



DRAFT Prospectus September 2019

A Comprehensive evaluation of the recreational capacity of Big Cottonwood and Little Cottonwood Canyons to inform recreational systems and visitor use management

The Project Purpose and Need

This prospectus describes a proposed research project between the University of Utah’s Outdoor Recreation, Education and Tourism Laboratory, and the Central Wasatch Commission. The purpose of this project is to evaluate and determine Big and Little Cottonwood Canyon’s

- a. Current and ideal temporal and spatial distributions of recreational visitor use;
- b. Determine the relationships between use patterns and the ecological and social conditions in key locations (including but not limited to trails, visitor attractions, and trailheads); and,
- c. Determine necessary social, ecological, and physical inputs for visitor capacity and transportation modeling.

Ultimately this project will provide results to help manage the amounts and types of use to achieve desired conditions. Specifically, the results of this project will provide information for managers and associated decisions-makers to assist in the management of each Canyon prescriptively for different physical, ecological, and social conditions, to plan for and achieve an ideal transportation system, increase recreation quality, appropriately distribute use, and plan for increased recreational visitation while preserving desired conditions.

The approach and concepts described in this document are underpinned by and directly align with the Interagency Visitor Use Management Council’s a) Visitor Use Management Framework, and b) Visitor Capacity Guidebook (IVUMC, 2016, 2019). The U.S. Forest Service is a council member and has embraced the content of the framework and capacity guidebook to guide current and future visitor use management in forests and grasslands. The IVUMC defines visitor capacity as “...the maximum amounts and types of visitor use that an area can accommodate while achieving and maintaining the desired resource conditions and visitor experiences that are consistent with the purposes for which the area was established” (IVUMC, 2019, p. 33).

Using the IVUMC framework and processes, this project will be the first in the Canyons to comprehensively analyze and determine the current conditions and ideal visitor capacity. Also different from previous studies, this project will evaluate the current temporal and spatial distributions of use, while generating the necessary inputs for transportation modeling, including pedestrian modeling. As described below, this information is necessary to ensure that infrastructure and management alterations in Big and Little Cottonwood Canyons are legally defensible, sensitive to constituent needs, and incorporate future visitor use projections while preserving desirable and high-quality conditions.

We intend for this prospectus to provide the foundation for in-depth conversation with relative stakeholders and the Central Wasatch Commission. Following these conversations, this prospectus will be revised into a formal proposal with a detailed budget, and specific timelines for negotiated deliverables. The current prospectus briefly outlines a) the background and rationale for the project, b) general research approach, c) desired data, d) potential deliverables, and e) a proposed timeline.

Background and Rationale

Interdependence between transportation and recreation

As outlined in the Mountain Accord's Existing Conditions and Future Trendlines Report, transportation, environmental conditions, recreation use, and the economy are intricately linked and interdependent (Mountain Accord, 2014). Specific to the work outlined in this prospectus, transportation and recreational visitor use within the Canyons are reciprocal. For example, the attributes of current transportation systems directly influence the quality of Canyon-based experiences, temporal and spatial distributions of use, air quality, pollution, and seasonal crowding. Consequently, without empirical research that incorporates both transportation and recreation, planning for and managing one domain may be misinformed and negate the goals of the other. This point appears well-supported by multiple CWM stakeholders and decision-makers who conclude,

“Currently, personal vehicles constitute the primary mode of access to recreation locations, severely stressing the transportation network on peak volume days and creating conflicts with other road users, such as road bikers. Increases in use will make access more difficult, even on days that experience average traffic volumes, and will potentially limit recreation participation in the future” (p. 12) and “...if actions are not taken to provide high quality recreation experiences for increasing numbers of users recreation experiences will begin to decline due to crowding, conflicts between user groups, environmental impacts, traffic and parking congestion, and degrading infrastructure” (Mountain Accord, 2014, pgs. 9, 12).

These reciprocal relationships are not new, however, are often neglected by planners and managers due to information deficits born from a lack of comprehensive studies that incorporate both transportation and recreational analyses (Manning et al., 2012). Therefore, this study proposes to evaluate recreation and to integrate associated transportation data comprehensively to inform and ultimately defend decisions and management of these areas.

Connection to transportation and recreation capacity

Inherent in these reciprocal relationships between transportation and recreation is the concept of visitor capacity, which is the maximum amount and type of recreation use that can be accommodated without unacceptable impacts to social, ecological, and environmental conditions. Capacity can be social, physical, and ecological, and this study will incorporate all three. Social elements are subjective and describes a threshold or range of conditions that are acceptable and desired, such as ‘no more than 10 people within view at one time’ or ‘no more than 3 minutes waiting for a parking spot.’ When conditions remain within a social or experiential capacity, the quality of the recreation experience is maintained, provided the ecological system is also sustained. However, without understanding preferences for these conditions, managers do not have defensible information for limiting use or other management actions (Manning, 2009). Physical elements are more objective and is the threshold that existing infrastructure can accommodate specific levels of use, such as the number of parking spaces in a lot or the number of sites

in a campground (Elsworth, 2011). Ecological capacity involves assessing the resilience and resistance of specific ecosystem elements, including endemic species, related to recreational use.

Social, physical, and ecological elements must be considered and ultimately aggregated when evaluating current conditions and identifying management objectives for ideal conditions. Recreational capacity and transportation are inextricably and intimately linked and the authors of the transportation and recreation sections in the Existing Conditions and Future Trendlines Report seem to agree, stating,

“Anticipated future trends including climate change, land use development (e.g., residential and ski resort expansion), and population growth will concentrate recreation users into smaller areas, increasing crowding and conflicts. Many of the high-quality areas for different recreation activities overlap, which increases conflicts between different user groups during high use days. As the use of these areas increases, user conflicts will intensify, diminishing the quality of future recreational experiences” and “in the Cottonwood Canyons, parking is at or near capacity on peak winter days (15-20 days per year). Parking is also a problem near recreation access points during peak summer periods.” (Mountain Accord, 2014, pgs. 2, 10).

Effective studies evaluating use in these Canyons must address these linkages in order to comprehensively analyze recreational capacities, which our proposed study intends to accomplish.

Analysis areas, management zones and available space

The interdependence between transportation, capacity, and recreation quality is complicated because the relationships between all three differ between settings, forest zones, and recreational activity groups (Manning, 2009). Key decision-makers and stakeholders seem to agree and state,

“The setting in which recreation occurs plays a critical role in the enjoyment of recreational activities. Each area within the Central Wasatch has a unique balance of different settings, which support these activities. Future land use development and increasing use in these areas can modify the setting and character, upsetting the delicate balance of recreation uses.” (Mountain Accord, p.11).

In order to identify and implement management strategies without interrupting this balance, it is important to consider that visitor capacity differs between management zones (e.g., wilderness areas vs. front country areas) and analysis areas (e.g., specific section of trail that receives high use) due to existing space, use and travel patterns, infrastructure, desired conditions, and setting considerations, which this research will address.

Research Approach

Apparent in the remarks above is the fact that visitor capacity and transportation are inherently linked, and that the relationships between all these must be considered within and across different types of settings and zones. Consequently, our research approach directly addresses this interplay and will identify and summarize available current indicators for temporal and spatial distributions of recreational visitor use; propose social, ecological, and physical thresholds; and develop necessary social and physical inputs for transportation modeling, and transportation timing, routing, and features. To accomplish this,

researchers will use a two-phased approach, incorporating a management-by-objectives framework, indicators and thresholds of quality, current distributions of use, and transportation modeling, described below.

Phase I: September – May, 2019-2020

- A. Review Existing Direction and Knowledge: Gap Analysis of Current Recreation Research and Monitoring in the Uinta-Wasatch-Cache National Forest

In order to uncover current knowledge concerning visitation within the Uinta-Wasatch-Cache National Forest, specifically as it applies to Big Cottonwood and Little Cottonwood Canyons, we will synthesize data that has been gathered between years 2000-2019. We will identify key results and findings and how they interact to inform visitor capacity in the canyons. The research synthesis will not seek to support or refute any hypotheses, build theory, or evaluate the impacts of the evidence using meta-analytic techniques (i.e., effect size). Instead, we will identify subthemes based on the constructs and issues identified in seminal works (e.g., Manning 2011) and by senior researchers. We will utilize the results to identify where we have solid data which can be utilized in a visitor capacity analysis approach and where there are data gaps. During this step, we will also review applicable policy, current monitoring efforts, and existing triggers for management action. This effort would culminate in a workshop designed to identify future research needs to move visitor capacity forward in the canyons.

Specifically, within the gap analysis we will:

- a. Review Big and Little Cottonwood Canyon applicable management legislation (USFS ROS Management Direction, wilderness areas), agency policies, and any other management direction for the Canyons (i.e., water quality, etc.);
- b. Assess and summarize existing information and current conditions as they relate to social, ecological, and physical capacity, including but not limited to: visitor use studies, monitoring results, academic theses and dissertations, reports by consultants, transportation data, water quality data, and wildlife monitoring data, etc.;
- c. Assess and summarize existing information and current conditions as they relate to sociodemographic and geographic trends and variations of existing user groups, with particular attention given to racial, ethnic, and socioeconomic analyses of current use of the Canyons; and,
- d. Develop an assessment and stakeholder-informed project plan for missing data needs.

Post understanding current information, data needs for addressing capacity components will be outlined and next steps for obtaining additional data needs will be proposed. Briefly, should significant data gaps exist, we would propose a data collection plan for 2020-2021, covering four seasons.

Phase I - Deliverables

Phase I of the capacity analysis proposes several deliverables, 1) a detailed report, including sections for an executive summary, results tied to capacity information available and any data gaps, with proposed resolutions for securing those gaps, and detailed recommendations for next steps.

Personnel: 1 full time graduate student for 1 year, 1 faculty for oversight and direction, and CWC staff to assist in securing available studies and information.

Estimated Cost: \$30,000, inclusive of Phase I report, workshop organization, and all deliverables.

*Note: Details, including costs associated with Phase II would be detailed once Phase I has been completed and results are presented to the group.

Note: After completion of Phase I, next steps would likely include the following:

Phase II: Visitor Capacity (1 year in duration, 4 seasons)

A. Existing conditions: Evaluating current use and physical capacity

One approach to begin understanding visitor capacity is to fully evaluate current use levels, and the spatial and temporal distributions of recreational use across and within different forest zones. Simultaneously, it is important to understand how existing infrastructure contributes to current physical capacity. Understanding both current use and existing physical capacity helps identify the timing and frequency of when infrastructure may be at capacity (e.g., days of week and times of day that a parking lot is full). Furthermore, knowing where visitors are going, how they are getting there, and how much time is spent in specific locations (i.e., distribution) helps identify how travel patterns and recreational choices contribute to congestion and user density, and where and when current infrastructure is inadequate (Beeco and Brown, 2013). Finally, this research acknowledges that all Canyon users are not monolithic, and that different social and recreational user groups likely engage with the Canyons differentially. Evaluating current use, as well as the non-use of Canyon resources, will contribute to understanding complex issues of social equity that are associated with uneven social and spatial preferences, uses, and trends.

B. Analysis areas and limiting attributes: Indicators of quality and their associated thresholds (ecological/social)

Through information secured through an understanding of current use and existing physical capacity, and the synthesis of the previous Gap Analysis, with stakeholders, we can begin identifying analysis areas and setting objectives for desired resource conditions and the quality of the visitor experience within these areas of concern and other areas (e.g., Management-by-Objectives). These objectives must be expressed in a manner that can be used efficiently, and easily applied by managers, which is accomplished by identifying and using indicators and thresholds of quality. Indicators are manageable and measurable proxies for desired social, ecological or physical conditions (e.g., time waiting for a parking space at a trailhead) and thresholds are the minimal acceptable condition of the indicator variable (e.g., 5 minutes). If indicators are outside the scope of managers' control (e.g., weather), then there may be little reason to focus on them in the context of a management planning effort. Effective thresholds are expressed in a quantitative manner, are bounded by time and/or space (e.g., per day, per mile of road), include some allowances for random or unusual circumstances, focus directly on impacts of concern, and are realistic (Hallo & Manning, 2011). Again, attention will be given to the social trends of Canyon use and the non-

use of the Canyons by particular racial, ethnic, immigrant, and socioeconomic groups, as well as the geographic distribution of users and non-users.

By identifying visitors' most important indicators of quality and their associated thresholds, managers can prescribe specific objectives that guide their decision-making related to capacity for areas of concern and other forest zones.

In addition, during this step, we will host a series of workshops with managers to identify the limiting attribute for each analysis area. The limiting attribute is the social, ecological, or physical element in the analysis area that constrains the ability to accommodate visitor use. For example, the IVUMC states that "the limiting attribute could range from specific (e.g., encounter rates every ¼ mile of trail) to more general (e.g., sense of crowding as perceived by visitors) (IVUMC, 2019, p. 34).

C. Transportation

Indicators, thresholds, current use, and existing physical capacity are the primary inputs into a comprehensive quantitative and visual transportation and pedestrian model, which allows for an objective evaluation of the current Big and Little Cottonwood Canyon's transportation system's deficits and attributes. Incorporating these inputs into a transportation model allows for managers and researchers to manipulate variables in the model (e.g., number of shuttles, shuttle stops, size of parking lots, and opening access to other areas). After manipulating the model, managers and researchers can identify if the resulting outputs may produce conditions that violate visitors' thresholds for conditions, exceed physical capacities, and stress the overall system. The product is a range of transportation and development options that managers can further explore, implement, and monitor over time for idealized conditions.

D. Identify capacity, allocation, and identify management strategies

In this step, we will leverage data and workshop results to identify appropriate capacities for each analysis area while aggregating these capacities to understand overall capacity. Stemming from this work, we will host a series of workshops that allow managers to determine the ideal allocation of visitor use in each analysis area and ultimately within each canyon. Allocations may be determined for day visitors, overnight visitors, commercial operators, and other visitor use groups. Furthermore, in these workshops will help managers identify relevant strategies and management triggers that could be enacted to achieve and maintain desired conditions. Finally, we will use the material from this step to develop a monitoring protocol following the IVUMC Monitoring Guidebook (IVUMC, 2019b).

Researchers will accomplish this approach using the steps described below. We briefly describe the research tools within each phase, which will be clarified further in a subsequent draft and full proposal after initial conversations with stakeholders and the Central Wasatch Commission.

Step I: Evaluating current levels of and distribution of use

GPS visitor tracking, parking lot traffic and trail counts, time-lapsed photography

Step II: Identifying current physical and ecological capacity elements

Evaluating existing infrastructure capacity and ecological indicators, and when and where capacity is reached through combining Step I data with GIS analysis

Step III: Identifying most salient indicators of quality experiences and their associated thresholds
Interviews and then questionnaires using visual and normative methods
Step IV: Work with UDOT/CWC to incorporate findings into transportation modeling
Step V: Work with the USFS/CWC to design an implementation and monitoring plan

Prepared by:
Dr. Kelly Bricker
Dr. Jeff Rose
University of Utah

Dr. Matthew Brownlee, Clemson University
Dr. Ryan Sharp, Kansas State University