**Overview**

At the request of project managers Blake Perez and Kaye Mickelson, Utah State University’s Institute of Outdoor Recreation and Tourism has prepared two study proposals to examine outdoor recreation use throughout the Central Wasatch. The desire for two study proposals stems from the discussions between the project managers and Dr. Jordan W. Smith, Director of the Institute. There was interest in preparing a proposal detailing a visitor use study that spanned the entire Central Wasatch (Millcreek Canyon, Little Cottonwood Canyon, and Big Cottonwood Canyon) for an entire year. There was also interest in preparing a proposal that would look specifically at Little Cottonwood Canyon and be focused on estimating future use to different settings throughout the canyon under each of the alternative transportation scenarios being considered by the Utah Department of Transportation in their Environmental Impact Study. Both proposals are detailed on the following pages, but key differences are highlighted here.

**Table 1.** Comparison of the regional Central Wasatch and the Little Cottonwood Canyon Visitor Use Studies

**Central Wasatch**

**Visitor Use Study**

Study Purpose • Quantify the spatial and temporal dynamics of recreation

use throughout the Central

Wasatch

• Determine the extent to which

recreation affects key indicators

of ecological, physical, and

social resource conditions

**Little Cottonwood Canyon**

**Visitor Use Study**

• Quantify the spatial and temporal dynamics of recreation use throughout Little Cottonwood Canyon

• Determine the extent to which recreation affects key indicators of ecological, physical, and social resource conditions

• **Estimate changes in recreation use to different settings throughout Little Cottonwood Canyon under each of the alternative transportation scenarios being considered by the Utah Department of Transportation in their Environmental Impact Study**

Study Length July 2021 – June 2022 July 2021 – October 2021 (requested so that study findings could be used to inform comments by the CWC to UDOT).

Study Cost $288,212.64 $254,603.82

Seasons Included

Recreation Settings Included

Summer, Fall, Winter, Spring **Summer and Fall only** (it will not be possible to examine winter recreation in time to inform comments by the CWC to UDOT)

28 setting (9-10 per canyon) 30 settings (5-6 per trail complex within the canyon)

**Central Wasatch**

**Visitor Use Study**

**Purpose and Objectives**

The primary purpose of this project will be to characterize the ecological, physical, and social resource conditions of outdoor recreation settings within the tri-canyon region consisting of Little Cottonwood Canyon, Big Cottonwood Canyon, and Millcreek Canyon. Our objectives are to provide the diverse set of stakeholders who use and value the canyons with a scientifically grounded understanding of:

1) the spatial and temporal dynamics of current and projected outdoor recreation use; 2) the extent to which outdoor recreation activity within the canyons affects key indicators of ecological, physical, and social resource conditions; and

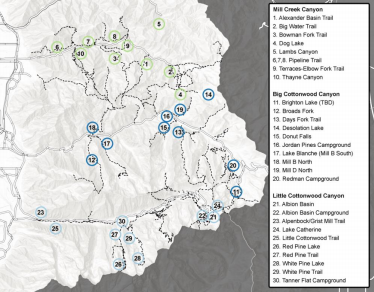
3) the likely changes in ecological, physical, and social resource conditions under projected levels of use.

Key indicators of ecological, physical, and social resource conditions are currently begin developed as part of the project’s “Phase 1” scoping effort. This scoping effort involves a gap analysis of current research and monitoring efforts within the canyons, a synthesis of existing data on ecological, physical, and social resource conditions, and interviews with key stakeholders with either an interest in, or influence over, the management of recreation resources within the canyons. The key indicators identified through Phase 1 scoping effort will be measured and monitored for a 12-month period spanning July 2021 – June 2022 to provide a comprehensive assessment of use and impacts throughout the year.

**Methodology**

***Study Regions***

Based upon our interviews with key stakeholders, we have identified 28 high-priority recreation settings for which increased use may be affecting the visitor experience or resource conditions. These settings are shown in Table 1 and Figure 1.

**Figure 1.** The five study regions within the Tri-Canyon Region. Sampling locations were based on feedback from interviewees in scoping process.

**Central Wasatch**

**Visitor Use Study**

**Table 1**. Likely sampling locations, by canyon.

Canyon and sampling location Sampling location type Type of Data Collection **Mill Creek Canyon**

1. Alexander Basin Trail Trail Trail counter; Vegetation 2. Big Water Trail Trail Trail counter; Vegetation 3. Bowman Fork Trail Trail Trail counter; Vegetation 4. Dog Lake Lake Trail counter; Vegetation; Water Quality 5. Lambs Canyon Trail Trail counter; Vegetation 6,7,8. Pipeline Trail Trail Trail counters (3); Vegetation 9. Terraces-Elbow Fork Trail Trail Trail counter; Vegetation 10. Thayne Canyon Trail Trail counter; Vegetation

**Big Cottonwood Canyon**

11. Brighton Lake (TBD) Trail Trail counter; Vegetation; Water Quality 12. Broads Fork Trail Trail counter; Vegetation 13. Days Fork Trail Trail Trail counter; Vegetation 14. Desolation Lake Lake Trail counter; Vegetation; Water Quality 15. Donut Falls Trail Trail counter; Vegetation; Water Quality 16. Jordan Pines Campground Campground Trail counter; Vegetation; Water Quality 17. Lake Blanche (Mill B South) Trail Trail counter; Vegetation; Water Quality 18. Mill B North Trail Trail counter; Vegetation 19. Mill D North Trail Trail counter; Vegetation 20. Redman Campground Campground Trail counter; Vegetation; Water Quality

**Little Cottonwood Canyon**

21. Albion Basin Trail Trail counter; Vegetation 22. Albion Basin Campground Campground Trail counter; Vegetation; Water Quality 23. Alpenbock/Grist Mill Trail Trail Trail counter; Vegetation 24. Lake Catherine Lake Trail counter; Vegetation; Water Quality 25. Little Cottonwood Trail Trail Trail counter; Vegetation 26. Red Pine Lake Lake Trail counter; Vegetation; Water Quality 27. Red Pine Trail Trail Trail counter; Vegetation 28. White Pine Lake Lake Trail counter; Vegetation; Water Quality 29. White Pine Trail Trail Trail counter; Vegetation 30. Tanner Flat Campground Campground Trail counter; Vegetation; Water Quality TOTAL 30

***Quantifying Recreation Use***

For each of these ‘high-priority’ settings, we are proposing to collect data on the amount and characteristics (i.e., group size, recreational activity, etc.) of current (2021-2022) and recent (2018 – 2021) recreation use. Data will be collected using a variety of different methods, including on-site surveys, infrared trail counters, trail cameras, pneumatic traffic counters, and mobile location data. The use of multiple data collection methodologies reflects the diversity of recreation settings found throughout the canyons (Table 2).

**Central Wasatch**

**Visitor Use Study**

**Table 2**. Purpose of different data collection methodologies that will be used to quantify recreation use. Data collection

method Setting type Purpose

On-site surveys Campgrounds, lakes, trailheads, and trails

Used to measure group size, activity type, and acceptable levels of use (an indicator of social conditions)

Infrared trail counters

Trailheads, and trails Used to measure amount of trail use

Trail cameras Trailheads, and trails Used to measure group size and activity type

Pneumatic traffic counters

Campgrounds Used to measure vehicular traffic to/from campgrounds

Mobile location data

Campgrounds, lakes, trailheads, and trails

Used to extract recent (2018 – 2021) use levels

We will be summarizing site-specific measures of recreation use to achieve the study’s first objective of characterizing the spatial and temporal dynamics of current and projected outdoor recreation use.

***Key Ecological, Physical, and Social Indicators***

For each of the study locations (Table 1), we are also proposing to collect data on ecological, physical, and social resource indicators. These indicators, which are listed in Table 3, have been developed based upon our preliminary scoping work and stakeholder interviews. Each indicator will be associated with current and projected levels of use to achieve the study’s second and third objectives of determining the extent to which outdoor recreation activity within the canyons affects key indicators of ecological, physical, and social resource conditions; and determining the likely changes in ecological, physical, and social resource conditions under projected levels of use.

**Ecological Condition Indicators.** Data for key ecological indicators will be collected through a rapid ecological assessment protocol. We will be deploying an ecological and physical assessment field team of two staff to conduct these assessments from July 2021 – June 2022. Indicators will be associated with both the amount and characteristics of current use to determine if, and to what extent, the volume and type of recreation use within the canyons affects each of the key ecological indicators.

*Outcomes*

• Summary statistics characterizing each of the ecological indicators (Table 3) for each of the sampling locations.

• Measures of association between each of the ecological indicators and

amount/characteristics of current use.

• Inference about how projected use, derived from the mobile location data and on-site counts, would likely impact each of the indicators for each sampling location.

**Physical Conditions.** Similar to the collection of data for the ecological indicators, data on the use of the canyons’ physical infrastructure will be collected by the ecological and physical assessment field team. The team will be collecting data on parking area and roadside parking use along SR201, SR190, and Millcreek Canyon Road throughout the study period. These data will be associated with both the amount and characteristics of current use to determine if, and to what extent, the volume and type of recreation use within the canyons affects parking capacity.

*Outcomes*

• Summary statistics characterizing the two physical indicators (Table 3) for all public parking locations within the canyons.

• Measures of association between each of the physical indicators and

amount/characteristics of current use.

**Central Wasatch**

**Visitor Use Study**

• Inference about how projected use, derived from the mobile location data and on-site counts, would likely impact the two physical indicators.

**Social Conditions.** We will also be deploying a social assessment field team (two full-time staff) to conduct on-site surveys across the study’s sampling locations. Data collection will run from July 2021 – June 2022 to capture a full year of use throughout the canyons. The on-site surveys will include questions on perceived crowding and conflict that are specific to each type of site.

*Outcomes*

• Summary statistics characterizing the each of the social indicators (Table 3) for each of the study’s sampling locations.

• Measures of association between each of the social indicators and amount/characteristics of current use.

• Inference about how projected use, derived from the mobile location data and on-site counts, would likely impact the social indicators.

**Table 3**. Ecological, physical, and social indicators that may be affected by recreation use. Indicator Method of measurement Frequency of measurement ***Ecological***

**Water Quality1**

*E. Coli*/coliforms Samples taken above and

Ten sites sampled weekly on random

Total Dissolved Nitrogen Nitrate

Dissolved Organic Carbon Particulate Carbon

Suspended Sediment

**Wildlife Habitat**

below trail/stream crossings and in select lakes

days throughout the study period (water quality samples *=* 624)

Habitat patch connectivity2 Satellite imagery Once (annual) **Vegetation**

Number of social trails for

sampled sites

Soil exposure for sampled sites ***Physical***

**Parking**

Rapid ecological assessment protocol

Once (annual) (rapid ecological assessment samples *=* 30)

Lot Use (stalls occupied) On-site counts Each site sampled weekly on random

On-road Use (cars parked)

***Social***

**Crowding**

days throughout the study period (parking capacity samples *=* 1,560)

Perceived Crowding On-site survey Each site sampled 10-times throughout

**Conflict**

Perceived Conflict (revealed preference; survey question)

On-site survey

the study period (estimated survey responses per site = 350)

1 Data collection and analysis follows Forrester et al., 2017.

2 Data collection and analysis follows Gutzwiller et al., 2017.

**References**

Forrester, H., Clow, D., Roche, J., Heyvaert, A., & Battaglin, W. (2017). Effects of Backpacker Use, Pack Stock Trail Use, and Pack Stock Grazing on Water-Quality Indicators, Including Nutrients, E. coli, Hormones, and Pharmaceuticals, in Yosemite National Park, USA. *Environmental Management*, *60*(3), 526–543. https://doi.org/10.1007/s00267-017- 0899-z

Gutzwiller, K. J., D’Antonio, A. L., & Monz, C. A. (2017). Wildland recreation disturbance: Broad-scale spatial analysis and management. *Frontiers in Ecology and the Environment*, *15*(9), 517–524. https://doi.org/10.1002/fee.1631

**Central Wasatch**

**Visitor Use Study**

**Study Details**

Study period: July 1, 2021 – August 31, 2022

Data collection: July, 1 2021 – June 30, 2022

Report preparation: July 1, 2022 – August 31, 2022

Study locations: 30 (10 high vulnerability sites/canyon)

**Expense Breakdown**

**Senior Personnel – Total request: $45,824.48**

Funds are requested for 1-month of summer salary for PI Smith ($10,142.27), 2-months of salary support for Co-PI Miller ($9,001.80), 2-months of salary support for Co-PI Lamborn ($8,835.77), 1- month of summer salary for Co-PI Monz ($10,764.14); and 1-month of salary release for Co-PI Rivers ($7,080.50).

**Other Personnel – Total request: $94,150.00**

*Field Technicians –* Funds are requested to support three wage hourly field technicians to conduct the ecological assessments and on-site surveys ($62,400).

*Research Assistant –* Funds are also requested to support a graduate research assistant to assist with data collection and analysis ($22,000.00).

*Lab Technician –* Funds are requested to support a lab tech. to process water quality data ($9,750.00)

**Fringe Benefits – Total request: $26,741.59**

*Senior Personnel ($21,308.39) –* Fringe benefits are requested for all senior personnel based upon Utah State University’s standard benefits rate for faculty (46.5%).

*Field and Lab Technicians ($5,433.20) –* Fringe benefits are requested for the project’s wage hourly field technicians, the lab technician, and the graduate research assistant. Fringe benefits are calculated at Utah State University’s standard benefit rate for students (0.80%).

**Equipment – Total request: $22,414.47**

*Equipment ($14,000.00) –* Funds are requested to purchase 28 TRAFx infrared trail counters.

*Water Quality Testing Materials ($8,414.47) –* Funds are requested to purchase IDEXX Colilert testing kits, trays, and filters for water quality analysis.

**Travel – Total request: $6,988.94**

*Travel ($6,988.94) –* Funds are requested to cover travel for project personnel to conduct site visits, set up trail counters, conduct the ecological assessments, and conduct the on-site surveys.

**Other Direct Costs – Total request: $92,093.16**

*Mobile Location Data ($75,000.00) –* Funds are requested to purchase multi-mode mobile location data for the study area. These historical (2018 – 2021) data will allow for projections of future use.

*Water Quality Data Analysis Costs ($17,093.16) –* Funds are requested to support analysis of water quality data at Utah State University.

**Total Direct Costs: $288,212.64**

**Indirect Costs (0%): $0**

**Total Amount Requested: $288,212.64**

**Little Cottonwood Canyon**

**Visitor Use Study**

**Purpose and Objectives**

The primary purpose of this project will be to characterize the ecological, physical, and social resource conditions of outdoor recreation settings within Little Cottonwood Canyon. Our objectives are to provide the diverse set of stakeholders who use and value the canyon with a scientifically grounded understanding of:

1) the spatial and temporal dynamics of current outdoor recreation use and future use under the alternative transportation scenarios being considered by the Utah Department of Transportation; 2) the extent to which outdoor recreation activity within the canyon affects key indicators of ecological, physical, and social resource conditions; and

3) the likely changes in ecological, physical, and social resource conditions under projected levels of use.

Key indicators of ecological, physical, and social resource conditions are currently begin developed as part of the project’s “Phase 1” scoping effort. This scoping effort involves a gap analysis of current research and monitoring efforts within the canyon, a synthesis of existing data on ecological, physical, and social resource conditions, and interviews with key stakeholders with either an interest in, or influence over, the management of recreation resources within the canyon. The key indicators identified through Phase 1 scoping effort will be measured and monitored throughout the summer and fall of 2021 in an effort to quantify these key indicators when the total volume of outdoor recreation use throughout the canyon is highest, and subsequently when key indicators of ecological, physical, and social resource conditions are likely to be affected the most.

**Methodology**

***Study Regions***

We have delineated five study regions throughout the canyon based upon the concentration and connectedness of recreational trails (Figure 1, Table 1). These study regions include:

1) the canyon entrance to Tanner Flat CG;

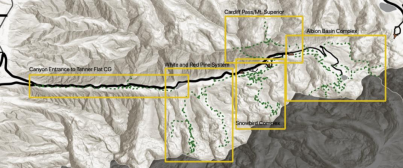
2) the White and Red Pine trail network;

3) the Snowbird Complex;

4) Cardiff Pass and Mt. Superior trails; and

5) the Albion Basin Complex.

For each of these study regions, we will be identifying five to six high-priority recreation settings for which increased use may be affecting the visitor experience or resource conditions.

**Figure 1.** The five study regions within Little Cottonwood Canyon. Study regions were defined based upon the concentration and connectivity of trails within the canyon.

**Little Cottonwood Canyon**

**Visitor Use Study**

***Quantifying Recreation Use***

For each of these ‘high-priority’ settings, we are proposing to collect data on the amount and characteristics (i.e., group size, recreational activity, etc.) of current (summer and fall 2021) and recent (2018 – 2021) recreation use. Data will be collected using a variety of different methods, including on-site surveys, infrared trail counters, trail cameras, pneumatic traffic counters, and mobile location data. The use of multiple data collection methodologies reflects the diversity of recreation settings found throughout the canyon.

**Table 1**. Purpose of different data collection methodologies that will be used to quantify recreation use. Data collection

method Setting type Purpose

On-site surveys Campgrounds, lakes, trailheads, and trails

Used to measure group size, activity type, and acceptable levels of use (an indicator of social conditions)

Infrared trail counters

Trailheads, and trails Used to measure amount of trail use

Trail cameras Trailheads, and trails Used to measure group size and activity type

Pneumatic traffic counters

Campgrounds Used to measure vehicular traffic to/from campgrounds

Mobile location data

Campgrounds, lakes, trailheads, and trails

Used to extract recent (2018 – 2021) use levels

We will be summarizing site-specific measures of recreation use to achieve the study’s first objective of characterizing the spatial and temporal dynamics of current and projected outdoor recreation use. These data will be paired with responses to a series of contingent trip taking questions asked as part of the on site survey. These questions will elicit future seasonal trip counts under each of the alternative transportation scenarios being considered by UDOT. Combining revealed (recent trips to different settings throughout the canyon) and stated (likely future trips under well defined hypothetical future scenarios, will allow us to estimate future use under the alternative transportation scenarios being considered by the Utah Department of Transportation. See Smith et al. (2010, 2016), Smith and Moore (2013), and Hestetune et al. (2018, 2020) for previous examples of the research team’s work using contingent trip taking questions to estimate future use levels under discrete hypothetical scenarios.

***Key Ecological, Physical, and Social Indicators***

For each of the study locations, we are also proposing to collect data on ecological, physical, and social resource indicators. These indicators, which are listed in Table 2, have been developed based upon our preliminary scoping work and stakeholder interviews. Each indicator will be associated with current and projected levels of use to achieve the study’s second and third objectives of determining the extent to which outdoor recreation activity within the canyons affects key indicators of ecological, physical, and social resource conditions; and determining the likely changes in ecological, physical, and social resource conditions under projected levels of use.

**Ecological Condition Indicators.** Data for key ecological indicators will be collected through a rapid ecological assessment protocol. We will be deploying an ecological and physical assessment field team of two staff to conduct these assessments from July 2021 – November 2021. Indicators will be associated with both the amount and characteristics of current use to determine if, and to what extent, the volume and type of recreation use within the canyon affects each of the key ecological indicators.

*Outcomes*

• Summary statistics characterizing each of the ecological indicators (Table 2) for each of the sampling locations.

**Little Cottonwood Canyon**

**Visitor Use Study**

• Measures of association between each of the ecological indicators and

amount/characteristics of current use.

• Inference about how projected use, derived from the mobile location data and on-site counts, would likely impact each of the indicators for each sampling location.

**Physical Conditions.** Similar to the collection of data for the ecological indicators, data on the use of the canyon’s physical infrastructure will be collected by the ecological and physical assessment field team. The team will be collecting data on parking area and roadside parking use along SR201. throughout the study period. These data will be associated with both the amount and characteristics of current use to determine if, and to what extent, the volume and type of recreation use within the canyon affects parking capacity.

*Outcomes*

• Summary statistics characterizing the two physical indicators (Table 2) for all public parking locations within the canyon.

• Measures of association between each of the physical indicators and

amount/characteristics of current use.

• Inference about how projected use, derived from the mobile location data and on-site counts, would likely impact the two physical indicators.

**Social Conditions.** We will also be deploying a social assessment field team (two full-time staff) to conduct on-site surveys across the study’s sampling locations. Data collection will run from July 2021 – October 2021. The on-site surveys will include questions on perceived crowding and conflict that are specific to each type of site.

*Outcomes*

• Summary statistics characterizing the each of the social indicators (Table 2) for each of the study’s sampling locations.

• Measures of association between each of the social indicators and amount/characteristics of current use.

• Inference about how projected use, derived from the mobile location data and on-site counts, would likely impact the social indicators.

**Table 3**. Ecological, physical, and social indicators that may be affected by recreation use. Indicator Method of measurement Frequency of measurement ***Ecological***

**Water Quality1**

*E. Coli*/coliforms Samples taken above and

Ten sites sampled weekly on random

Total Dissolved Nitrogen Nitrate

Dissolved Organic Carbon Particulate Carbon

Suspended Sediment

**Wildlife Habitat**

below trail/stream crossings and in select lakes

days throughout the study period (water quality samples *=* 624)

Habitat patch connectivity2 Satellite imagery Once (annual) **Vegetation**

Number of social trails for

sampled sites

Soil exposure for sampled sites ***Physical***

**Parking**

Rapid ecological assessment protocol

Once (annual) (rapid ecological assessment samples *=* 30)

Lot Use (stalls occupied) On-site counts

**Little Cottonwood Canyon**

**Visitor Use Study**

On-road Use (cars parked) Each site sampled weekly on random days throughout the study period

(parking capacity samples *=* 1,560)

***Social***

**Crowding**

Perceived Crowding On-site survey Each site sampled 10-times throughout

**Conflict**

Perceived Conflict (revealed preference; survey question)

On-site survey

the study period (estimated survey responses per site = 350)

1 Data collection and analysis follows (Hestetune et al., 2018, 2020; Smith et al., 2010, 2016; Smith & Moore, 2013). 2 Data collection and analysis follows Gutzwiller et al., 2017.

**References**

Forrester, H., Clow, D., Roche, J., Heyvaert, A., & Battaglin, W. (2017). Effects of Backpacker Use, Pack Stock Trail Use, and Pack Stock Grazing on Water-Quality Indicators, Including Nutrients, E. coli, Hormones, and Pharmaceuticals, in Yosemite National Park, USA. *Environmental Management*, *60*(3), 526–543. https://doi.org/10.1007/s00267-017- 0899-z

Gutzwiller, K. J., D’Antonio, A. L., & Monz, C. A. (2017). Wildland recreation disturbance: Broad-scale spatial analysis and management. *Frontiers in Ecology and the Environment*, *15*(9), 517–524. https://doi.org/10.1002/fee.1631 Hestetune, A., Jakus, P. M., Monz, C., & Smith, J. W. (2020). Climate change and angling behavior on the North shore of Lake Superior (USA). *Fisheries Research*, *231*, 105717. https://doi.org/10.1016/j.fishres.2020.105717

Hestetune, A., McCreary, A., Holmberg, K., Wilson, B., Seekamp, E., Davenport, M. A., & Smith, J. W. (2018). Research note: Climate change and the demand for summer tourism on Minnesota’s North Shore. *Journal of Outdoor Recreation and Tourism*, *24*, 21–25. https://doi.org/10.1016/j.jort.2018.10.003

Smith, J. W., & Moore, R. L. (2013). Social-psychological factors influencing recreation demand: Evidence from two recreational rivers. *Environment and Behavior*, *45*(7), 821–850. https://doi.org/10.1177/0013916512446335 Smith, J. W., Seekamp, E., McCreary, A., Davenport, M., Kanazawa, M., Holmberg, K., Wilson, B., & Nieber, J. (2016). Shifting demand for winter outdoor recreation along the North Shore of Lake Superior under variable rates of climate change: A finite-mixture modeling approach. *Ecological Economics*, *123*, 1–13.

Smith, J. W., Siderelis, C., & Moore, R. L. (2010). The effects of place attachment, hypothetical site modifications and use levels on recreation behavior. *Journal of Leisure Research*, *42*(4), 621–640. CABDirect2.

**Little Cottonwood Canyon**

**Visitor Use Study**

**Study Dates**

Study period: July 1, 2021 – December 31, 2021

Data collection: July, 1 2021 – October 31, 2021

Report preparation: November 1, 2021 – November 30, 2021

**Expense Breakdown**

**Senior Personnel – Total request: $45,835.93**

Funds are requested for 1-month of summer salary for PI Smith ($10,148.36), 2-months of salary support for Co-PI Miller ($8,999.10), 2-months of salary support for Co-PI Lamborn ($8,833.12), 1- month of summer salary for Co-PI Monz ($10,770.60); and 1-month of salary release for Co-PI Rivers ($7,084.75).

**Other Personnel – Total request: $72,150.00**

*Field Technicians –* Funds are requested to support three wage hourly field technicians to conduct the ecological assessments and on-site surveys ($62,400).

*Lab Technician –* Funds are requested to support a lab tech. to process water quality data ($9,750.00)

**Fringe Benefits – Total request: $50,407.71**

*Senior Personnel ($21,313.71) –* Fringe benefits are requested for all senior personnel based upon Utah State University’s standard benefits rate for faculty (46.5%).

*Field Technicians ($29,016.00) –* Fringe benefits are requested for the project’s wage hourly field technicians. Fringe benefits are calculated at Utah State University’s standard benefit rate for full time employees (46.5%).

*Lab Technician ($78.00) –* Fringe benefits are requested for the project’s wage hourly lab technician. Fringe benefits are calculated at Utah State University’s standard benefit rate for student employees (0.08%).

**Equipment – Total request: $22,414.47**

*Equipment ($14,000.00) –* Funds are requested to purchase 28 TRAFx infrared trail counters.

*Water Quality Testing Materials ($8,414.47) –* Funds are requested to purchase IDEXX Colilert testing kits, trays, and filters for water quality analysis.

**Travel – Total request: $6,702.55**

*Travel ($6,702.55) –* Funds are requested to cover travel for project personnel to conduct site visits, set up trail counters, conduct the ecological assessments, and conduct the on-site surveys.

**Other Direct Costs – Total request: $57,093.16**

*Mobile Location Data ($40,000.00) –* Funds are requested to purchase multi-mode mobile location data for the study area. These historical (2018 – 2021) data will allow for projections of future use.

*Water Quality Data Analysis Costs ($17,093.16) –* Funds are requested to support analysis of water quality data at Utah State University.

**Total Direct Costs: $254,603.82**

**Indirect Costs (0%): $0**

**Total Amount Requested: $254,603.82**