

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.

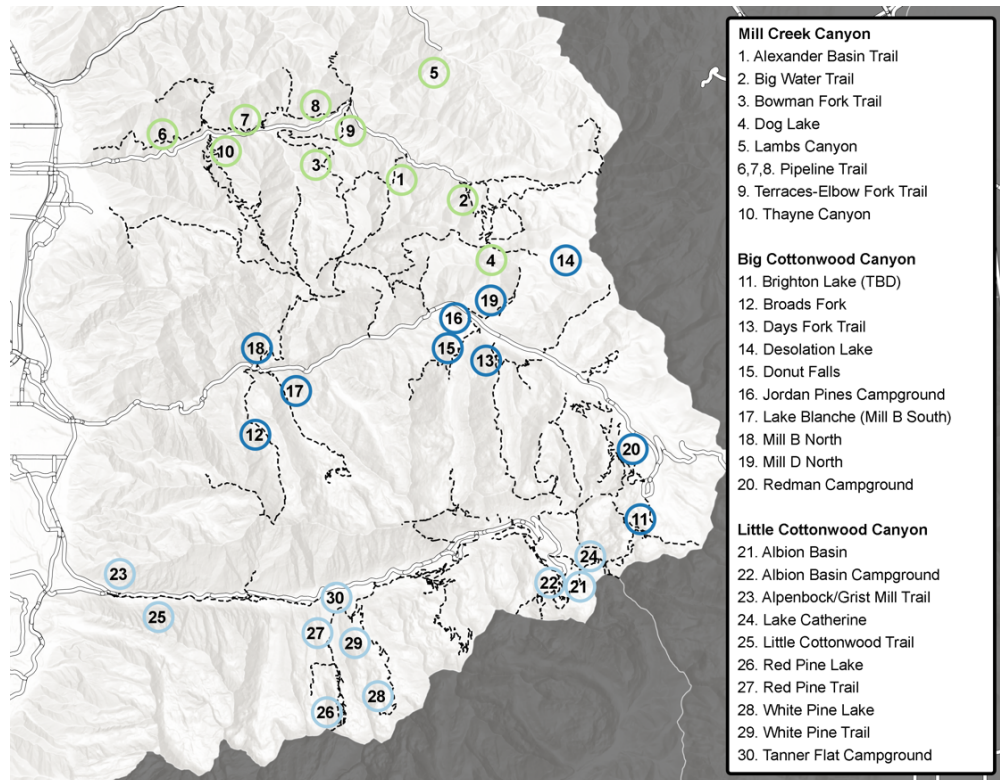


Figure 1. The five study regions within the Tri-Canyon Region. Sampling locations were based on feedback from interviewees in scoping process.

Central Wasatch Visitor Use Study

Table 1. Likely summer and fall 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

Central Wasatch Visitor Use Study

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. 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 (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

Central Wasatch Visitor Use Study

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.

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
<i>Ecological</i>		
Water Quality¹		
<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		
Wildlife Habitat		
Habitat patch connectivity ²	Satellite imagery	Once (annual)
Vegetation		
Number of social trails for sampled sites	Rapid ecological assessment protocol	Once (annual) (rapid ecological assessment samples = 30)
Soil exposure for sampled sites		
<i>Physical</i>		
Parking		
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)		
<i>Social</i>		
Crowding		
Perceived Crowding	On-site survey	Each site sampled 10-times throughout the study period (estimated survey responses per site = 350)
Conflict		
Perceived Conflict (revealed preference; survey question)	On-site survey	

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

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

Central Wasatch Visitor Use Study

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.

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)

Deliverables:

- November 1, 2021 – Interim report on summer (July, August, September) use.
- 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.
- September 1, 2022 – Final detailed report on 12-months of use.

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.

**Central Wasatch
Visitor Use Study**

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