<table>
<thead>
<tr>
<th>Student(s)</th>
<th>Major(s)</th>
<th>Project Summary</th>
<th>Project Amount</th>
<th>Stipend(s)</th>
<th>Supplies</th>
<th>Travel</th>
<th>Faculty Mentor</th>
<th>Dissemination</th>
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<tr>
<td>Rhiana Fox</td>
<td>Math &amp; Psychology</td>
<td>Using Data Analytics to study the psychological effects due to long-term illness.</td>
<td>3,510</td>
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<td>Heather Moon</td>
<td>Presented at the ICUR virtual conference.</td>
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<td>Gary McEwen</td>
<td>Exercise Science</td>
<td>Effects of Bio-Electro-Magnetic-Energy-Regulation (BEMER) on recovery and performance in Anaerobic Exercise Tests</td>
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<td>Collin Fehr</td>
<td>Presented at the ICUR virtual conference and the ACSM meeting in Boise, Idaho.</td>
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<td>Tristan Olsen</td>
<td>Mathematics and Chemistry</td>
<td>Using Parametric Linear Programming to approximate phase state curves</td>
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<td>Judy Boozer</td>
<td>Biology</td>
<td>Use of Amphioxus as a model for Regenerative Medicine.</td>
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<td>Leigh Latta</td>
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<td>Dylan Miller</td>
<td>Biology, Chemistry</td>
<td>Method Development for the Determination of Uptake Rates used in Passive Sorbent Tube-Type Sampling.</td>
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<td>Nancy Johnston</td>
<td>Presented at the ICUR virtual conference.</td>
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<tr>
<td>Eli Moser</td>
<td>GeoChemistry</td>
<td>Collection and analysis of mobile sulfur compound data around a pulp papermill in northern-central Idaho.</td>
<td>1,440</td>
<td>1,440</td>
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<td>Nancy Johnston</td>
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<td>Elias Pukkila</td>
<td>Chemistry/Biology</td>
<td>Analysis of multiple anions in the water supply and surrounding natural water deposits of North Idaho.</td>
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<td>Nancy Johnston</td>
<td>Presented at the ICUR virtual conference.</td>
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<td>Ryan Glimp and McKenzie Malm</td>
<td>Kinesiology:Exercise Science (Glimp) Kinesiology:Health &amp; Fitness (Malm)</td>
<td>Body Dysmorphia Occurrence in College Athletes versus College Students</td>
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<td>Clay Robinson</td>
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FY17 HERC Undergraduate Research: Institution Name

FY21 HERC Undergraduate funding received: 20,000

# undergrads participating in research: 11
Hello, my name is Eli Moser. This summer I had the privilege to be funded by the State Board of Education Higher Education Resource Council and Provost Stinson to conduct research on sulfur dioxide (SO2) in the Lewis-Clark Valley.

Sulfur dioxide in our valley is partially responsible for the noxious odor that hangs in the valley. It is emitted by industry such as the local paper mill. SO2 is a criteria pollutant monitored by the EPA but has never been monitored constantly for a significant amount of time in the area. SO2 is known to cause irritation of the skin and respiratory system and increases the symptoms in people with preexisting respiratory issues. SO2 also has negative environmental effects such as acid rain and the reduction on growth in foliage existing in high concentration areas.

My project goals were to measure SO2 concentrations and find trends temporally, spatially, and seasonally. To achieve this, we sampled for two hours a day every three days from late June 2019 and continue to sample hourly each week and month. We analyzed the data using a state-of-the-art equipment that measures SO2 concentrations and to find trends in the data. We also conducted fieldwork to measure the emissions from the paper mill and to understand the sources of SO2 emission in the valley.

The title of my project was Collection and analysis of mobile sulfur compound data near a pulp papermill in northern-central Idaho. As the project developed the final poster title that was presented at the Idaho Conference of Undergraduate Research (ICUR) was Analysis of Sulfur Dioxide Emissions in the Lewis-Clark Valley.

Similar to the project itself, I developed as a scientist and a person over the course of this project. I have learned more of the chemistry of SO2 in the atmosphere and instrumentation than I previously had exposure to in classes or normal lab procedures. I have expanded my ability to write research papers with a great deal of detail and all of the necessary components. I have also learned more about the importance of time management and the importance of perseverance.

My project has taught me that perseverance is essential for conducting research and has taught me many lessons like better communication and time management. I believe that future projects will be vastly improved by the experience that I have gained while taking on this project. I am very thankful for the opportunity and hope to see many more students in the future have a similar research experience.

Sincerely,

Elijah Moser
Dear Dr. Stinson,

I want to thank you for facilitating my Summer 2020 Idaho HERC award. As this component of my project comes to a close, I reflect on the results we have achieved from a very positive outlook. The HERC grant I received was instrumental in initiating our study of diffusive uptake rates for use with passive sampling. These findings laid the groundwork for the following steps in our overall research.

At the Idaho Conference on Undergraduate Research this month, I presented the poster entitled “Determination of Diffusive Uptake Rates for VOCs on Passive Thermal Desorption Air Samplers.” This poster allows me to showcase the research methods that I learned during my time at Lewis-Clark State College. The poster also includes a data visualization of the uptake rates calculated. This visualization is a compilation of the results obtained from my project.

The poster also includes a copy of the final research report for the remainder of the summer. This report includes the expansion of our data sets including uptake rates of up to two weeks. This report will be published on the school’s website.

Thank you for your support of this research!

With Gratitude,

Dylan Miller
Analysis of Nitrate and Other Anions in Natural Water Sources of North Central Idaho

Elias J. Pukkila and Nancy A. C. Johnston
Division of Natural Sciences and Mathematics, Lewis Clark State College, Lewiston, Idaho

Abstract
Nitrate in the water supply may cause cancer and birth defects when ingested. Nitrate is introduced to the water supply when farmers use fertilizer for their crops. The fertilizer contains high concentrations of nitrates. These nitrates are then able to enter various water sources via runoff from rain. Water samples from various water sources in North Central Idaho during early summer were collected. Nitrates and six other anions (Fluoride, Chloride, Nitrite, Bromide, Phosphate, and Sulfate) were analyzed using ion chromatography. Only Fluoride, Chloride, Nitrate, and Sulfate were detected in any of the samples. No amounts of nitrate analyzed exceeded the EPA MCL (maximum contaminant level) except for one site located in a small creek located in a valley between two farms. Therefore, analysis shows little risk of health danger for most water sources in North Central Idaho.

Introduction
- Runoff from fertilized land can cause high concentrations of nitrate to flow into different water sources which can be harmful to biological systems when ingested.
- Sites were chosen based on the EPA’s nitrate priority areas. These are areas which have had high nitrate levels that need to be monitored.2
- One of these areas is located to the east of the Lewis-Clark valley. Sites were picked along the river to observe any change in anions as creeds located in these nitrate priority areas were deposited into the river.
- Two samples were taken from each site on different days during the beginning of summer.

Results/Discussion

![Figure 2: 50 ppm 7 Anion Standard Chromatogram](image)

![Figure 3: Nitrate Calibration Curve](image)

![Figure 4: Source Water Nitrate Concentrations](image)

![Figure 5: Source Water Chloride Concentrations](image)

![Figure 6: Source Water Sulfate Concentrations](image)

![Figure 7: Source Water Fluoride Concentrations](image)

![Figure 8: Map of Source Water Sampling Sites](image)

Methods
- Water samples were retrieved from the several locations provided in Figure 2. 500 mL PTFE bottles were used to store the liquid before analysis.
- The samples were analyzed no later than 48 hours after they were extracted and were syringed through 0.45 um filter before injection into the ion chromatograph.
- Standards were prepared using a Thermo standard stock solution containing the 7 anions being analyzed. 5 different concentration levels were made to create a calibration curve (50 ppm, 25 ppm, 10 ppm, 5 ppm, and 1 ppm)

![Figure 9: Ion Analysis Process](image)

IC Parameters
- Column: Dionex IonPac AS 14A
- Suppressor: Dionex AEROS SDD 14mm
- Flow: 0.5 mL/min
- Current: 20 nA
- Eluent: 8 mM Carbonate/ 4mM Hexametaphosphate
- Run time: 22 min

Conclusions
- No amounts of Nitrite, Bromide, or Phosphate were detected in any source water sample. Concentrations for these anions may have been under the LOD for the experiment.
- Chloride and Sulfate concentrations of all samples stayed well below the EPA’s set MCL of drinking water of 250 ppm.3
- The source of the Fluoride in the drinking water is possibly from the addition of fluoride to drinking water.
- Sampling site 8 was the only site to show Nitrate concentrations exceeding the EPA’s established MCL of 10 ppm.4 This is possibly due to the farmland to both sides of the creek.
- All other sampling sites were well below the MCL for nitrate.

References

Acknowledgements
- This publication was made possible by an Institutional Development Award (IDA) from the National Institute of General Medical Sciences of the National Institutes of Health under grant #P20GM123468 and the Idaho State Board of Education Higher Education Research Council.