/10.1029/2020GC009345>

Moran, B. J., Boutt, D. F., & Munk, L. A. (2019). Stable and radioisotope systematics reveal fossil water as fundamental characteristic of arid orogenic-scale groundwater systems. *Water Resources Research*, 55. <https://doi.org/10.1029/2019WR026386>

Munk, L. A., Boutt, D. F., Hynek, S. A., & **Moran, B. J.** (2018). Hydrogeochemical fluxes and processes contributing to the formation of lithium-enriched brines in a hyper-arid continental basin. *Chemical Geology*, 493, 37–57. <https://doi.org/10.1016/j.chemgeo.2018.05.013>

SELECTED CONFERENCE PRESENTATIONS

Moran, B. J., Boutt, David, Munk, L.A., Jenckes, Jordan and Mcknight, Sarah, Relic and Contemporary Waters of the Dry Andes: Global Implications for Water and Lithium Resource Development: Geological Society of America Abstracts with Programs 2022. Vol 54, No. 5 <https://doi.org/10.1130/abs/2022AM-380604>

Moran, B. J., Boutt, D. F., Munk, L. A., and Fisher, J. D.: Pronounced Water Age Partitioning Between Arid Andean Aquifers and Fresh-Saline Lagoon Systems, EGU General Assembly 2021, online, 19–30 Apr 2021, EGU21-13753, <https://doi.org/10.5194/egusphere-egu21-13753>, 2021.

[*Contributing Author] Vicarelli, M. and Nagabhatla, N.: Differences in Nature Based Solutions perception and implementation strategies across academic disciplines, an empirical analysis, EGU General Assembly 2021, online, 19–30 Apr 2021, EGU21-3767, <https://doi.org/10.5194/egusphere-egu21-3767>, 2021.

Moran, B. J., Boutt, D. F., Munk, L. A., Joshua D. Fisher, Felicity Arengo, Patricia Marconi & Diego Frau. Revealing Paleo-Groundwater and Interbasin Flow as Fundamental to Water and Mineral Resource Sustainability on the Arid Altiplano-Puna Plateau. Abstract H11N-1711 presented at 2019 Fall Meeting, AGU, San Francisco, Calif., 9-13 Dec.

Moran, B. J., Boutt, D. F., Munk, L. A. & Hynek, S. A. Resolving Water and Solute Budget Imbalance in a Groundwater Dominated Arid Catchment Using Hydrofacies Characterization and Inverse Modelling. Geological Society of America Abstracts. Poster presentation to be delivered at the Geological Society of America meeting, Indianapolis, IN., November 2018.

Moran, B. J., Boutt, D. F., Munk, L. A. & Hynek, S. A. Long-Term Drainage of Stored Groundwater Resolves the Hydrologic Budget Discrepancies of Arid Catchments. Geological Society of America Abstracts. Poster presentation delivered at the Geological Society of America Meeting, Seattle, WA., October 2017. <https://doi.org/10.1130/abs/2017AM-296332>

Moran, B. J., Boutt, D. F., Munk, L. A. & Hynek, S. A. Characterizing Regional and Transient Groundwater in Order to Address Water Balance Discrepancies in Salar de Atacama Basin, Chile. Abstract H54B-08 presented (oral) at 2016 Fall Meeting, AGU, San Francisco, Calif., 11-15 Dec.