Hydrologic Monitoring in the Cascade-Siskiyou National Monument Meadows

Final Research Project Report

Section 1: Executive Summary & Project Objectives

1.1 Project Overview

This project was initially designed to conduct a hydrologic survey across three distinct meadow environments within the Cascade-Siskiyou National Monument (CSNM) over a 10-week summer block. However, initial remote assessment and field reconnaissance revealed that a broad spatial assessment would fail to capture smaller temporal changes that define meadow vulnerability, specifically fine-level winter freezing and spring snowmelt impacts.

Because of this, the project pivoted: field operations were concentrated on a single, comprehensive field site (Lower Parsnip Lakes) in a year-round study (June 2025 through May 2026). This shift allowed for the deployment of a groundwater monitoring array as well as monthly surface water monitoring, providing insight into the meadow's annual water balance.

1.2 Core Project Objectives

1. Permitting and Compliance: Coordination with the BLM Medford Office, securing authorization for groundwater monitoring infrastructure
2. Groundwater Array Installation and Surface Water Preparation: Fabricated and an H-Type flume, also known as a weir, and installed a field transect of shallow groundwater wells equipped with continuous pressure transducers.
3. Year-Round Monitoring: Data collection and maintenance trips across all seasons to capture flows in different conditions.
4. Data Analysis: Input data into spreadsheets then to Python notebooks for data cleaning, hydrograph visualization, and groundwater modeling.
5. Communicating Findings: Shared project methodologies and outcomes by presenting a technical poster at the SOU STEM ReX presentation, delivering a talk at the FCSNM Research Symposium, and engaging with regional experts at the Bretz Club Conference.

Section 2: Detailed Methodology & Chronological Activities

2.1: Remote Reconnaissance, and Site Ground-Truthing, Permitting (June 12 – July 21, 2025)

- Activities: Field preparations began with remote site ID by analyzing high-resolution National Hydrography Datasets (NHDPlus_HR), UC Davis Soil Maps, and USGS topographic data to model regional drainage basins. Upon site selection a research permit application was acquired from the Bureau of Land Management (BLM).
- Field Milestones: Initial ground-truthing visits were conducted on June 23 and July 8, 2025, to verify accessible terrain and surface water features. The final site selection was made on July 17 at Parsnip Lakes.

2.2: Study Design, Well Installation, and Weir Fabrication (July 23 – August 20, 2025)

- Activities: Shallow groundwater well deployment took place during two consecutive installation days (July 23 and July 24). Four 1-1/4" PVC shallow monitoring wells fitted with plastic points and caps were driven into the meadow substrate along two transects (one in the x and one in the y plane). HOBO water level loggers were suspended within the wells to record pressure and temperature changes.
- While developing surface flow methods, low-flow streamflow created conditions where standard velocity measurements were insufficient and a need to use a weir arose. The aluminum weir was hand-built to reduce cost. Weir fabrication involved design, cutting, bending, and welding.

2.3: Year-Round Field Tracking and Site Maintenance (August 11, 2025 – May 11, 2026)

- Activities: 15 site visits to download surface and ground water logger data caches, and to check well casing stability. Additionally, surface water flows were measured using the aluminum weir.

2.4: Data Analytics and Dissemination (August 14, 2025 – Late Spring 2026)

- Activities: Because of the large dataset generated by continuous logger deployment, Python notebooks were used to help manage and analyze the data.
- Data analysis allowed for the creation of a poster of preliminary results for the SOU STEM ReX presentation in the fall of 2026. In March 2026, results were presented at the Friends of Cascade-Siskiyou National Monument (FCSNM) Research Symposium.

Section 3: Project Deliverables, Outcomes, and Computational Assets

3.1: Continuous Hydrologic Datasets

The primary scientific outcome consists of multi-season monitoring data at Parsnip Lakes covering June 2025 through May 2026. The data includes:

- The timing and magnitude of summer water table declines. Although refinement of well installations may limit the usability of this data.
- Baseflow rates during summer and flows during spring snowmelt and storm runoff events.
- Groundwater and surface water temperature fluctuations throughout the seasons.

3.2: SOU STEM ReX Poster Presentation (November 2025)

A technical poster was designed and presented at the Southern Oregon University STEM Research Experience (ReX) showcase. The poster focused on the early findings of the project, highlighting surface water measurements, the shallow groundwater monitoring transects, and

hydraulic gradients. The presentation communicated undergraduate research methodologies to the broader SOU campus community.

3.3: Friends of Cascade-Siskiyou National Monument (FCSNM) Research Symposium Presentation (March 2026)

A research presentation was prepared and delivered at the annual FCSNM Research Symposium. This data included winter and early-spring data that was shown to monument managers, local conservationists, and academic stakeholders. The presentation detailed how continuous water table monitoring captures responses to seasonal changes and how monitoring can help analyze monument-scale climate resiliency.

3.4: Bretz Club Conference Scientific Exchange

Shifting matching funds from a USGS meeting in Corvallis allowed for attendance to the Bretz Club Conference. This resulted in the methodologies and findings being reviewed by academic and federal hydrologists from the USFS Watershed Processes Group, OSU, and USGS, allowing for meaningful feedback and increased awareness of the Friends and the monument.

Section 4: Detailed Account of Funds Expended

4.1: Materials and Supplies

The materials and supplies budget was used for instrumentation. Institutional equipment matching funds were utilized as planned, and the Friends Research Fund (FRF) allocation of $314.00 was completely expended.

Materials Expenditure Table

Item Description	Proposed Qty	Actual Qty	Matching Funds	FRF Funds	Total Expended
HOBO Water Level Loggers	6	6	$2,394.00	$0.00	$2,394.00
Well & Logger Installation Equipment	1	1	$293.00	$0.00	$293.00

Item Description	Proposed Qty	Actual Qty	Matching Funds	FRF Funds	Total Expended
Well Elements *(1-1/4" PVC, points, caps)*	10	10	$320.00	$80.00	$400.00
Waterproof Field Notebooks	2	2	$0.00	$20.00	$20.00
AMS Double Infiltration Ring	1	1	$0.00	$214.00	$214.00
Total Materials & Supplies	20	20	$3,007.00	$314.00	$3,321.00

Materials Narrative Justification:

All instrumentation performed as expected. Weir materials (aluminum sheet metal and L-channel) were purchased using matching funds.

4.2 Student Stipends & Time Worked Reconciliation

Labor allocation shifted from a 10-week summer block into a long-term monitoring schedule spanning from June 2025 through May 2026.

- Proposed Labor Allocation: 350 Hours total ($6,300.00 across $2,500.00 FRF grant funds and $3,800.00 institutional match).
- Actual Logged Labor: 269.25 Hours total ($4,846.50 at the standard $18.00/hour rate).
- Labor Variance: -80.75 Hours due to single study site.

Funding Source Labor Split

The FRF student stipend award was fully drawn down down:

- FRF Grant Allocation: $2,500.00 (100% utilized to fund additional hours of summer, fall, and winter monitoring).
- Institutional Matching Funds: $2,346.50 expended (reconciled from the initial $3,800.00 commitment, which helped fund Bretz Club Attendance and additional milage for field visits)

Logged Hours Categorization Summary

Labor hours were distributed across three main categories:

1. Field Site Setup, Permitting, & Installation (76.75 Hours Logged)
    - *Key Activities:* Preliminary remote GIS scouting, filing BLM permitting paperwork, tool preparation, physical well installations, and constructing the weir.
2. Year-Round Monitoring & Site Maintenance (113.00 Hours Logged)
    - *Key Activities:* Site visits distributed across summer, winter, and spring to run manual well checks, download logger data, and take surface water measurements with the weir structure.
3. Data Entry, Quantitative Analysis, & Modeling (79.50 Hours Logged)
    - *Key Activities:* Establishing database folders, continuous spreadsheet data entry, running geospatial data analyses, modeling groundwater variations over time, and compiling materials for final report generation.

4.3: Travel, Mileage, and Conference Logistics Reconciliation

1. BLM Coordination: All communication with the BLM Medford Office was transitioned virtual, eliminating the planned $25.46 mileage expense.
2. Pivoting to the Bretz Club Conference: The matching travel and lodging funds originally earmarked for a trip to the USFS PNW Research Station in Corvallis were redirected. Instead, the annual Bretz Club Conference and Field Trip (hosted by the same *Watershed Processes Group* alongside OSU and USGS researchers) was attended to connect with regional hydrologic professionals
3. Field Trips: Field site tracking expanded from summer to year-round trips to collect surface flow records.

Travel Expenditure Table

Travel Destination	Original Budget	Actual Expended	Line Variance	Funding Re-Allocation Narrative
Ashland to Parsnip Lakes	$43.29	$66.75	+$25.46	Increased Frequency: Extended tracking window required 6 additional site check trips.

Travel Destination	Original Budget	Actual Expended	Line Variance	Funding Re-Allocation Narrative
BLM Medford Office	$25.46	$0.00	-$25.46	Moved Online: Coordination handled virtually; unused FRF mileage funds shifted to offset local meadow trips.
Total Travel Costs	$68.75	$66.75	*-$2.00*	Accounts for error in transferring total travel cost to final budget in proposal.

D. Final Summary of Direct Project Costs

Budget Category	Proposed Match	Proposed FRF	Actual Match	Actual FRF	Final Total
A. Materials & Supplies	$3,007.00	$314.00	$3,007.00	$314.00	$3,321.00
B. Student Stipends	$3,800.00	$2,500.00	$2,346.50	$2,500.00	$4,846.50
C. Lodging & Per Diem	$460.00	$0.00	$460.00	$0.00	$460.00
D. Mileage Costs	$641.07	$66.75	$1034.48	$66.75	$1101.23
Total Project Costs	$7,908.07	$2,880.75	$6847.98	$2,880.75	$9728.73

Final Grant Compliance Statement

The $2,880.75 award provided by the Friends Research Fund was fully utilized. Financial adaptations necessitated by moving the study to a year-round were managed by internal reallocations of funding.