

# Central Wasatch Visitor Use Study

## Purpose and Objectives

The primary purpose of this project will be to provide a comprehensive understanding of outdoor recreation use as well as key ecological and physical 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:

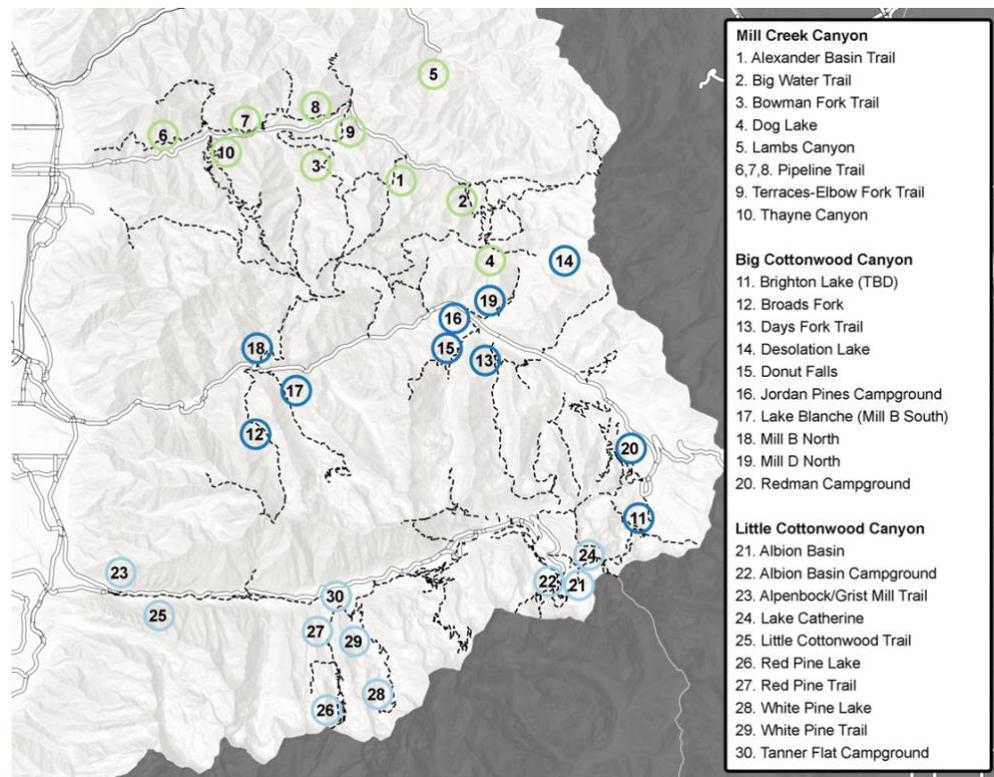
- 1) the spatial and temporal dynamics of current and projected outdoor recreation use;
- 2) the extent to which outdoor recreation activity within the canyons affects key indicators of ecological and physical resource conditions; and
- 3) the likely changes in ecological and physical resource conditions under projected levels of use.

Key indicators of ecological and physical resource conditions are currently being 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 beginning Fall 2021, pending a signed agreement between the Central Wasatch Commission and Utah State University and the procurement of a special use permit from the Uinta-Wasatch-Cache National Forest.

## 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 resource conditions. These settings are shown in Table 1 and Figure 1.



**Figure 1.** High-priority recreation settings within the Tri-Canyon Region. Settings were based on feedback from interviewees in scoping process.

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**Table 1.** High-priority recreation settings for non-winter use, by canyon.

Canyon and sampling location	Sampling location type	Type of Data Collection
<b>Mill Creek Canyon</b>		
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
<b>Big Cottonwood Canyon</b>		
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
<b>Little Cottonwood Canyon</b>		
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 infrared trail counters, 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).

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

Data collection method	Setting type	Purpose
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 and Physical Resource Indicators***

For each of the high-priority recreation settings (Table 1), we are also proposing to collect data on ecological and physical 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 and physical resource conditions; and determining the likely changes in ecological and physical 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 Fall 2021 – Summer 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.
- Inference about how projected use, derived from the mobile location data and on-site counts, would likely impact the two physical indicators.

## Central Wasatch Visitor Use Study

**Table 3.** Ecological, physical, and social indicators that may be affected by recreation use.

Indicator	Method of measurement	Frequency of measurement
<b>Ecological</b>		
<b>Water Quality<sup>1</sup></b>		
<i>E. Coli</i> /coliforms	Samples taken above and below trail/stream crossings and in select lakes	Ten sites sampled weekly on random days throughout the study period (water quality samples = 624)
Total Dissolved Nitrogen		
Nitrate		
Dissolved Organic Carbon		
Particulate Carbon		
Suspended Sediment		
<b>Wildlife Habitat</b>		
Habitat patch connectivity <sup>2</sup>	Satellite imagery	Once (annual)
<b>Vegetation</b>		
Number of social trails for sampled sites	Rapid ecological assessment protocol	Once (annual) (rapid ecological assessment samples = 30)
Soil exposure for sampled sites		
<b>Physical</b>		
<b>Parking</b>		
Lot Use (stalls occupied)	On-site counts	Each site sampled weekly on random days throughout the study period (parking capacity samples = 1,560)
On-road Use (cars parked)		

<sup>1</sup> Data collection and analysis follows Forrester et al., 2017.

<sup>2</sup> 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

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Study period: Fall 2021 – Summer 2022

Data collection: Fall 2021 – Summer 2022

Report preparation: TBD depending upon date of study commencement

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

Deliverables (*All dates are tentative depending upon date of study commencement*)

- February 1, 2022 – Interim report on fall (October, November, December) use.
- May 1, 2022 – Interim report on winter (January, February, March) use.
- August 1, 2022 – Interim report on spring (April, May, June) use.
- November 1, 2022 – Interim report on summer (July, August, September) use.
- December 1, 2022 – Final detailed report on 12-months of use.

**Central Wasatch  
Visitor Use Study**

**Expense Breakdown**

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**Senior Personnel – Total request: \$28,390.69**

Funds are requested for 2-weeks of summer salary for PI Smith (\$6,111.11), 1-month of salary support for Co-PI Miller (\$4,650.33), 1-month of salary support for Co-PI Lamborn (\$5,166.67), 2-weeks of summer salary for Co-PI Monz (\$5,382.07); and 1-month of salary release for Co-PI Rivers (\$7,080.50).

**Other Personnel – Total request: \$34,950**

*Field Technicians* – Funds are requested to support one wage hourly field technician to assist with conducting the ecological assessments (\$3,200).

*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: \$16,493.18**

*Senior Personnel* (\$13,225.33) – 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* (\$3,267.85) – 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: \$3,025.00**

*Travel* (\$3,025.00) – 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: \$197,366.49**

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

**Total Amount Requested: \$197,366.49**

## Central Wasatch Visitor Use Study

### Supplemental Study of Social Resource Conditions

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In addition to the scope of work outlined above, on-site intercept surveys can be conducted to:

- 1) determine the extent to which outdoor recreation activity within the canyons affects key indicators of social resource conditions; and
- 2) determine the likely changes in social resource conditions under projected levels of use.

We will 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 Fall 2021 to Summer 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.

Site-specific measures of use, collected via infrared trail counters, pneumatic traffic counters, and mobile location 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.

#### *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.

### Supplemental References

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- 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.

**Central Wasatch  
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**Supplemental Study Expense Breakdown**

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**Senior Personnel – Total request: \$28,390.69**

Funds are requested for 2-weeks of summer salary for PI Smith (\$6,111.11), 1-month of salary support for Co-PI Miller (\$4,650.33), 1-month of salary support for Co-PI Lamborn (\$5,166.67), 2-weeks of summer salary for Co-PI Monz (\$5,382.07).

**Other Personnel – Total request: \$49,920.00**

*Field Technicians* – Funds are requested to support two wage hourly field technician to assist with conducting the ecological assessments (\$49,920.00).

**Fringe Benefits – Total request: \$14,070.35**

*Senior Personnel* (\$9,926.99) – Fringe benefits are requested for all senior personnel based upon Utah State University's standard benefits rate for faculty (46.5%).

*Field Technicians* (\$4,143.36) – 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 hourly employees (8.30%).

**Travel – Total request: \$4,204.00**

*Travel* (\$4,204.00) – Funds are requested to cover travel for project personnel to conduct site visits and conduct the on-site surveys.

**Total Direct Costs: \$89,504.53**

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

**Total Amount Requested: \$89,504.53**