



**Logan River Observatory Annual Report**

**2024–2025**

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**July 1, 2025**

In partnership with:



UtahState  
University



**Preface**

This report provides a summary of data collected within the Logan River Observatory as required by funds provided by the Utah State Legislature, which are managed and overseen by the Utah Division of Water Resources and Utah Division of Water Rights. The primary objectives of the report are to highlight the data types and availability within the Logan River Observatory and to summarize recent and ongoing research and outreach affiliated with the observatory.

**Cite this report as:**

Neilson, B.T., Strong, P., and Horsburgh, J.S. (2025). Logan River Observatory Annual Report. Utah Water Research Laboratory, Utah State University, Logan, Utah, USA.

<https://uwrl.usu.edu/files/pdf/2024-25-lro-annual-report.pdf>

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## 2024–2025 SUMMARY OF LOGAN RIVER OBSERVATORY ACTIVITIES AND ACCOMPLISHMENTS

*(More details are provided in subsequent sections)*

### Collecting detailed watershed data (discharge, water quality, climate):

The Logan River Observatory (LRO) maintains 20 discharge stations, 7 full water quality stations, 13 partial water quality stations, 4 full climate stations, and 2 partial climate stations. During the past year, we added a mid-elevation climate station, added two repeaters to enable real-time data to be telemetered from all mid-canyon stations, and expanded the gaging station network to include an additional spring inflow, two additional mainstem locations, and two other tributaries to Cutler Reservoir. Raw data are automatically updated online every hour at all gaging and water quality stations. One climate station does not provide real-time data, but it will be upgraded in the next year via connection to the new repeaters. Raw field data have been quality controlled and are publicly available<sup>1</sup>. Quality controlled data are updated quarterly. As part of new funding from the Utah Division of Water Rights (DWRi) initiated in 2025, the LRO is now working with the United States Geological Survey (USGS) Utah Water Science Center to install and/or maintain 5 additional gaging stations throughout the Bear River basin that are complementary to LRO operations.

### Advancing training and expertise<sup>2</sup>:

LRO data are being used in 16 upper division undergraduate or graduate classes and are regularly used in Senior Design projects within the College of Engineering at USU. The LRO data are currently being used in 10 ongoing PhD dissertations and 6 MS theses and were part of 1 PhD and 3 MS dissertation/theses completed last year. We currently employ, mentor, and continue to train 4 undergraduate student LRO technicians.

### Addressing existing water issues in the state:

The LRO has become an example of what the future of data collection to support watershed management throughout the state of Utah could become. Recent studies, including the Measurement and Infrastructure Gap Analysis in Utah's Great Salt Lake Basin<sup>3</sup> and a Hydroinformatics and Technology Gap Analysis<sup>4</sup> performed for DWRi, built on information and knowledge established via the development of the LRO. These studies are guiding the future of Great Salt Lake basin gaging investments and state-wide water-related data management. This has led to continued work focused on understanding and measuring inflows directly to the Great Salt Lake via projects with DWRi and USFWS that have been supported by the LRO. Data systems and software developed for managing LRO data are now being used by USU to assist DWRi in modernizing the databases and data management systems used to collect, store, manage, and share data at measurement stations located throughout the state of Utah.

Building on prior NSF-funded research regarding groundwater behavior in the karst Bear River range mountains, LRO staff, faculty, and students are facilitating a local Cache Valley groundwater recharge

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<sup>1</sup> <http://lrodata.usu.edu/>

<sup>2</sup> For more information, see <https://uwrl.usu.edu/lro/resources> and <https://uwrl.usu.edu/lro/people/students>.

<sup>3</sup> <https://doi.org/10.4211/hs.8bf055dbe78b46d184cc7a4bb53931c7>

<sup>4</sup> <https://doi.org/10.4211/hs.9d02ff3c946249fe9cbc39b2a16c829e>

study focused on better understanding water availability to inform future groundwater allocations. Additionally, a USU Extension research grant is focused on enhancing LRO data accessibility and interpretation.

### Supporting new research to advance understanding of Utah’s watersheds:

LRO-affiliated faculty continue to pursue research projects that further the mission of the LRO and depend on LRO data. The 12 currently funded projects total \$8.8M. LRO researchers continue to develop new proposals to further support diverse water related needs across the state, including recent efforts toward the establishment of coordinated efforts for managing water-related data across Utah state agencies, and approaches to establish gaging infrastructure for real-time inflow estimates to the GSL. This work builds on existing human, physical, and cyberinfrastructure within the LRO. LRO researchers also produced 7 related publications and delivered 18 presentations in 2024–2025. These articles and presentations highlight the LRO or report research results from the Logan River watershed based on data from the LRO. One presentation was a highly promoted USU Research Landscapes outreach event that engaged diverse participants, focused on the LRO, and described the need for better measurement and data management approaches across the state.

### Focusing on future challenges associated with limited water supplies:

Given the continued focus of Utah’s Governor and the Utah State Legislature on addressing the low level of the Great Salt Lake and limited water availability throughout the State of Utah and the Colorado River Basin, water-related legislation continues to be developed and revisited to better water management strategies. The measurement infrastructure in the LRO provides a model for the data collection needed to better support water management decisions, with applications that have now extended far beyond the LRO into the GSL basin and other areas of Utah. Collaborations with the Logan River Task Force, Cache Water District, USU’s Institute of Land, Water, Air, and the Great Salt Lake Strike Team will continue to focus on quantifying water availability and establishing appropriate conservation approaches while enabling delivery of water to intended downstream users—along with demonstrating the data collection required to support these applications. Over the last year, in collaboration with the Utah Division of Water Resources (DWRe) and DWRI, LRO faculty have worked to better understand and meet the various measurement, monitoring, cyberinfrastructure, and modeling needs that are helping answer many water-management-related questions. In collaboration with a broad group of stakeholders, local groups, and state agencies, the LRO will continue to provide science-based solutions to key water related concerns across the state.

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## BACKGROUND

Water is the lifeblood of Utah. Utah's residents depend on a safe and adequate water supply, not only for drinking, but for other municipal, agricultural, industrial, and recreational uses. Much of Utah's water supply comes from reservoirs or streams that are fed by snowmelt. Utah's climate can be highly variable, with large changes in water availability from year to year. Furthermore, as Utah's climate shifts, historical data may not be predictive of future water supply, raising new questions. For example: *As weather patterns change to more rain and less snow, what will be the effect on springtime river flows that fill our reservoirs and provide summer flow crucial for meeting agricultural and urban demands? How will Utah's rapidly growing population impact our already limited water supply? How will climate and population changes affect Utah's drought resiliency?*

Although water levels in the Great Salt Lake have improved, concerns remain regarding the success of the lake ecosystem, the potential impacts of low lake levels on mining industries, and the effects of lakebed dust on human health. Even with recent large investments in water conservation, with the goal of getting more water to the lake, additional water delivery to the lake is still needed<sup>5</sup>. The primary related question that remains is: *What conservation practices should be implemented, and how do we ensure saved water is delivered to the Great Salt Lake?* Reliable and representative data are essential for answering questions like these, and additional monitoring of Utah watersheds is necessary for making informed water management decisions. The LRO's watershed monitoring network can help answer these questions by providing data and the research needed to fill these important knowledge gaps. Additionally, it can serve as a model for other watershed monitoring efforts focused on management.

### Logan River Observatory Overview

The overarching goal of the LRO is to provide long-term, comprehensive hydrologic data to inform local and statewide water management decisions based on Utah-specific hydrologic research. In support of this goal, the LRO is also an outdoor laboratory and classroom for training the next generation of engineers and scientists who will be Utah's future water managers. Detailed watershed data (discharge, water quality, climate) combined with this increase in expertise provide opportunities to: (1) address existing water issues throughout the state, (2) support new research to advance understanding of Utah's watersheds, and (3) focus on future challenges associated with limited water supplies.

The LRO team has established partnerships with local stakeholders to support and improve existing monitoring infrastructure, including the Utah DWRe, Utah DWri, Utah State University, Logan City, Cache Water District, and Trout Unlimited. Last year, in collaboration with the Division of Water Rights, updates to diversion gaging infrastructure throughout the Logan River watershed were completed to support ongoing research efforts related to statewide water distribution questions. Further, recent funds from the Division of Water Rights, focused on addressing the gaging needs identified within the Measurement and Infrastructure Gap Analysis for the Bear River Basin, facilitated the installation of new gaging stations and maintenance of existing stations by the LRO and the USGS. The LRO Team also coordinates with the Logan River Task Force and Cache Water District to support their efforts via data collection and modeling efforts.

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<sup>5</sup> See Great Salt Lake Strike Team Report at: <https://d36oiwf74r1rap.cloudfront.net/wp-content/uploads/2025/01/GSL-Jan2025.pdf>

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## LRO DATA TYPES AND AVAILABILITY

The LRO data provides critical information to guide Utah's water resources planning and management decisions and offers foundational information to support water-related research, which is a primary focus for scientists and engineers at the Utah Water Research Laboratory, other USU departments, and collaborators.

In the original GAMUT network<sup>6</sup>, aquatic monitoring stations were placed within the Logan River watershed<sup>7</sup>: **(1)** in a high-elevation first-order stream (Logan River Near Franklin Basin), **(2)** in a mid-elevation second- or third-order stream (Logan River Near Tony Grove), **(3)** at a low elevation valley site (Logan River at Main Street (Highway 89/91) Bridge), and **(4)** near the terminus of the stream below the Logan City urban area of interest (Logan River at Mendon Road (600 South)) in order to span a range of elevations and mountain-to-urban environments. The climate and terrestrial monitoring stations were located at: **(1)** a high-elevation mountain headwater area (Climate Station at Franklin Basin), **(2)** a mid-elevation area (Climate Station at Tony Grove), and **(3)** a low elevation area in a valley/urban location (Climate Station at Logan River Golf Course). As detailed by Jones et al. (2017), standard designs for both aquatic and climate stations were established.

As the LRO has become more established, additional sites have been added, and adaptations to site specifications have been made to expand the original GAMUT network into what is now the LRO monitoring network. For example, many new aquatic stations that measure flow, temperature, and specific conductance have been added, both within the Logan River and in adjacent watersheds. These new stations fill gaps in the initial infrastructure throughout the Logan River, but also now capture critical inflows to Cutler Reservoir. Combined with the added USGS gaging stations on the Bear River Near Smithfield (USGS #10102250), Cub River (USGS #10102220), and Summit Creek (USGS #10102350), all major inflows to Cutler Reservoir are now being gaged in real-time, which is a tremendous benefit for water managers in Cache Valley.

The LRO website includes an interactive map of the station locations<sup>8</sup> (see [Figure 1](#)) with classifications of sites maintained by the LRO and complementary sites maintained by the USGS and the Utah Division of Water Rights. Data for each site can be accessed by clicking on the location markers in the web map. A simplified schematic of primary LRO sites along the Logan River and major inflows and outflows ([Figure 2](#)) provides a brief overview of key data collection locations.

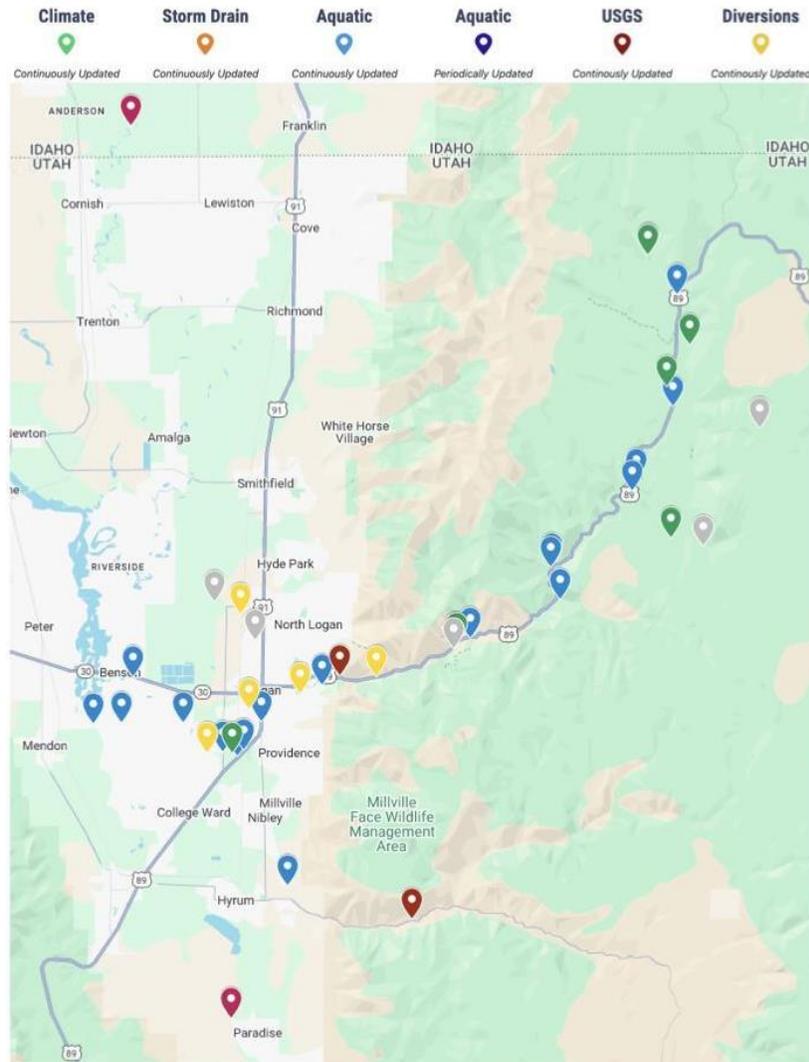
The more comprehensive list of all LRO monitoring sites, frequency of data updates, status, and the data types or parameters available ([Table 1](#)) illustrates the extent of data gathered within the LRO. Given the variety of site types, the data types and frequency of updates can be important factors when using these data for different applications. A similar table is provided for the climate sites in [Appendix C](#) (Table C-1).

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<sup>6</sup> [Appendix A](#) describes the origins of the Logan River Observatory and its foundational ties to the iUTAH project and the GAMUT monitoring network.

<sup>7</sup> [Appendix B](#) gives a detailed description of the Logan River watershed.

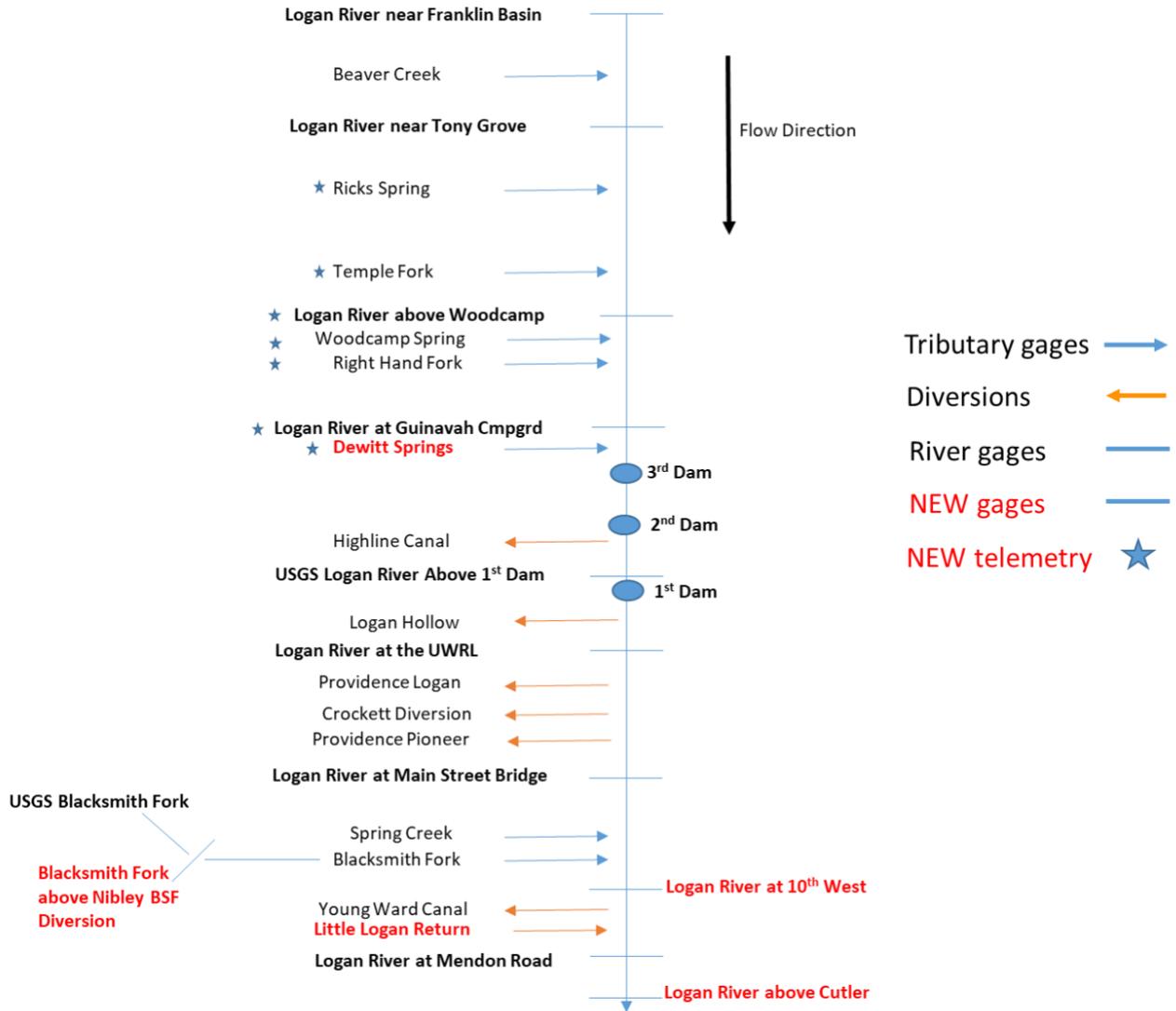
<sup>8</sup> <https://uwrl.usu.edu/lro/locations>



**Figure 1.** LRO sites and other relevant monitoring locations that provide complementary data<sup>9</sup>.

Over the past year, we modernized the LRO’s underlying data systems to ensure that all data collected within the LRO are reliably collected, hosted, and openly and publicly shared within an operational Hydrologic Information System called HydroServer. This transition ensures that LRO data can be maintained sustainably. Copies of the data are also shared within the HydroShare repository for easy access, and additional updates were made to the LRO website to ensure that data are easily available. Datasets for monitoring sites at which continuous data are collected are automatically updated regularly, and LRO technicians conduct routine quality control for continuous datasets. Many additional periodic monitoring sites are also shared via separate HydroShare resources. These data are downloaded periodically and undergo routine quality control.

<sup>9</sup> See the navigable map that includes all sites and links to the respective datasets at: <https://uwrl.usu.edu/lro/locations>



**Figure 2.** Schematic of primary LRO mainstem and tributary site locations along the Logan River. The vertical line represents the Logan River, with flow from top to bottom. Arrows pointing toward the river (blue) indicate measured inflows, and arrows pointing away from the river (orange) indicate measured withdrawals. Lines that cross the river indicate the locations of aquatic monitoring sites. Flow rates of all diversions are monitored by the Utah Division of Water Rights and are included here to provide an overview of primary inflows and diversions.

**Table 1.** Aquatic sites and variables measured at each site within the Logan River Observatory\*.

Site Name	Updates	Water Temperature (C)	Specific Conductance (uS/cm)	pH	Dissolved Oxygen (optical, local % saturation and	Turbidity (NTU)	Gage Height (cm)	Water Surface Elevation (m, with respect to benchmark)	Discharge (cms)	Blue Green Algae (RFU)	CDOM (QSU)	Water Depth (m)	Velocity (m/s)
<b>LOGAN RIVER SITES</b>													
<a href="#">Logan River near Franklin Basin</a>	Continuously Updated	•	•	•	•	•	•	•	•				
<a href="#">Logan River near Tony Grove</a>	Continuously Updated	•	•	•	•	•	•	•	•				
<a href="#">Logan River Above Wood Camp</a>	Continuously Updated	•	•				•	•	•				
<a href="#">Logan River at Wood Camp Bridge</a>	Continuously Updated	•	•				•	•	•				
<a href="#">Logan River at Guinavah Campground Bridge</a>	Continuously Updated	•	•				•	•	•				
<a href="#">Logan River at the Utah Water Research Laboratory west bridge</a>	Continuously Updated	•	•	•	•	•	•	•	•	○	○		
<a href="#">Logan River at Main Street (Highway 89/91) Bridge</a>	Continuously Updated	•	•	•	•	•	•	•	•				
<a href="#">Logan River at 1000 W</a>	Continuously Updated	•	•				•	•	•				
<a href="#">Logan River at Mendon Road (600 South)</a>	Continuously Updated	•	•	•	•	•	•	•	•	○	○		
<a href="#">Logan River above Cutler Reservoir</a>	Continuously Updated	•	•						•				•
<b>LOGAN RIVER TRIBUTARY/SPRINGS SITES</b>													
<a href="#">Beaver Creek above confluence with Logan River</a>	Continuously Updated	•	•				•	•	•				
<a href="#">Temple Fork above confluence with Logan River</a>	Continuously Updated	•	•				•	•	•				

Site Name	Updates	Water Temperature (C)	Specific Conductance (uS/cm)	pH	Dissolved Oxygen (optical, local % saturation and	Turbidity (NTU)	Gage Height (cm)	Water Surface Elevation (m, with respect to benchmark)	Discharge (cms)	Blue Green Algae (RFU)	CDOM (OSU)	Water Depth (m)	Velocity (m/s)
<a href="#">Ricks Spring above confluence with Logan River</a>	Continuously Updated	•	•				•	•	•				
<a href="#">Right Hand Fork above confluence with Logan River</a>	Continuously Updated	•	•				•	•	•				
<a href="#">Dewitt Springs above confluence with Logan River</a>	Continuously Updated	•	•						•				•
<a href="#">Spring Creek above confluence with Logan River</a>	Continuously Updated	•	•				•	•	•				
<a href="#">Blacksmith Fork River at Darwin's Bridge</a>	Continuously Updated	•	•	•	•		•	•	•				
<a href="#">Blacksmith Fork River at 1700 South Footbridge</a>	Continuously Updated						•						
<a href="#">Blacksmith Fork River above confluence with Logan River</a>	Continuously Updated	•	•	•	•	•	•	•	•				
<a href="#">Spring Creek at Mendon Road (600 South)</a>	Continuously Updated	•	•				•		•				
<a href="#">Little Bear River at Mendon Road (600 South)</a>	Continuously Updated	•	•						•				•
<b>CANAL SITES</b>													
Northwest Field Canal at 1600 North	Decommissioned	○	○	○	○	○	○	○	○				
South Logan Benson Canal at Benson Irrigation Company Flume	Decommissioned	○	○	○	○	○		○					
<b>STORM DRAIN SITES</b>													
River Heights Bridge Storm Drain	Decommissioned	○							○			○	○

Site Name	Updates	Water Temperature (C)	Specific Conductance (uS/cm)	pH	Dissolved Oxygen (optical, local % saturation and	Turbidity (NTU)	Gage Height (cm)	Water Surface Elevation (m, with respect to benchmark)	Discharge (cms)	Blue Green Algae (RFU)	CDOM (QSU)	Water Depth (m)	Velocity (m/s)
Spring Creek Storm Drain	Decommissioned	o							o			o	o
<b>USGS GAGING SITES***</b>													
<a href="#">Bear River Near Smithfield, UT - 10102250</a>	Continuously Updated						•		•				
<a href="#">Summit Creek at Mouth Near Smithfield, UT - 10102350</a>	Continuously Updated						•						
<a href="#">Cub River Near Mouth Near Richmond, UT - 10102220</a>	Continuously Updated						•						
<a href="#">Bear River Near Corinne, UT - 10126000</a>	Continuously Updated	•	•				•		•				
<a href="#">Little Bear River at Paradise, UT - 10105900</a>	Continuously Updated						•		•				

\*• indicates that data are presently being collected for this parameter; o indicates that data were historically collected for this parameter; **Continuously Updated** = real-time updates of data to HydroServer with daily updates of data to HydroShare (<http://www.hydroshare.org/>).

\*\* For the continuously updated stations that have discharge data, the underlying data and details of the rating curves can be found by clicking “Explore Rating Curve” button below the “Most Recent Instantaneous Measurements” on each site’s details accessed from <http://lrodata.usu.edu/>. The data for these sites, as well as the periodically updated sites, can also be found directly by going to <http://www.hydroshare.org> and searching for “Logan River rating curves.” The exception is the Northwest Field Canal site.

\*\*\* USGS Sites report water surface level and depth in ‘ft’ and discharge in ‘cfs’

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## LOGAN RIVER OBSERVATORY RESEARCH

### LRO Research Findings/Outcomes

Information summarizing recent relevant research efforts within the LRO can be found at <https://uwrl.usu.edu/lro/research/projects>. A brief description of a subset of projects is provided along with a listing of significant outcomes from each effort.

### Currently Funded LRO Related Research Projects<sup>10</sup>

The LRO monitoring and data infrastructure provide a scaffolding onto which new, synergistic, and collaborative research projects can be built. The following are ongoing or newly funded research projects that use LRO data and/or research infrastructure.

**Advancing Utah Division of Water Rights' Operational Measurement Data Systems.** J.S. Horsburgh (USU). Utah Division of Water Rights, 2024–2027. *\$954,861.*

**Bear River Basin Gaging Support.** B.T. Neilson, J.S. Horsburgh (USU). UT Division of Water Rights, 2024–2029. *\$1,502,147.*

**Groundwater Assessment of Cache Valley: An Updated Evaluation of Groundwater Recharge, Yield, and Vulnerability in Cache Valley.** Humphrey, T. Marston (Utah USGS Water Science Center), B.T. Neilson, D. Newell (USU), K. Solomon (University of Utah). Utah Division of Water Rights/Cache Water District/Cache County, 2024–2027. *\$597,400.*

**Linking Long-Term Data from the Logan River Observatory to Changes in Snowpack to Inform Local Water Management and Conservation Planning.** S. Hotaling, B.T. Neilson, K. Becker (USU). USU Extension Water Initiative Grants Program, 2024–2026. *\$74,542.*

**Establishing a Functional Flows Framework for the GSL Basin.** B. Lane, B.T. Neilson, S. Null, M. Baker (USU), J. Ostermiller (UT DWQ), P. Thompson (UT DWR). GSL Watershed Enhancement Trust, 2024–2025. *\$299,372.*

**Monitoring and Quantification of Great Salt Lake Inflows from the Bear River.** B.T. Neilson, B. Crookston (USU). US Fish and Wildlife Service via GSL-WET, 2024–2025. *\$46,230.*

**CIROH: Advancing Snow Observation Systems to Improve Operational Streamflow Prediction Capabilities.** C.A. Oroza, R. Johnson, D. Taylor (U of U), C. Skalka (U of Vt.), J.S. Horsburgh (USU). National Oceanic and Atmospheric Administration (NOAA), 2023–2026. *\$1,605,057.*

**CIROH: Advancing Camera-Based Monitoring for Operational Hydrologic Applications.** S. Young, J.S. Horsburgh (USU), E. Goharian (USC). United States Geological Survey, 2023–2026. *\$509,800.*

**CIROH: Modernized Standards and Tools for Sharing and Integrating Real time Hydrologic Observations Data.** J.S. Horsburgh (USU). National Oceanic and Atmospheric Administration (NOAA), 2022–2025. *\$729,673.*

**Collaborative Research: Separating the Climate and Weather of River Channels: Characterizing Dynamics of Coarse-Grained River Channel Response to Perturbations Across Scales.** C.B. Phillips (USU). National Science Foundation, 2022–2025. *\$609,086.*

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<sup>10</sup> Find information on prior projects at <https://uwrl.usu.edu/lro/research/projects>.

**Characterizing the Distribution of Intermittent Tributary Spawning by Populations of Native Salmonids of the Intermountain West.** Timothy Walsworth (USU). U.S. Forest Service, 2021–2025. \$94,898.

**Collaborative Research: Quantifying Watershed Dynamics in Snow-Dominated Mountainous Karst Watersheds Using Hybrid Physically Based and Deep Learning Models.** B.T. Neilson, D.L. Newell (USU). National Science Foundation, 2021–2025. \$777,921.

**Determining the Mobility, Fate, and Ecological Consequences of Dust-Derived Constituents in Mountain Watersheds.** J. Brahney. National Science Foundation, 2020–2025. \$742,072.

### LRO Related Proposals 2024–2025

**Characterizing Great Salt Lake Ecosystem Inflows via Flow Measurement and Stable Isotope Sampling.** B. Neilson, E. Lukens, M. Stamp (USU) in coordination with members of National Audubon Society/GSL Watershed Enhancement Trust. Utah Division of Forestry Fire and State Lands, 2025-2027. \$200,000.

**CIROH: Developing Smarter Streamflow Gages Using IoT, MQTT, and OGC's SensorThings API.** J.S. Horsburgh and S. Young (USU). United States Geological Survey via the Cooperative Institute for Research to Operations in Hydrology (CIROH), 2025–2027. \$177,058.

**CIROH: Advancing Automated Water Data Records Processing for Operations.** J.S. Horsburgh (USU). United States Geological Survey via the Cooperative Institute for Research to Operations in Hydrology (CIROH), 2025–2027. \$100,300.

**Improvement of HydroServer for publishing hydrological datasets.** J.S. Horsburgh (USU). (2025–2026), World Meteorological Organization, \$40,348.

**Task Order 8 Supplement: Data Quality Control.** J.S. Horsburgh (USU). (2025–2027), Utah Division of Water Rights, \$178,401.

### Research Products 2024–2025<sup>11</sup>

+ = Post-Doctoral Researcher, ++ = Graduate Student, +++ = Undergraduate Student

#### Logan River Publications (34 total; 7 in 2024–25):

Liljestrand<sup>++</sup>, D., R. Johnson, B.T. Neilson, P. Strong, E. Cotter. (2025). “Leveraging Snow Probe Data, LiDAR, and Machine Learning for Snow Depth Estimation in Complex Terrain Environments.” *The Cryosphere*, accepted April 22, 2025.

Brooks, P.D., D.K. Solomon, S. Kampf, S. Warix, C. Bern, D. Barnard, H.R. Barnard, G.T. Carling, R.W.H. Carroll, J. Chorover, A. Harpold, K. Lohse, F. Meza, J. McIntosh, B.T. Neilson, M. Sears, M. Wolf. (2025). “Groundwater Dominates Snowmelt Runoff and Controls Streamflow Efficiency in the Western United States.” *Nature Communications Earth & Environment*, 6, 341. <https://doi.org/10.1038/s43247-025-02303-3>

Horsburgh, J.S., K. Lippold, D.L. Slauch. (2025). “Adapting OGC’s SensorThings API and Data Model to Support Data Management and Sharing for Environmental Sensors.” *Environmental Modelling & Software*, 183: 106241. <https://doi.org/10.1016/j.envsoft.2024.106241>

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<sup>11</sup> See [Appendix D](#) for a complete list of prior research products.

- Jones, A.S., J.S. Horsburgh. (2025). "Hydrologic Information Systems: An Introductory Overview." *Environmental Modelling & Software*, 185: 106308. <https://doi.org/10.1016/j.envsoft.2024.106308>
- Goodrum<sup>++</sup>, G.C., C.P. Hawkins, T.E. Walsworth, S.E. Null. (2025). "Predicting Road-crossing Passability for River Connectivity Analysis." *River Research and Applications*. <https://doi.org/10.1002/rra.4434>
- Walsworth, T.E., S. Rousseau<sup>++</sup>. (2024). "Intermittent Streams as Native Salmonid Habitat: Spatio-Temporal Variability in Availability, Suitability, and Drivers of Change Across Scales." Report to the U.S. Forest Service.
- Smith, M., K. Becker, S. Hotaling. (2024). "Climate Change and the Logan River: Past, Present, and Future." USU Extension Fact Sheet. October 24, 2024. [https://digitalcommons.usu.edu/extension\\_curall/2467/](https://digitalcommons.usu.edu/extension_curall/2467/)

#### Student Theses/Dissertations (24 total; 4 in 2024–25):

- Dority, B. (2025). "Increasing the Spatial Resolution of Snow Hydrology Data and Augmenting Existing Hydrology Monitoring Networks Using Low-Cost Snow Sensing Stations." M.S. Thesis, Utah State University. *All Graduate Theses and Dissertations, Fall 2023 to Present*. 488. <https://digitalcommons.usu.edu/etd2023/488>
- Benitez<sup>++</sup>, G. (2025). "Exploring Variations in High-Resolution Downstream Hydraulic Geometry of the Logan River." M.S. Thesis, Utah State University. *All Graduate Theses and Dissertations, Fall 2023 to Present*. 444. <https://digitalcommons.usu.edu/etd2023/444>
- Rousseau<sup>++</sup>, S. (2024). "The Drivers and Ecological Importance of Streamflow Permanence for Native Salmonids: Evaluated at Multiple Spatio-Temporal Scales." M.S. Thesis, Utah State University. *All Graduate Theses and Dissertations, Fall 2023 To Present*. 262. <https://digitalcommons.usu.edu/etd2023/262/>
- Longyang<sup>++</sup>, Q. (2024). "Machine Learning-enhanced Hydrologic Modeling under Changing Climate." Ph.D. Dissertation, Arizona State University. <https://keep.lib.asu.edu/items/193393>

#### Logan River Conference Presentations and Posters (90 total; 18 in 2024–25):

- Neilson, B.T., J. Horsburgh, P. Strong, A. Johnson<sup>++</sup>. (2025). "Logan River Observatory and Northern Utah Gaging Infrastructure Updates." Bear River Watershed Council Meeting. May 7, 2025. Tremonton, UT.
- Kahrizi<sup>++</sup>, E., J.S. Horsburgh. (2025). "Developing Benchmark Datasets for Testing Automated Sensor Data Quality Control Algorithm Performance." USU Spring Runoff Conference. March 25–26, 2025. Logan, UT.
- Neilson, B.T., J. Horsburgh, P. Strong. (2025). "Northern Utah Gaging and Measurement Infrastructure Needs and Updates." USU Spring Runoff Conference. March 25–26, 2025. Logan, UT.
- Tennant<sup>++</sup>, H. D. Hill<sup>++</sup>, D.L. Newell, T. Xu, B.T. Neilson. (2025). "Estimating Dynamic Gains and Losses to Rivers Using Temperature Models." USU Spring Runoff Conference. March 25–26, 2025. Logan, UT.
- Zierenberg<sup>+++</sup>, A. S. Rousseau<sup>++</sup>, T.E. Walsworth. (2025). "Overlooked Habitats Buffer Spawning Opportunities for Cutthroat Trout." Research on Capitol Hill. February 20, 2025. Salt Lake City, UT.
- Neilson, B.T., J.S. Horsburgh, P. Strong. (2025). "Logan River Observatory Updates: Ongoing Research and Future Measurements." UT Chapter of American Fisheries Society Annual Meeting—Bear River Symposium. February 10–12, 2025. Logan, UT.
- Tennant<sup>++</sup>, H., B.T. Neilson, D. Hill<sup>++</sup>, D. Newell, J.P. Evans, S. Choi<sup>++</sup>, T. Xu, N. Ashmead<sup>++</sup>, J. McNamara. (2025). "How Karst Geology Changes Expected Streamflow Regimes in Western Snowmelt-Driven

- Watersheds.” UT Chapter of American Fisheries Society Annual Meeting—Bear River Symposium. February 10–12, 2025. Logan, UT.
- Zierenberg<sup>+++</sup>, A. A. Garner<sup>++</sup>, E. Wallace<sup>++</sup>, S. Rousseau<sup>++</sup>, T.E. Walsworth. (2025). “Assessing Response Diversity of Spawning Conditions Among Streams to Interannual Changes in Snowpack.” UT Chapter of American Fisheries Society Annual Meeting—Bear River Symposium. February 10–12, 2025. Logan, UT.
- Neilson, B.T. (2025). “Water in Cache Valley.” Cache Valley Rotary Club Meeting. January 9, 2025. Logan, UT.
- Horsburgh, J.S., K. Lippold, D. Slaugh. (2024). “HydroServer: Advancing Software for Standards-Based Collection, Management, and Sharing of Environmental Sensor Data.” American Geophysical Union Fall Meeting 2024. December 9–13, 2024. Washington, DC.
- Goharian, E., S. Young, J.S. Horsburgh, R.B. Issa<sup>++</sup>, S. Khan<sup>++</sup>, S. Neupane<sup>++</sup>, M. Hatami<sup>++</sup>. (2024). “Advancing Camera-Based Monitoring for Operational Hydrologic Applications.” American Geophysical Union Fall Meeting 2024. December 9–13, 2024. Washington, DC.
- Brooks, P.D., D.K. Solomon, S.K. Kampf, C. Bern, D. Barnard, H.R. Barnard, G.T. Carling, R.W.H. Carroll, J. Chorover, A. Harpold, K.A. Lohse, J.C. McIntosh, B.T. Neilson, K. Singha, F. Meza, S.R. Warix, M. Wolf. (2024). “Snowmelt Runoff Dominated by Groundwater in the Western United States: Implications for Predicting Water Availability in a Changing Climate.” American Geophysical Union Fall Meeting 2024. December 9–13, 2024. Washington, DC.
- Choi<sup>++</sup>, S., T. Xu, H. Tennant<sup>++</sup>, B.T. Neilson, D. Hill<sup>++</sup>, D. Newell, J.P. Evans, N. Ashmead<sup>++</sup>, J.P. McNamara. (2024). “Applicability of a Transformer Model for Karst and Non-Karst Snow-Dominated Watersheds.” American Geophysical Union Fall Meeting 2024. December 9–13, 2024. Washington, DC.
- Neilson, B.T. (2024). “Measuring Utah’s Water: Lessons from the Logan River Observatory.” USU Research Landscapes. September 12, 2024. Salt Lake City, UT.
- Horsburgh, J.S., K. Lippold, D. Slaugh, M. Ramirez. (2024). “Advancing the HydroServer Hydrologic Information System for Collecting, Managing, and Sharing Hydrologic Sensor Data.” WaterSciCon24. June 23–27, 2024. Saint Paul, MN.
- Neilson, B.T., H. Tennant<sup>++</sup>, D. Hill<sup>++</sup>, D. Newell, J. McNamara, N. Ashmead<sup>++</sup>, T. Xu, S. Choi<sup>++</sup>. (2024). “Stream-Centric Methods for Determining Groundwater Contributions and Sources in Karst Mountain Watersheds.” Eurokarst 2024. June 11–13, 2024. Rome, Italy.
- Tennant<sup>++</sup>, H., B.T. Neilson, D. Hill<sup>++</sup>, D. Newell, J.P. Evans, S. Choi<sup>++</sup>, T. Xu, N. Ashmead<sup>++</sup>, J. McNamara. (2024). “How Karst Geology Changes Expected Streamflow Regimes in Western Snowmelt Driven Watersheds.” Eurokarst 2024. June 11–13, 2024. Rome, Italy.
- Walsworth, T.E., S. Rousseau<sup>++</sup>. (2024). “Response Diversity Among Tributaries with Variable Flow Permanence Patterns Buffers Salmonid Spawning Habitat Availability to Interannual Snowpack Variation.” Annual Meeting of the Association for the Sciences of Limnology and Oceanography. June 1–7, 2024. Madison, WI.

#### Great Salt Lake Related Publications (8 total; 5 in 2024–25):

- Dunn<sup>++</sup>, D., B.M. Crookston, C. Phillips, S. Dutta, B.T. Neilson. (2025). “Seasonal Water and Salt Cycling in the Great Salt Lake after Opening the New Causeway Breach.” *Journal of Hydrology: Regional Studies*, 59, 102332. <https://doi.org/10.1016/j.ejrh.2025.102332>.

Anderegg, W., C. Buttars, J. Ferry, N. Gochnour, K. Shelley, B. Steed, D. Tarboton, L. Ahmadi, E. Albers, B. Bingham, P. Brooks, T. Davis, E. Dixon, J. Endter-Wada, T. Flint, C. Hasenyager, T. Hawkes, W. Johnson, J. Lin, J. Mackey, A. McEntire, B.T. Neilson, S. Null, K. Perry, B. Stireman, C. Strong, L. Vernon, M. Weinberg, M. Yost. (2025). "Great Salt Lake Data and Insights Summary: A Synthesized Resource Document for the 2025 General Legislative Session." Kem C. Gardner Policy Institute, University of Utah, Salt Lake City, UT.

Neilson, B.T., J. Horsburgh. (2024). "Report to the Governor and Legislature on Utah's Land, Water, and Air--Chapter 2C: Connecting the Dots between Snowpack, Streamflow, and Water Management." Utah State University, Logan UT.

Anderegg, W., C. Buttars, J. Ferry, N. Gochnour, K. Shelley, B. Steed, D. Tarboton, L. Ahmadi, E. Albers, B. Bingham, P. Brooks, T. Davis, E. Dixon, J. Endter-Wada, T. Flint, C. Hasenyager, T. Hawkes, W. Johnson, J. Lin, J. Mackey, A. McEntire, B.T. Neilson, S. Null, K. Perry, B. Stireman, C. Strong, L. Vernon, M. Weinberg, M. Yost. (2024). "Great Salt Lake Data and Insights Summary: A Synthesized Resource Document for the 2024 General Legislative Session." Kem C. Gardner Policy Institute, University of Utah, Salt Lake City, UT.

Lukens, E., E. K. Turney, S. Null, B. Neilson (2024). "Measurement and Infrastructure Gap Analysis in Utah's Great Salt Lake Basin. "HydroShare,  
<https://doi.org/10.4211/hs.8bf055d8e78b46d184cc7a4bb53931c7>

#### Great Salt Lake Related Presentations (10 total; 6 in 2024–25):

Nusrat, F., B. Lane, J. Ostermiller, S. Null, B.T. Neilson, P. Thompson, M. Stamp, N. Patterson, M. Baker. (2025). "Establishing a Functional Flows Framework for the Great Salt Lake Basin: Part 2." USU Spring Runoff Conference. March 25–26, 2025. Logan, UT.

Patterson, N., F. Nusrat, B. Lane, J. Ostermiller, S. Null, B.T. Neilson, P. Thompson, M. Stamp, M. Baker. (2025). "Establishing a Functional Flows Framework for the Great Salt Lake Basin: Part 1." USU Spring Runoff Conference. March 25–26, 2025. Logan, UT.

Neilson, B.T., B. Bingham. (2025). "Great Salt Lake Basin: Measurement Infrastructure Gap Analysis." Utah Water Users Association 2025 Workshop. March 17–19, 2025. St. George, UT.

Neilson, B.T., B. Bingham, E. Lukens, E. Turney, S. Null. (2025). "Great Salt Lake Basin: Measurement Infrastructure Gap Analysis Updates." Utah Department of Natural Resources, Utah Water Task Force Meeting. March 12, 2025. Salt Lake City, UT.

Tarboton, D., P. Brooks, B.T. Neilson, W. Anderegg, W.P. Johnson, S. Null, K. Perry, M. Yost, C. Hasenyager, L. Ahmadi, C. Strong, T. Davis, The Great Salt Lake Strike Team. (2024). "Collaboration Between University and State Agency Researchers and Policy Experts has Synthesized Essential Data and Insights to Engage with Policy Makers in Evaluating Options for Restoring Great Salt Lake." American Geophysical Union Fall Meeting 2024. December 9–13, 2024. Washington, DC.

Nusrat, F., B. Lane, J. Ostermiller, S. Null, B.T. Neilson, P. Thompson, M. Stamp, M.A. Baker. (2024). "Establishing a Functional Flows Framework for the Great Salt Lake Basin." American Geophysical Union WaterSciCon24. June 24–27, 2024. Saint Paul, MN.

#### Faculty Involvement

The LRO is a collaborative facility that provides opportunities for collaboration across departments, institutions, and agencies. Faculty that have been involved in the last year include:

**Bethany Neilson**, Utah State University (CEE)—  
LRO leadership  
**Jeff Horsburgh**, Utah State University (CEE)—  
LRO leadership  
**Michelle Baker**, Utah State University, (BIOL)  
**Janice Brahney**, Utah State University (WATS)  
**Phaedra Budy**, Utah State University (WATS)  
**Brian Crookston**, Utah State University (CEE)  
**Scott Hotaling**, Utah State University (WATS)  
**Scott Jones**, Utah State University (PSC)  
**Belize Lane**, Utah State University (CEE)  
**Jim McNamara**, Boise State University (GEOSCI)

**Kyle Moor**, Utah State University (CEE)  
**Dennis Newell**, Utah State University (GEOSCI)  
**Sarah Null**, Utah State University (WATS)  
**Colin Phillips**, Utah State University (CEE)  
**Zac Sharp**, Utah State University (CEE)  
**Pin Shuai**, Utah State University (CEE)  
**David Tarboton**, Utah State University (CEE)  
**Derrick Vaughan**, Utah State University (GEOSCI)  
**Timothy Walsworth**, Utah State University (WATS)  
**Tianfang Xu**, Arizona State University (SSEBE)  
**Sierra Young**, Utah State University (CEE)  
**Ruijie Zeng**, Arizona State University (SSEBE)

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## LOGAN RIVER OBSERVATORY OUTREACH AND EDUCATION

In addition to its value as a platform and data source for research, the LRO also supports education by:

- [Continuing to work to increase public awareness of the connection between the landscape, humans, and water.](#)

This often occurs via presentations to a variety of groups.

- [Providing information to the general public via different media outlets.](#)

Examples include the following (click title to access article):

[Spring Runoff Is Older Than You Think \(5/5/25, @ the U\)](#)

[Spring Runoff Is Older Than You Think: Study Reveals Years-Long Underground Journey \(5/5/25, Physics.org\)](#)

[New Snowmelt Data May Improve Future Water Supply Predictions \(5/15/25, UPR Live\)](#)

[Research Team to Take Inventory of Cache Valley Groundwater \(10/30/24, Utah State TODAY\)](#)

[Utah Water Research Laboratory Unveils Interactive Exhibit at The Leonardo \(10/24/24, COE News, USU\)](#)

[Logan River Observatory Water Measurements Highlighted at Latest Research Landscapes \(9/19/24, Utah State TODAY\)](#)

[Mind the Gap: Yearlong Analysis Identifies Diverse Water Measurement Needs in Great Salt Lake Basin \(8/12/24, Utah State TODAY\)](#)

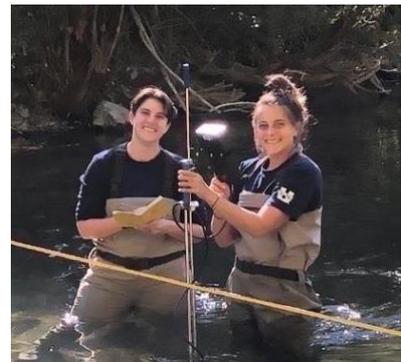
[New USU Study Illuminated Subsurface Dynamics in Karst Mountain Watersheds \(5/30/24, Utah State TODAY\)](#)

- [Supporting stakeholders in water related decision making:](#)
  - Members of the LRO (S. Null, D. Tarboton, B. Neilson) continue to be part of the Great Salt Lake Strike Team to help provide guidance to the Utah legislature regarding options to address the declining levels in the Great Salt Lake. These members have also worked with legislators and other government representatives to establish new gages throughout the GSL Basin, better understanding water shepherding pathways to the GSL, and working to establish the utility of a water data center to meet stakeholder needs, based in part on the work in the LRO.

- Members of the LRO are working closely with the Cache Water District to establish methods for adapting to ongoing requirements for water conservation. The recent Cache Valley Groundwater Recharge Study (B. Neilson, D. Newell, D. Vaughan) funded by the Utah Legislature is progressing and we have established good working relationships with nearly every city throughout Cache Valley.
- The LRO data management team (J. Horsburgh) is working closely with the Utah Division of Water Rights in modernizing and advancing their operational data systems. This work supports Water Rights in advancing their data collection and management in support of their day-to-day water management decision making.
- Members of the LRO (B. Neilson, M. Baker, B. Lane, S. Null, T. Walsworth, M. Stamp) are working to characterize and quantify functional flows for GSL basin streams and wetlands. This work is being done as part of Utah Division of Water Resources' GSL Basin Integrated Planning effort, and results will help water managers maximize ecosystem benefits when deciding when and where to deliver water for GSL.
- Members of the LRO (B. Neilson, E. Lukens, M. Stamp) will be working with the Utah Division of Forestry, Fire, and State Lands to identify and measure inflows to GSL other than its major tributary rivers. Project results will help the GSL Watershed Enhancement Trust and GSL Commissioner's Office identify key sources of water to target for leasing, acquisition, and protection efforts.
- Members of the LRO (S. Hotalling, B. Neilson, E. Lukens, M. Stamp) will be working to develop a 'State of the Logan River' annual report to summarize and visualize long-term hydrologic data trends. The LRO will create accessible and approachable indicators and metrics of watershed health to communicate changes over time with water managers and the general public.
- Serving as an outdoor laboratory and classroom for training the next generation of engineers and scientists to address water issues in the state:

LRO serves as a data source for real-world classroom exercises for many different USU classes (approximate number of students each year shown in parentheses).

CEE 3610	Environmental Management (80)
CEE 3430	Hydrology (70)
CEE 3500	Fluid Mechanics (65)
CEE Senior Design	Each year there is at least one group of senior design students focused on different aspects of the Logan River (10)
CEE 5003/6003	Remote Sensing of Land Surfaces (8)
CEE 5190/6190	GIS for Civil Engineers (40)
CEE 5470/6470	Sedimentation Engineering (15)
CEE 6100	Hydroinformatics (17)
CEE 6660	Environmental and Hydrologic Data Analysis and Experimentation (20)

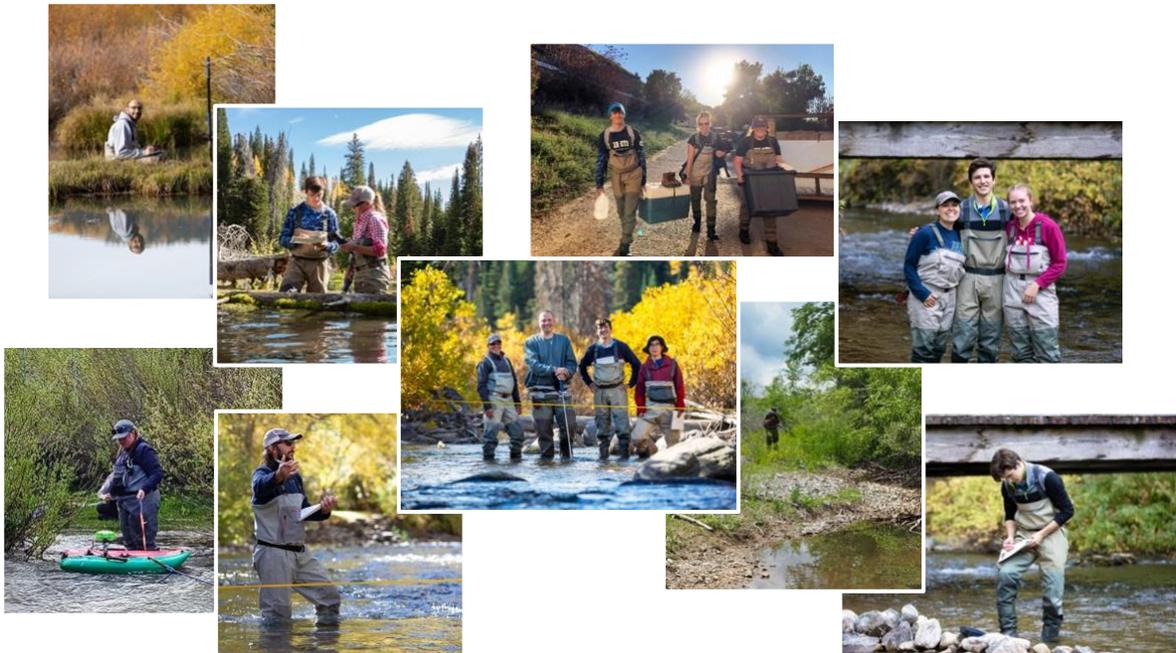


CEE 6400 Physical Hydrology (20)  
CEE 5500/6500 Open Channel Hydraulics (30)  
WATS 3100 Fish Diversity and Conservation (~15)

- Supporting the research for many graduate and undergraduate students that will generate a better understanding of potential challenges related to our water supplies.

Current LRO undergraduate student employees and mentees<sup>12</sup>:

- Brooke Bondley, BS, Environmental Engineering
- William Bosen, BS, Watershed Sciences
- Mia Campbell, BS, Civil & Environmental Engineering
- Marie Foster, BS, Civil & Environmental Engineering



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<sup>12</sup> [Appendix E](#) (Table E-1) provides a description of the current and previous graduate students and projects focused on the Logan River watershed.

## APPENDICES

## Appendix A: Logan River Observatory Origins

In 2012, the three major Utah universities (Utah State University, University of Utah, and Brigham Young University) proposed a new collaborative project for scientists and practitioners to collect, integrate, and share physical, biological, and social water data to advance understanding and generate knowledge needed to solve urban- and arid-region water sustainability problems. The project included infrastructure (human, observational, and cyber) to lay a foundation for addressing water, population growth, and climate change issues that confront the State of Utah. The resulting EPSCoR (Established Program to Stimulate Competitive Research) program funding award from the U.S. National Science Foundation launched iUTAH (innovative Urban Transitions and Arid-region HydroSustainability): a 5-year, multi-institution, interdisciplinary project focused on water sustainability in Utah. A lasting legacy of the iUTAH project was its environmental observations via the GAMUT (Gradients Along Mountain to Urban Transitions) monitoring network. In the Logan River watershed, eight aquatic monitoring stations and four climate stations were established to measure, record, and publicly distribute a wide range of climate (e.g., precipitation, snow depth, air temperature, relative humidity), hydrology (e.g., water depth, flow rates), and water quality (e.g., water temperature, dissolved oxygen, pH, turbidity, nitrate) information. The sensor network was deployed to log and transmit the data, which are made publicly available via web-based tools and an online data repository. In 2018, iUTAH's GAMUT network for the Logan River was reorganized into the LRO. The monitoring sites and information streams established by iUTAH laid a solid foundation for data collection to support better water management in Cache Valley and provided an opportunity to study the long-term impacts of rapidly growing rural counties on water use and quality across the state of Utah.

## Appendix B: Logan River Watershed Overview

The Logan River watershed is located in the Bear River mountain range east of Logan, Utah. With headwaters near the Utah–Idaho border, the upper, or canyon, portion of the basin is steep and flows southwest through mostly natural land cover (forest and rangeland) with little development other than paved and dirt roads, a ski resort, and a small number of summer homes. Currently, the majority of precipitation falls as snow, resulting in a snowmelt-dominated hydrograph. Peak flows occur in the late spring, with an average annual flow at the mouth of the canyon of approximately 230 cfs (6.5 cms).

The geology of the upper portion of the watershed is primarily limestone and dolomite (Dover, 1995). The topography is characterized by sinkholes and fractures formed by dissolution of the rocks (also known as karst features), which creates underground drainage systems. According to Spangler (2001; 2011), some Logan Canyon geologic layers (e.g., the Garden City Formation and Laketown Dolomite) have more karst development than other layers, but all units have the ability to transmit water via fractures, faults, and bedding planes created and enhanced by dissolution. The exception is the Swan Peak Formation, primarily composed of quartzite, which minimizes vertical groundwater movement between some of the karst layers and intersects the river in multiple places (Spangler, 2011). Groundwater movement is also influenced by the Logan Peak Syncline and the merger of the Naomi Peak Syncline and Cottonwood Canyon Anticline near Wood Camp Spring (Bahr, 2016).

Three major karst springs in Logan Canyon (Ricks, Wood Camp, and Dewitt Springs) provide significant flow to the river throughout most of the year. Numerous smaller springs (both karst and non-karst) feed the Logan River or its tributaries and may or may not flow year-round. Many tracer studies have been conducted in an effort to establish subsurface connectivity between the karst aquifer and these major springs (Spangler, 2001, 2011), as well as other short-residence-time intrabasin and interbasin subsurface connectivity. Dewitt Springs is a primary drinking water source for Logan City, and a large portion of its flow is diverted before entering the Logan River. Three additional perennial tributaries also join the Logan River (Beaver Creek, Temple Fork Creek, and Right Hand Fork Creek). Other tributaries are either limited in their contribution or are intermittent, with no flow reaching Logan River during parts of the year.

In lower Logan Canyon, a series of three small dams (First, Second, and Third Dam) divert flow for hydropower generation. An irrigation diversion between First and Second Dams supplies water to the Highline Canal. Once the river enters the valley portion of the watershed, it flows through residential areas, then more urbanized portions of Logan City, then residential areas again, and finally through agricultural areas west of Logan City. During the summer growing season, most, and sometimes all, of the river's flow is diverted into four additional canals for residential and agricultural irrigation (Providence–Logan, Crockett, Providence–Pioneer, and Young Ward Canals). Two major tributaries, Spring Creek and the Blacksmith Fork River, as well as many other smaller inflows, also contribute to the river in the residential, urban, and agricultural areas. These inflows are primarily sourced from stormwater, groundwater drainage, and irrigation return flows. Various restoration efforts led by the Logan River Task Force<sup>13</sup> have been implemented in the valley portion of the river to address human impacts throughout the watershed and along the river corridor.

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<sup>13</sup> <https://uwrl.usu.edu/lro/logan-river-task-force>

**Appendix C:**  
Climate Site and Parameters Measured

**Table C-1.** Climate site and parameters measured at each site within the Logan River Observatory.

Site Name	Updates	Vapor Pressure (kPa)	Barometric Pressure (kPa)	Cumulative Precipitation (cm)	Snow Depth (cm)	Wind Speed (m/s)	Wind Direction	Air Temperature (C)	Relative Humidity (%)	Incoming Shortwave Radiation (W/m <sup>2</sup> )	Outgoing Shortwave Radiation (W/m <sup>2</sup> )	Incoming Longwave Radiation (W/m <sup>2</sup> )	Outgoing Longwave Radiation (W/m <sup>2</sup> )	Net Radiation (W/m <sup>2</sup> )	Incoming PAR (umol/m <sup>2</sup> s)	Outgoing PAR (umol/m <sup>2</sup> s)	Soil Temperature @ 5,10,20,50,100 cm (C)	Soil Permittivity @ 5,10,20,50,100 cm	Soil Volumetric Water Content @ 5,10,20,50,100 cm (%)
<a href="#">Climate Station at Logan River Golf Course</a>	Continuously Updated	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
<a href="#">Climate Station at Franklin Basin</a>	Continuously Updated	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
<a href="#">Wilkins Repeater</a>	Continuously Updated					•	•	•	•										
Climate Station at TW Daniels Experimental Forest	Decommissioned	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
<a href="#">Climate Station at Tony Grove</a>	Continuously Updated	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
<a href="#">Climate Station at Dewitt Springs</a>	Continuously Updated	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
<a href="#">Climate Station at Temple Fork</a>	Periodic		•	•		•	•	•	•										
<a href="#">Climate Station at Beaver Mountain Summit</a>	Continuously Updated		•	•	•	•	•	•	•	•	•	•	•		•	•			

## Appendix D: Prior Logan River Observatory Research Products (before June 2024)

### Annual Reports (5):

- Neilson, B.T., P. Strong, J.S. Horsburgh. (2024). "Logan River Observatory Annual Report." Utah Water Research Laboratory, Utah State University, Logan, Utah, USA. | [PDF](#)
- Neilson, B.T., P. Strong, J.S. Horsburgh. (2023). "Logan River Observatory Annual Report." Utah Water Research Laboratory, Utah State University, Logan, Utah, USA. | [PDF](#)
- Neilson, B.T., P. Strong, J.S. Horsburgh. (2022). "Logan River Observatory Annual Report." Utah Water Research Laboratory, Utah State University, Logan, Utah, USA. | [PDF](#)
- Neilson, B.T., P. Strong, J.S. Horsburgh. (2021). "State of the Logan River Watershed." Utah Water Research Laboratory, Utah State University, Logan, Utah, USA. | [PDF](#)
- Neilson, B.T., P. Strong, J.S. Horsburgh. (2020). "State of the Logan River Watershed." Utah Water Research Laboratory, Utah State University, Logan, Utah, USA. | [PDF](#)

### Publications (27):

- Tennant<sup>++</sup>, H., B.T. Neilson, D. Hill<sup>++</sup>, D.L. Newell, J.P. Evans, S. Choi<sup>++</sup>, J.P. McNamara, N. Ashmead<sup>++</sup>, T. Xu. (2024). "Karst Hydrologic Memory Supplements Streamflow During Dry Periods in Snow-Dominated, Mountainous Watersheds." *Hydrological Processes*, 38(12), e70019. <https://doi.org/10.1002/hyp.70019>
- Longyang<sup>++</sup>, Q., S. Choi<sup>++</sup>, H. Tennant<sup>++</sup>, D. Hill<sup>++</sup>, N. Ashmead<sup>++</sup>, B.T. Neilson, D.L. Newell, J.P. McNamara, T. Xu. (2024). "An Attention-Based Explainable Deep Learning Approach to Spatially Distributed Hydrologic Modeling of a Snow Dominated Mountainous Karst Watershed." *Water Resources Research*, 60:11, <https://doi.org/10.1029/2024WR037878>
- Hafen<sup>++</sup>, K.C., J.M. Wheaton, B.B. Roper, P. Bailey, W.W. Macfarlane, B.T. Neilson, C.J. Tennant. (2024). "Estimating Increased Transient Water Storage with Increases in Beaver Dam Activity." *Water*, 16:11, 1515. <https://doi.org/10.3390/w16111515>
- Thurber<sup>++</sup>, D., B. Lane, T. Xu, B.T. Neilson. (2024). "Dissolving the Mystery of Subsurface Controls on Snowmelt–Discharge Dynamics in Karst Mountain Watersheds Using Hydrologic Timeseries." *Hydrological Processes*, 38(5). <https://doi.org/10.1002/hyp.15170>
- Neilson, B.T., F.M. Lasswell<sup>++</sup>. (2024). "Logan River Temperature Modeling Documentation and Alternative Analysis." Technical Report.
- Tennant<sup>++</sup>, H., B.T. Neilson. (2024). "Bear River Range Springs, Utah." Kresic, N. Notable Springs of the United States. Blueridge Press. Warrenton, VA.
- Goodrum<sup>++</sup>, G.C., S.E. Null. (2023). "Reduced Complexity Models for Regional Aquatic Habitat Suitability Assessment." *Journal of the American Water Resources Association*, 59(1), 107–126. <https://doi.org/10.1111/1752-1688.13077>
- Tyson<sup>++</sup>, C., Q. Longyang<sup>++</sup>, B.T. Neilson, R. Zeng, T. Xu. (2023). "Effects of Meteorological Forcing Uncertainty on High-Resolution Snow Modeling and Streamflow Prediction in a Mountainous Karst Watershed." *Journal of Hydrology*, 619, 129304. <https://doi.org/10.1016/j.jhydrol.2023.129304>
- Murray<sup>++</sup>, D., B.T. Neilson, J. Brahney. (2023). "Beaver Pond Geomorphology Influences Pond Nitrogen Retention and Denitrification." *Journal of Geophysical Research: Biogeosciences*, 128(4), e2022JG007199. <https://doi.org/10.1029/2022JG007199>
- Leach, J.A., C. Kelleher, B.L. Kurylyk, R.D. Moore, B.T. Neilson. (2023). "A Primer on Stream Temperature Processes." *WIREs Water*, 10(4), e1643. <https://doi.org/10.1002/wat2.1643>

- Pennock<sup>++</sup>, C.A., G.P. Thiede, P. Budy (2023). "Density-Dependent Processes and Population Dynamics of Native Sculpin in a Mountain River." *Ecology of Freshwater Fish*, 32(3), 593–605.  
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### Presentations and Posters (72):

Young, S., E. Goharian, J.S. Horsburgh, R. Bin Issa<sup>++</sup>, S. Khan<sup>++</sup>, S. Neupane<sup>++</sup>, M. Erfani<sup>++</sup>, G. Mehdi Hatami<sup>++</sup>. (2024). "Advancing Camera-Based Monitoring for Operational Water Resource Applications." American Society of Civil Engineers World Environmental and Water Resources Congress. May 19–22, 2024. Milwaukee, WI.

Young S., E. Goharian. (2024). "Hydrologic Monitoring Using Cameras: Key Takeaways from Initial Deployments." Water Observing Technology Forum, Alabama Water Institute. April 23, 2024. Tuscaloosa, AL.

Neilson, B.T., B. Barker, C. Flint, C. Baldwin. (2024). "Research Summit: Water Panel." Utah State University Research Summit Series. April 23, 2024. Logan, UT.

Dority<sup>++</sup>, B., J.S. Horsburgh. (2024). "Designing and Developing Low-Cost Snow Sensing Stations." USU Spring Runoff and Northern Utah Water Users Conference. March 26–27, 2024. Logan, UT.

Bin Issa<sup>++</sup>, R., S. Khan<sup>++</sup>, S. Neupane<sup>++</sup>, J.S. Horsburgh, E. Goharian, S. Young. (2024). "Advancing Camera-Based Monitoring for Hydrologic Applications." USU Spring Runoff and Northern Utah Water Users Conference. March 26–27, 2024. Logan, UT.

Tennant<sup>++</sup>, H., B.T. Neilson, T. Xu, S. Choi, D. Hill<sup>++</sup>, D. Newell, J. McNamara, N. Ashmead<sup>++</sup>, J. Evans. (2024). "Effects of Karst Geology on Streamflow in Western Snowmelt Driven Watersheds." USU Spring Runoff and Northern Utah Water Users Conference. March 26–27, 2024. Logan, UT.

Hill<sup>++</sup>, D., B.T. Neilson, H. Tennant<sup>++</sup>, D. Newell, S. Choi<sup>++</sup>, T. Xu, J. McNamara, N. Ashmead<sup>++</sup>. (2024). "Quantifying the Role of Karst Groundwater on Mountain River Discharge During Extreme Low Flow Years." USU Spring Runoff and Northern Utah Water Users Conference. March 26–27, 2024. Logan, UT.

Kostynick<sup>++</sup>, R., C. Masteller, C.B. Phillips. (2023). "Do Differences in Bankfull Width Reflect Catchment-Scale Variability in Erosion Thresholds?" American Geophysical Union Fall Meeting 2023. December 11–15, 2023. San Francisco, CA.

Xu, T., S. Choi<sup>++</sup>, Q. Longyang<sup>++</sup>, B.T. Neilson, H. Tennant<sup>++</sup>, D. Hill<sup>++</sup>, N. Ashmead<sup>++</sup>, J. McNamara, D. Newell. (2023). "Multi-scale Rainfall-Runoff Modeling of a Snow Dominated Mountainous Karst Watershed Using Attention-Based Deep Learning." American Geophysical Union Fall Meeting 2023. December 11–15, 2023. San Francisco, CA.

Ashmead<sup>++</sup>, N., J. McNamara, B.T. Neilson, M.D. Schmitz, D.N. Schwartz, T. Xu, D. Newell, D. Hill<sup>++</sup>, H. Tennant<sup>++</sup>, S. Choi<sup>++</sup>. (2023). "Radiogenic Isotope and Ionic Concentration Ratios Reveal Hydrologic Mixing, Subsurface Residence Time, and Cross-Basin Transfer in a Snow-Fed Mountain Karst Watershed." American Geophysical Union Fall Meeting 2023. December 11–15, 2023. San Francisco, CA.

Tennant<sup>++</sup>, H., B.T. Neilson, T. Xu, S. Choi, D. Hill<sup>++</sup>, D. Newell, J. McNamara, N. Ashmead<sup>++</sup>, J. Evans. (2023). "Effects of Karst Geology on Streamflow in Western Snowmelt Driven Watersheds." American Geophysical Union Fall Meeting 2023. December 11–15, 2023. San Francisco, CA.

Hill, D.<sup>++</sup>, B.T. Neilson, H. Tennant<sup>++</sup>, D. Newell, S. Choi<sup>++</sup>, T. Xu, J. McNamara, N. Ashmead<sup>++</sup>. (2023). "Quantifying the Role of Karst Groundwater on Mountain River Discharge During Extreme Low Flow Years." American Geophysical Union Fall Meeting 2023. December 11–15, 2023. San Francisco, CA.

- Goodrum, G., S.E. Null (2023). "Optimizing Water Management for Water Supply and Fish Habitat in the Bear River Basin." American Water Resources Association 2023 Summer Conference. July 17, 2023. Denver, CO.
- Neilson, B.T., S.A. Null, J.S. Horsburgh, M. Yost, B. Barker, Division of Water Rights. (2023). "Future Water Distribution Efforts in the Great Salt Lake Basin." 2023 American Water Resources Association Utah Section 50th Annual Conference—Saving Water: A Matter of Money and Data. May 25, 2023. Salt Lake City, UT.
- Thiede, G.P., J. Brahney, S. Buhler, L. Aragon, E. Robinson, P. Budy. (2023). "Tires in Trout: Microplastic Uptake by Aquatic Stream Organisms." Advances in the Population Ecology of Stream-dwelling Salmonids Symposium VI. May 8–12, 2023. Mallorca, Spain.
- Johnson<sup>+++</sup>, A., B.T. Neilson. (2023). "Compounding Human and Drought Impacts Negatively Affect Rivers." USU Research Week Student Research Symposium. April 11–12, 2023. Logan, UT.
- Hill<sup>++</sup>, D., B.T. Neilson, H. Tennant<sup>++</sup>, N. Ashmead<sup>++</sup>, D. Newell, T. Xu, J. McNamara. (2023). "Quantifying Groundwater Exchange Throughout the Upper Logan River Watershed." USU Research Week Student Research Symposium. April 11–12, 2023. Logan, UT.
- Lasswell<sup>++</sup>, F.M., A. Johnson<sup>+++</sup>, B.T. Neilson. (2023). "Lateral Flow Connections Between Irrigation Distribution Systems and Rivers." USU College of Engineering Research Week Poster Session. April 4, 2023. Logan, UT.
- Neilson, B.T., F.M. Lasswell<sup>++</sup>. (2023). "Does Canal Efficiency Always Improve Water Availability?" 2023 Utah Water Users Workshop. March 20–22, 2023. St. George, UT.
- Strong, P., H. Tennant<sup>++</sup>, J. S. Horsburgh, B.T. Neilson. (2023). "The Logan River Observatory: A Lab In Our Own Backyard." USU Spring Runoff Conference. March 14–15, 2023. Logan, UT.
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- Thiede, G.P., C.A. Pennock, P. Budy. (2023). "Density-Dependent Processes and Population Dynamics of Native Sculpin in a Mountain River." Utah Chapter of the American Fisheries Society. February 27–March 1, 2023. St. George, UT.
- Phillips, C.B., J. Blaylock, J. Woodhouse, G. Benitez<sup>++</sup>, R. Kostynick, C. Masteller. (2022). "An Exploration of Variability in Bankfull River Width." American Geophysical Union Fall Meeting 2022. December 12–16, 2022. Chicago, IL.
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- Masteller, C., R. Kostynick, G. Benitez<sup>++</sup>, C.B. Phillips. (2022). "Wiggles in Width: Insights into Alluvial Channel Dynamics from Variability in High-Resolution Downstream Hydraulic Geometry." Geological Society of America—Connects 2022. October 9–12, 2022. Denver, CO.
- Gustavos<sup>++</sup>, M., B.T. Neilson, P. Strong, J. Brahney. (2022). "Assessing Microplastic Sources and Characteristics from Mountain Streams to Urban Rivers." 2022 Joint Aquatic Sciences Meeting (JASM). May 14–20, 2022. Grand Rapids, MI.

- Thurber<sup>++</sup>, D., B. Lane. (2022). "Streamflow Response to Snowmelt in a Karst Mountain System." AGU Hydrology Days, Colorado State University. April 27, 2022. Fort Collins, CO.
- Jones<sup>++</sup>, A.S., T.L. Jones, J.S. Horsburgh. (2021). "PyHydroQC: A Python Package for Automating and Streamlining Aquatic Sensor Data Post Processing." American Geophysical Union Fall Meeting 2021. December 13–17, 2021. New Orleans, LA.
- Benitez<sup>++</sup>, G., C. Masteller, C.B. Phillips. (2021). "Defining the Reach Scale of a Mountain River from High-resolution Hydraulic Geometry." American Geophysical Union Fall Meeting 2021. December 13–17, 2021. New Orleans, LA.
- Liljestrand<sup>++</sup>, D., C. Oroza, B.T. Neilson, P. Strong, E. Cotter. (2021). "Leveraging LIDAR, Machine Learning, and Citizen-Science for Low-Cost, High-Resolution Snow-Depth Estimation." American Geophysical Union Fall Meeting 2021. December 13–17, 2021. New Orleans, LA.
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- Alger<sup>++</sup>, S.M., B. Lane, B.T. Neilson. (2020). "Lateral Return Flows Control Summer Stream Temperature Patterns in Irrigation-Depleted Streams." American Fisheries Society Utah Chapter Meeting. February 27, 2020. St. George, UT.
- Tennant<sup>++</sup>, H., B.T. Neilson, M.P. Miller, T. Xu, P.D. Brooks. (2019). "Using Naturally Occurring Tracers to Quantify Components of Urban and Agricultural Streamflow." American Geophysical Union Fall Meeting 2019. Abstract H23D-02. December 9–13, 2019. San Francisco, CA.
- Alger<sup>++</sup>, M., B. Lane, B.T. Neilson. (2019). "Controls on Summer Stream Temperature Patterns in Irrigation-Depleted Streams." American Geophysical Union Fall Meeting 2019. Abstract H23K-2049. December 9–13, 2019. San Francisco, CA.
- Xu, T., Q. Longyang<sup>++</sup>, C. Tyson<sup>++</sup>, R. Zeng, B.T. Neilson, D.G. Tarboton. (2019). "Hybrid Physically Based and Deep Learning Modeling of a Snow Dominated Mountainous Karst Watershed." American Geophysical Union Fall Meeting 2019. Abstract H32D-02. December 9–13, 2019. San Francisco, CA.
- Longyang<sup>++</sup>, Q., C. Tyson<sup>++</sup>, T. Xu, R. Zeng, B.T. Neilson. (2019). "Effects of Climate Forcing Uncertainty on Snow Modeling and Streamflow Prediction in a Mountainous Karst Watershed." American Geophysical Union Fall Meeting 2019. Abstract H33I-2033. December 9–13, 2019. San Francisco, CA.
- Murray<sup>++</sup>, D., B.T. Neilson, J. Brahney, N. Bouwes. (2019). "Can Beavers Mitigate Non-Point Source Pollution?" American Fisheries Society and The Wildlife Society Joint Conference 2019. September 27–October 4, 2019. Reno, NV.
- Alger<sup>++</sup>, M., B. Lane, B.T. Neilson. (2019). "Characterizing Streamflow and Temperature Patterns on the Blacksmith Fork River to Prevent Summer Dewatering." 2019 UCOWR/NIWR Annual Water Resources Conference. June 11–13, 2019. Snowbird, UT.
- Murray<sup>++</sup>, D., B.T. Neilson, J. Brahney. (2019). "Can Beavers Mitigate Non-Point Source Pollution?" 2019 Society for Freshwater Science (SFS) Annual Meeting. May 19–23, 2019. Salt Lake City, UT.

- Capito<sup>++</sup>, L., B.T. Neilson, J. Brahney. (2019). "Environmental Controls on Didymo Bloom Formation." 2019 Society for Freshwater Science (SFS) Annual Meeting. May 19–23, 2019. Salt Lake City, UT.
- Strong, P., H. Tennant<sup>++</sup>, J.S. Horsburgh, B.T. Neilson. (2019). "The Logan River Observatory: A Lab in Our Own Backyard." USU Spring Runoff Conference. March 26, 2019. Logan, UT.
- Alger<sup>++</sup>, M., B. Lane, B.T. Neilson. (2019). "Characterizing Streamflow and Temperature Patterns on the Blacksmith Fork River to Prevent Summer Dewatering." USU Spring Runoff Conference. March 26, 2019. Logan, UT.
- Capito<sup>++</sup>, L., B.T. Neilson, J. Brahney. (2019). "Environmental Controls on Didymo Bloom Formation." USU Spring Runoff Conference. March 26, 2019. Logan, UT.
- Neilson, B.T., H. Tennant<sup>+++</sup>, T.L. Stout<sup>++</sup>, Miller, M., Gabor<sup>+</sup>, R.S., Y. Jameel<sup>++</sup>, M. Millington<sup>++</sup>, A. Gelderloos<sup>++</sup>, G.J. Bowen, P.D. Brooks. (2018). "Stream-centric Methods for Determining Groundwater Contributions in Karst Mountain Watersheds." American Geophysical Union Fall Meeting 2018. Abstract H33E-04. December 10–14, 2018. Washington, D.C.
- Jones<sup>++</sup>, A.S., J.S. Horsburgh. (2018). "The iUTAH Experience: Cyberinfrastructure and Data Management for a Large, Interdisciplinary Water Project." Universities Council for Water Resources (UCOWR) Annual Meeting. June 26–28, 2018. Pittsburgh, PA.
- Jones<sup>++</sup>, A.S., J.S. Horsburgh, Z.A. Aanderud, M.A. Baker, D. Eiriksson. (2018). "A Monitoring Network for Sensing Water Quality and Hydrology Across Mountain to Urban Transitions." Universities Council for Water Resources (UCOWR) Annual Meeting. June 26–28, 2018. Pittsburgh, PA.
- Buahin<sup>+</sup>, C.A., J.S. Horsburgh, B.T. Neilson. (2018). "Enabling High-Performance Heterogeneous Computing for Component-Based Integrated Water Modeling Frameworks." 9th International Congress on Environmental Modelling and Software, Modelling for Sustainable Food-Energy-Water Systems. June 24–28, 2018. Fort Collins, CO.
- Tennant<sup>+++</sup>, H., B.T. Neilson, M.L. Barnes<sup>++</sup>, T.L. Stout<sup>++</sup>, M. Miller, R. Gabor<sup>+</sup>, M. Millington<sup>++</sup>, Y. Jameel<sup>++</sup>, A. Gelderloos<sup>++</sup>, G. Bowen, P. Brooks. (2018). "Combined Approaches for Estimating Groundwater Exchanges in Karst Watersheds." USU Student Research Symposium. April 2018. Logan, UT.
- Horsburgh, J.S., M.A. Baker, B.T. Neilson, P. Strong, A.S. Jones<sup>++</sup>. (2018). "Logan River Observatory: Extending iUTAH's GAMUT Network for Long-Term Monitoring to Inform Local Policy and Water Management." USU Spring Runoff Conference. March 27, 2018. Logan, UT.
- Eiriksson, D., A.S. Jones<sup>++</sup>, J.S. Horsburgh, C. Cox, D. Dastrup. (2017). "Data Quality Control: Challenges, Methods, and Solutions from an Eco-Hydrologic Instrumentation Network." American Geophysical Union Fall Meeting 2017. December 11–15, 2017. New Orleans, LA.
- Jones<sup>++</sup>, A.S., J.S. Horsburgh, D. Eiriksson, D. (2017). "Assessing Subjectivity in Sensor Data Post Processing via a Controlled Experiment." American Geophysical Union Fall Meeting 2017. December 11–15, 2017. New Orleans, LA.
- Aanderud, Z.T., A.S. Jones<sup>++</sup>, J.S. Horsburgh, D. Eiriksson, D. Dastrup, C. Cox, S.B. Jones, D. Bowling, J. Carlisle, G. Carling, M.A. Baker. (2017). "Transcending System Boundaries Through Integrative Ecohydrologic Research." 11th Annual Salt Lake County Watershed Symposium, November 11–12, 2017. Salt Lake City, UT.
- Horsburgh, J.S. (2017). "Cyberinfrastructure for Water Data: Perspectives from iUTAH's Data-Intensive Water Research." 45th Annual Utah Section Water Resources Conference, Data for Water Management. May 16, 2017. Salt Lake City, UT.
- Tennant<sup>+++</sup>, H., B.T. Neilson, M.L. Barnes<sup>++</sup>, T.L. Stout<sup>++</sup>, M. Miller, R. Gabor<sup>+</sup>, M. Millington<sup>++</sup>, Y. Jameel<sup>++</sup>, A. Gelderloos<sup>++</sup>, G. Bowen, P. Brooks. (2017). "Combined Approaches for Estimating Groundwater Exchanges in Karst Watersheds." American Water Resources Spring Specialty Conference. May 2017. Alta, UT.

- Mihalevich<sup>++</sup>, B., J.S. Horsburgh. (2017). "Resolving Spatial and Temporal Variability in Dissolved Organic Matter Characteristics within Combined Agricultural and Stormwater Conveyances." Utah State University Spring Runoff Conference. March 28–29, 2017. Logan, UT.
- Horsburgh, J.S., A.A. Melcher<sup>++</sup>, B.A. Mihalevich<sup>++</sup>. (2017). "Stormwater Monitoring and Pollutant Load Estimation in Combined Agricultural and Urban Water Systems." Rural Water Technology Conference, United States Bureau of Reclamation, March 8–9, 2017. Provo, UT.
- Tennant<sup>+++</sup>, H., B.T. Neilson. (2016). "Groundwater Influences on Logan River Watershed." USU Fall Undergraduate Research Symposium. December 2016. Logan, UT.
- Neilson, B.T. (2016). "Understanding Groundwater Influences in Streams and Rivers." Distinguished Lecture Series, Department of Geology, Utah State University. October 2016. Logan, UT.
- Jones<sup>++</sup>, A.S., J.S. Horsburgh. (2016). "Water Quality Surrogates: Development of Surrogate Relationships, Review of Recent Advances, and Applications." National Nonpoint Source Monitoring Workshop. August 23–25, 2016. Salt Lake City, UT.
- Melcher<sup>++</sup>, A.A., J.S. Horsburgh, B.A. Mihalevich<sup>+++</sup>. (2016). "Continuous Surrogate Monitoring for Pollutant Load Estimation in Urban Water Systems." National Nonpoint Monitoring Workshop, August 23–25, 2016. Salt Lake City, UT.
- Jones<sup>++</sup>, A.S., J.S. Horsburgh, S. Reeder, J. Caraballo<sup>+++</sup>, D. Smith<sup>+++</sup>, M. Matos<sup>+++</sup>. (2016). "Streaming Sensor Data: Tools for Acquisition, Management, and Visualization." 10th National Water Quality Monitoring Conference. May 2–6, 2016. Tampa, FL.
- Melcher<sup>++</sup>, A.A., J.S. Horsburgh, B.A. Mihalevich<sup>++</sup>, P. Suiter<sup>+++</sup>. (2016). "Continuous Surrogate Monitoring for Pollutant Load Estimation in Urban Water Systems." Utah State University Spring Runoff Conference, April 5–6, 2016. Logan, UT.
- Mihalevich<sup>++</sup>, B.A., J.S. Horsburgh, A.A. Melcher<sup>++</sup>. (2016). "Spatial and Temporal Variability of Dissolved Organic Matter in a Stormwater Conveyance." Utah State University Spring Runoff Conference, April 5–6, 2016. Logan, UT.
- Suiter<sup>+++</sup>, P.J., A.S. Jones<sup>++</sup>, J.S. Horsburgh, B.A. Mihalevich<sup>++</sup>, A.A. Melcher<sup>++</sup>. (2016). "Development of a Mobile Water Quality Monitoring Platform." Utah State University Spring Runoff Conference, April 5–6, 2016. Logan, UT.
- Tennant<sup>+++</sup>, H., M.L. Barnes<sup>++</sup>, T. Stout<sup>++</sup>, B.T. Neilson. (2015) "Methods and Techniques for Measuring Discharge in Three Utah Watersheds." iUTAH Summer Symposium. July 2015. Midway, UT.
- Barnes<sup>++</sup>, M.L., T. Stout<sup>++</sup>, H. Tennant<sup>+++</sup>, B.T. Neilson. (2015). "Groundwater–Surface Water Interactions in Three Utah Watersheds." Utah State University Spring Runoff Conference. April 2015. Logan, UT.
- Horsburgh, J.S., A.S. Jones<sup>++</sup>, S. Reeder. (2014). "Automating Data Management and Sharing Within a Large-Scale, Heterogeneous Sensor Network." 7th International Congress on Environmental Modelling and Software. June 15–19, 2014. San Diego, CA.
- Horsburgh, J.S., A.S. Jones<sup>++</sup>, S. Reeder, J. Patton<sup>+++</sup>, J. Caraballo<sup>+++</sup>, M. Ramirez<sup>+++</sup>, N. Mouzon<sup>+++</sup>. (2013). "Using CUAHSI HIS to Support Large Scale Collaborative Research in Utah." CUAHSI HIS Cyberseminar. May 1, 2013.

### Student Theses/Dissertations (20):

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- Tennant, H. (2018). "Combined Approaches for Quantifying Groundwater–Surface Water Exchanges in Karst Watersheds." Utah State University. *Undergraduate Honors Capstone Projects*. 443. Logan, UT. <https://doi.org/10.26076/7aa5-b2d3>

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Stout, T. (2017). "Development and Application of Hydraulic and Hydrogeologic Models to Better Inform Management Decisions." M.S. Thesis, Utah State University. *All Graduate Theses and Dissertations, Spring 1920 to Summer 2023*. 6044. <https://digitalcommons.usu.edu/etd/6044>

### Great Salt Lake Related Publications (3):

Anderegg, W., C. Buttars, J. Ferry, N. Gochnour, K. Shelley, B. Steed, D. Tarboton, L. Ahmadi, E. Albers, B. Bingham, P. Brooks, J. Endter-Wada, C. Hasenyager, J. Lin, A. McEntire, B.T. Neilson, S. Null, K. Perry, B. Stireman, C. Strong, L. Vernon, K. Welch, M. Yost. (2024). "Great Salt Lake Strike Team Policy Summaries." Kem C. Gardner Policy Institute, University of Utah, Salt Lake City, UT.

Null, S., Neilson, B.T. (2023). "Report to the Governor and Legislature on Utah's Land, Water, and Air— Chapter 2A Water Shepherding: Delivering Saved Water to Great Salt Lake." Utah State University, Logan UT.

Anderegg, W., Buttars, C., Ferry, J., Gochnour, N., Shelley, K., Steed, B., Tarboton, D., Ahmadi, L., Albers, E., Bingham, B., Brooks, P., Endter-Wada, J., Hasenyager, C., Lin, J., McEntire, A., Neilson, B. T., Null, S., Perry, K., Stireman, B., Strong, C., Vernon, L., Welch, K., Yost, M. (2023). "Great Salt Lake Policy Assessment." Kem C. Gardner Policy Institute, University of Utah, Salt Lake City, UT.

### Great Salt Lake Related Presentations (4):

Lane, B., F. Nusrat, J. Ostermiller, S. Null, B.T. Neilson, M. Stamp, P. Thompson, M.A. Baker. (2024). "Establishing a Functional Flows Framework for the Great Salt Lake Basin." Great Salt Lake Issues Forum. May 8, 2024. Salt Lake City, UT.

Neilson, B.T., E. Lukens, E. Turney, S.E. Null. (2024). "Stream and Diversion Measurement Gap Analysis." 2024. USU Spring Runoff and Northern Utah Water Users Conference. March 26–27, 2024. Logan, UT.

Dunn<sup>++</sup>, D., B. Crookston, B.T. Neilson, C. Phillips. (2023). "Exploring the Spatiotemporal Distribution of Salt Mass in the South Arm of the Great Salt Lake, UT in Response to a Recent Drought–Flood Cycle: Implications for Adaptive Management." American Geophysical Union Fall Meeting 2023. December 11–15, 2023. San Francisco, CA.

Nusrat, F., B. Lane, J. Ostermiller, S. Null, B.T. Neilson, P. Thompson, M.A. Baker. (2023). "Utah's Functional Flows Framework." Salt Lake County Watershed Symposium. November 15–16, 2023. West Valley City, UT.

### Other Significant Publications (1):

Neilson, B.T. and F.M. Lasswell (2024). Logan River Temperature Modeling Documentation and Alternative Analysis. Technical Report.

**Appendix E:**  
Graduate Student Involvement with Logan River Observatory

**Table E-1.** Graduate students that use LRO data for part of their thesis/dissertation or worked on a project focused on some aspect of the Logan River watershed.

Student Name	Degree	Department	University	Advisor	Date of Completion	Overview of Research	Thesis/Dissertation Title
<b>Current Students</b>							
Motasem Abualqumboz	PhD	CEE	USU	D. Tarboton		Advancing and scaling up distributed hydrologic models to evaluate runoff changes in response to climate and land use change	
Luke Alder	MS	Geology	USU	D. Newell		Investigating sources, flow paths, and residence times of shallow groundwater in Cache Valley using stable isotopes, geochemical tracers, and statistical analyses to improve understanding of recharge dynamics and support sustainable water resource management	
Bryan Blau	MS	Geology	USU	D. Vaughn		Shallow groundwater recharge in Cache Valley	
Greg Goodrum	PhD	WATS	USU	S. Null	expected August 2025	Improving Aquatic Habitat Representation in Utah Using Large Spatial Scale Environmental Datasets	
Razin Issa	MS	CEE	USU	S. Young		Camera-based hydrologic monitoring	
Abby Johnson	MS	CEE	USU	B.T. Neilson		Water management influences on instream temperatures	
Ishwar Joshi	PhD	CEE	USU	B. Crookston		Uncertainties in flood modeling in the Logan and Blacksmith Fork Rivers	
Ehsan Kahrizi	PhD	CEE	USU	J.S. Horsburgh		Automated sensor data quality control	
Safran Khan	PhD	CEE	USU	S. Young		Camera-based hydrologic monitoring	
Michael Lasswell	PhD	CEE	USU	B.T. Neilson		Advance numerical modeling to understand valley surface/subsurface connectivity to optimize water management in the Intermountain West.	
Dane Liljestrand	PhD	CEE	University of Utah	C. Oroza		Improving basin-scale snow depth estimation through adaptation of citizen-science collected measurements and LIDAR terrain data.	
Sajan Neupane	MS	CEE	USU	J.S. Horsburgh		Camera-based hydrologic monitoring: Cloud workflows for estimating hydrologic variables from camera images.	
Xurxo Rigueira	PhD	CS	ASU (visiting scholar)	T. Xu		Developing new transformer-based models for streamflow prediction in snow dominated karst watersheds like the Logan River.	
Collins Stephenson	MS	CEE	USU	P. Shuai		Canal-aquifer interactions near the Blacksmith Fork River	
Shahin Sujon	PhD	CEE	USU	K. Moor		Microplastic photochemistry and fate in western mountainous rivers.	

Student Name	Degree	Department	University	Advisor	Date of Completion	Overview of Research	Thesis/Dissertation Title
Hyrum Tennant	PhD	CEE	USU	B.T. Neilson		Variability of groundwater storage in karst geology and its effects on streamflow.	
<b>Completed Students</b>							
Braedon Dority	MS	CEE	USU	J.S. Horsburgh	May 2025	Low-Cost, low-power, in situ operational snow sensing	Dority, B. (2025). "Increasing the Spatial Resolution of Snow Hydrology Data and Augmenting Existing Hydrology Monitoring Networks Using Low-Cost Snow Sensing Stations." M.S. Thesis, Utah State University. <i>All Graduate Theses and Dissertations, Fall 2023 to Present</i> . 488. <a href="https://digitalcommons.usu.edu/etd2023/488">https://digitalcommons.usu.edu/etd2023/488</a>
Gabriel Benitez	MS	CEE	USU	C. Phillips	May 2025	Linking deviations from hydraulic geometry scaling to causal mechanisms and instream processes.	Benitez, G.V. (2025). "Exploring Variations in High-Resolution Downstream Hydraulic Geometry of the Logan River." M.S. Thesis, Utah State University. <i>All Graduate Theses and Dissertations, Fall 2023 to Present</i> . 444. <a href="https://digitalcommons.usu.edu/etd2023/444">https://digitalcommons.usu.edu/etd2023/444</a>
Skyler Rousseau	MS	WATS	USU	T. Walsworth	Aug 2024	Examining the climatic and landscape controls on the availability and ecological function of intermittent streams	Rousseau, S. (2024). "The Drivers and Ecological Importance of Streamflow Permanence for Native Salmonids: Evaluated at Multiple Spatio-Temporal Scales." M.S. Thesis, Utah State University. <i>All Graduate Theses and Dissertations, Fall 2023 to Present</i> . 262. <a href="https://digitalcommons.usu.edu/etd2023/262/">https://digitalcommons.usu.edu/etd2023/262/</a>
Longyang Qianqiu	PhD	CEE	Arizona State University	R. Zeng	Mar 2024	Developing physically interpretable deep learning models to simulate hydrologic processes	Longyang, Q. (2024). "Machine Learning-enhanced Hydrologic Modeling under Changing Climate." Ph.D. Dissertation, Arizona State University. <a href="https://keep.lib.asu.edu/items/193393">https://keep.lib.asu.edu/items/193393</a>
Nate Ashmead	MS	Hydrological Sciences	Boise State University	J. McNamara	Aug 2024	Snowmelt dynamics and streamflow at the watershed scale.	Ashmead, N. (2024). "Radiogenic Isotope and Ionic Concentration Ratios Reveal Hydrologic Mixing, Subsurface Residence Time, and Cross-Basin Transfer in a Snow-Fed Mountain Karst Watershed." M.S. Thesis. Boise State University Theses and Dissertations. 2227. <a href="https://doi.org/10.18122/td.2227.boisestate">https://doi.org/10.18122/td.2227.boisestate</a>
Devon Hill	MS	CEE	USU	B.T. Neilson	April 2024	Using natural tracers to understand hydrologic connectivity in the Logan River watershed.	Hill, D. (2024). "Quantifying the Role of Karst Groundwater on Mountain River Discharge." M.S. Thesis, Utah State University. <i>All Graduate Theses and Dissertations, Fall 2023 to Present</i> . 169. <a href="https://doi.org/10.26076/1efb-b42b">https://doi.org/10.26076/1efb-b42b</a>
Amber Jones	PhD	CEE	USU	J. Horsburgh	Mar 2024	Machine learning techniques to investigate surrogate relationships, to develop automated methods of quality assurance/quality control of hydrologic and water quality time series data, and to better understand lateral inflow variability throughout the Logan River watershed.	Jones, A. (2024). "Water Data Science: Data Driven Techniques, Training, and Tools for Improved Management of High Frequency Water Resources Data." Ph.D. Dissertation, Utah State University. <i>All Graduate Theses and Dissertations, Fall 2023 to Present</i> . 134. <a href="https://doi.org/10.26076/936d-14ca">https://doi.org/10.26076/936d-14ca</a>

Student Name	Degree	Department	University	Advisor	Date of Completion	Overview of Research	Thesis/Dissertation Title
Macy Gustavus	MS	WATS	USU	J. Brahney	May 2023	Sources of plastic to the Logan–Bear river system	Gustavus, M. (2023). "From Mountain Streams to Urban Rivers: An Assessment of Microplastic Sources and Characteristics." M.S. Thesis, Utah State University. All Graduate Theses and Dissertations, Spring 1920 to Summer 2023. 8759. <a href="https://doi.org/10.26076/4d02-66b9">https://doi.org/10.26076/4d02-66b9</a>
Taylor Kesler	MS	CEE	USU	Z. Sharp	May 2023	Comparing 1D, 2D, and 3D Hydraulic Models in Urban Flooding Applications	Kesler, T. (2023). "Comparing 1D, 2D, and 3D Hydraulic Models in Urban Flooding Applications." M.S. Thesis, Utah State University. All Graduate Theses and Dissertations, Spring 1920 to Summer 2023. 8691. <a href="https://doi.org/10.26076/38b6-8acb">https://doi.org/10.26076/38b6-8acb</a>
Daniel Thurber	MS	CEE	USU	B. Lane	Dec 2022	Exploring potential thesis topics surrounding the relationships between seasonal snowpack storage and the timing/magnitude of Spring and Summer streamflow signatures and the sensitivity of those relationships to climate change.	Thurber, D.M. (2022). "Characterizing Karst Mountain Watersheds Through Streamflow Response to Snowmelt." M.S. Thesis, Utah State University. All Graduate Theses and Dissertations, Spring 1920 to Summer 2023. 8673. <a href="https://doi.org/10.26076/3fb9-d6ee">https://doi.org/10.26076/3fb9-d6ee</a>
Ryan Shaver	MS	CEE	Arizona State University	T. Xu	May 2022	Long Short-Term Memory for Karst Watershed Modeling: Case Study of Logan River Canyon, UT, USA	Shaver, R. (2022). "Long Short-Term Memory for Karst Watershed Modeling: Case Study of Logan River Canyon, UT, USA." M.S. Thesis, Arizona State University. Barrett, the Honors College Thesis/Creative Project Collection. <a href="https://keep.lib.asu.edu/items/164857">https://keep.lib.asu.edu/items/164857</a>
Dane Brophy	MS	CEE	USU	B.T. Neilson	May 2021	Dane worked to determine if satellite imagery had high enough resolution information for mapping karst features. He also coarsened very high-resolution UAV imagery to determine the resolution of data needed to map known features.	Brophy, D.P. (2021). "Testing Methods of Surficial Sinkhole Identification Using Remotely Sensed Data." M.S. Report, Utah State University. All Graduate Plan B and other Reports, Spring 1920 to Summer 2023. 1526. <a href="https://digitalcommons.usu.edu/gradreports/1526">https://digitalcommons.usu.edu/gradreports/1526</a>
Hyrum Tennant	MS	CEE	USU	B.T. Neilson	May 2021	Hyrum used flow, ion, and isotope data to establish detailed spatial estimates of flow losses, flow gains from ungaged lateral inflows, and flow source information throughout the urban and agriculturally influenced portion of the Logan River.	Tennant, H. (2021). "Ungaged Inflow and Loss Patterns in Urban and Agricultural Sub-Reaches of the Logan River Observatory." M.S. Thesis, Utah State University. All Graduate Theses and Dissertations, Spring 1920 to Summer 2023. 8057. <a href="https://digitalcommons.usu.edu/etd/8057">https://digitalcommons.usu.edu/etd/8057</a>
Conor Tyson	MS	CEE	USU	T. Xu / B.T. Neilson	May 2021	Conor modeled snow accumulation and melt over the entire canyon portion of the Logan River watershed. These model results are being combined with machine learning approaches to link the spatial and temporal snowmelt patterns with streamflow. Conor has successfully completed his thesis and in the process of preparing a journal article for publication.	Tyson, C. (2021). "Effects of Climate Forcing Uncertainty on High-Resolution Snow Modeling and Streamflow Prediction in a Mountainous Karst Watershed." M.S. Thesis, Utah State University. All Graduate Theses and Dissertations, Spring 1920 to Summer 2023. 8041. <a href="https://digitalcommons.usu.edu/etd/8041">https://digitalcommons.usu.edu/etd/8041</a>

Student Name	Degree	Department	University	Advisor	Date of Completion	Overview of Research	Thesis/Dissertation Title
Desneiges Murray	MS	WATS	USU	J. Brahney	Jan 2021	Deni collected a significant amount of inflow, outflow, and within beaver pond physical and chemical data. She used these data how beaver dams influence the fate and transport of nonpoint source pollution.	Murray, D. (2021). "The Fate and Cycling of Nitrogen, Phosphorus, and Trace Heavy Metals in Beaver-Altered Headwater Streams." M.S. Thesis, Utah State University. All Graduate Theses and Dissertations, Spring 1920 to Summer 2023. 8035. <a href="https://digitalcommons.usu.edu/etd/8035">https://digitalcommons.usu.edu/etd/8035</a>
Madison Alger	MS	CEE	USU	B. Lane	Jan 2021	Madison collected a significant amount of flow and temperature data in portion of the Blacksmith River that was dewatered due to upstream diversion structures. She used these data to investigate temperature patterns throughout this section and how these changed when shallow groundwater from nearby irrigation canals returned to the river.	Alger, S.M. (2021). "Summer Stream Temperature Patterns and Controls in an Irrigation Depleted Western Stream." M.S. Thesis, Utah State University. All Graduate Theses and Dissertations, Spring 1920 to Summer 2023. 8029. <a href="https://digitalcommons.usu.edu/etd/8029">https://digitalcommons.usu.edu/etd/8029</a>
Lindsay Capito	MS	WATS	USU	J. Brahney	Dec 2020	Lindsay investigated controls on Didymosphenia geminate (or didymo) growth in controlled and natural systems. Didymo is a stalk forming benthic diatom species that can diminish the recreational and aesthetic value of a stream, can cause infrastructure problems such as the fouling of water intakes, and can have significant ecosystem and ecological impacts. Didymo samples are being collected downstream of the UWRL site to monitor time variable responses where blooms have repeatedly occurred. LRO data at the UWRL site will be key in interpreting didymo trends.	Capito, L. (2020). "Environmental Controls on Didymosphenia geminata Bloom Formation." M.S. Thesis, Utah State University. All Graduate Theses and Dissertations, Spring 1920 to Summer 2023. 7941. <a href="https://digitalcommons.usu.edu/etd/7941">https://digitalcommons.usu.edu/etd/7941</a>
Greg Goodrum	MS	WATS	USU	S. Null	Aug 2020	Improving Aquatic Habitat Representation in Utah Using Large Spatial Scale Environmental Datasets.	Goodrum, G. (2020). "Improving Aquatic Habitat Representation in Utah Using Large Spatial Scale Environmental Datasets." M.S. Thesis, Utah State University. All Graduate Theses and Dissertations, Spring 1920 to Summer 2023. 7902. <a href="https://digitalcommons.usu.edu/etd/7902/">https://digitalcommons.usu.edu/etd/7902/</a>
Beth Ogata	PhD	Biology	USU	M. Baker	Aug 2020	Beth worked to understand anthropogenic influences on bacterial assemblages within stream biofilms, which are an integral component of stream ecosystems, alter stream biogeochemistry. More specifically, her research examined how nutrients and pharmaceuticals, ubiquitous pollutants in streams worldwide, affect bacterial assemblages in stream biofilms.	Ogata, E.M. (2020). "Anthropogenic Influences on Bacterial Assemblages in Stream Biofilms." Ph.D. Dissertation, Utah State University. All Graduate Theses and Dissertations, Spring 1920 to Summer 2023. 7889. <a href="https://digitalcommons.usu.edu/etd/7889">https://digitalcommons.usu.edu/etd/7889</a>
Tony Melcher	PhD	CEE	USU	J. Horsburgh	May 2019	Estimating Suspended Solids and Phosphorus Loading in Urban Stormwater Systems Using High-Frequency, Continuous Data	Melcher, A.A. (2019). "Estimating Suspended Solids and Phosphorus Loading in Urban Stormwater Systems Using High-Frequency, Continuous Data." Ph.D. Dissertation, Utah State University. All Graduate Theses and Dissertations, Spring 1920 to Summer 2023. 7455. <a href="https://digitalcommons.usu.edu/etd/7455">https://digitalcommons.usu.edu/etd/7455</a>

Student Name	Degree	Department	University	Advisor	Date of Completion	Overview of Research	Thesis/Dissertation Title
Hyrum Tennant	BS honors	CEE	USU	B.T. Neilson	May 2018	Combined Approaches for Quantifying Groundwater-Surface Water Exchanges in Karst Watersheds	Tennant, H. (2018). "Combined Approaches for Quantifying Groundwater-Surface Water Exchanges in Karst Watersheds." Utah State University. Undergraduate Honors Capstone Projects. 443. Logan, UT. <a href="https://doi.org/10.26076/7aa5-b2d3">https://doi.org/10.26076/7aa5-b2d3</a>
Caleb Buahin	PhD	CEE	USU	J. Horsburgh	Dec 2017	Advancing the Cyberinfrastructure for Integrated Water Resources Modeling	Buahin, C. (2017). "Advancing the Cyberinfrastructure for Integrated Water Resources Modeling." Ph.D. Dissertation, Utah State University. All Graduate Theses and Dissertations, Spring 1920 to Summer 2023. 6901. <a href="https://digitalcommons.usu.edu/etd/6901">https://digitalcommons.usu.edu/etd/6901</a>
Bryce Mihalevich	PhD	CEE	USU	B.T. Neilson	Aug 2017	Resolving Spatial and Temporal Variability in Dissolved Organic Matter Characteristics within Combined Agricultural and Stormwater Conveyances.	Mihalevich, B.A. (2017). "Resolving Spatial and Temporal Variability in Dissolved Organic Matter Characteristics within Combined Agricultural and Stormwater Conveyances." M.S. Thesis, Utah State University. All Graduate Theses and Dissertations, Spring 1920 to Summer 2023. 6264. <a href="https://digitalcommons.usu.edu/etd/6264">https://digitalcommons.usu.edu/etd/6264</a>
Trinity Stout	MS	CEE	USU	B.T. Neilson	Aug 2017	Development and Application of Hydraulic and Hydrogeologic Models to Better Inform Management Decisions	Stout, T. (2017). "Development and Application of Hydraulic and Hydrogeologic Models to Better Inform Management Decisions." M.S. Thesis, Utah State University. All Graduate Theses and Dissertations, Spring 1920 to Summer 2023. 6044. <a href="https://digitalcommons.usu.edu/etd/6044">https://digitalcommons.usu.edu/etd/6044</a>