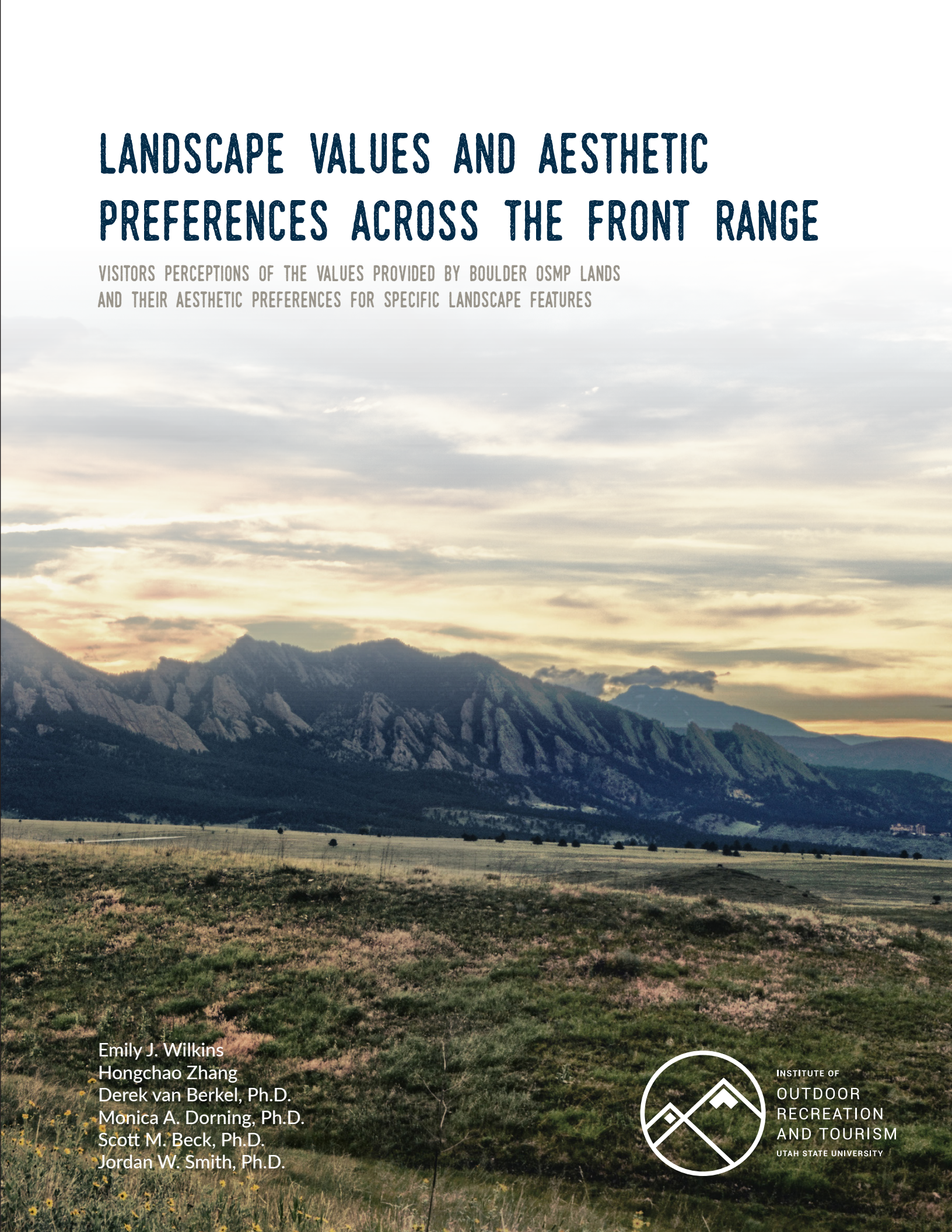
LANDSCAPE VALUES AND AESTHETIC PREFERENCES ACROSS THE FRONT RANGE

VISITORS PERCEPTIONS OF THE VALUES PROVIDED BY BOULDER OSMP LANDS AND THEIR AESTHETIC PREFERENCES FOR SPECIFIC LANDSCAPE FEATURES



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PURPOSE

Boulder's Open Space and Mountain Parks (OSMP) lands are managed to provide a diverse set of benefits valued by Boulder's residents as well as tourists. Not all OSMP lands provide the same set of benefits however. For example, the rock-outcroppings of the Flatirons may serve a much different purpose than the agricultural lands east of the city. Understanding how the values associated with OSMP lands vary across the region can provide managers with insights into how best to allocate resources so that they yield the maximum public benefit. In addition to an understanding of the values visitors associate with OSMP lands, management can benefit from knowledge of how different features of the landscape impact user experiences, both positively and negatively. The objectives of this study were to:

1. investigate the values visitors associate with OSMP lands; and
2. characterize the specific landscape features that affect visitors' experiences on Boulder OSMP lands.

METHODS

Data were collected via a questionnaire administered to visitors at sampled OSMP trailheads between May 22, 2018 and June 14, 2018. Sampling was stratified across six different landscape character areas (*foothills*, *peaks and unique topography*, *remote lands*, *grasslands*, *plains*, and *water*) that Boulder OSMP uses to classify the public lands they manage. We collected 537 complete questionnaires, with the sampling effort yielding an overall response rate of 84.3%.

RESULTS

Our findings suggest the values associated with Boulder OSMP lands vary by landscape character area, sometimes in dramatic ways. For example, visitors generally associate historic and cultural values with the *foothills* and *water* landscape character areas. However, historic and cultural values are not as strongly associated with the *grasslands* landscape character area. This finding suggests investments in historical and cultural interpretation would be more appreciated in the *foothills* and *water* landscape character areas, as opposed to the *grasslands* landscape character area.

Our results also shed light on how specific landscape features affect visitors' experiences on Boulder OSMP lands. Again, visitors' landscape preferences varied highly across the landscape character areas. Some landscape features, like development (e.g., residential, industrial, and commercial), have a moderately negative impact on the outdoor recreation opportunities offered in some landscape character areas, and a substantial negative impact in others. For instance, visitors to the *peaks and unique topography* landscape character areas reported that seeing residential, industrial, and commercial structures only had a marginally negative influence on their experiences. However, visitors to the *water* or *grasslands* landscape character areas reported that seeing development had a major negative impact on their experiences. This information allows managers to pinpoint specific aesthetic components of the visual landscape that can either be emphasized or avoided in future management actions.

The values associated with Boulder OSMP lands vary by landscape character area

INTRODUCTION

Research Aim

Boulder's Open Space and Mountain Parks (OSMP) lands are managed to provide a diverse set of benefits that are valued by Boulder's residents as well as tourists. These benefits range from protecting the region's ecological health (e.g., maintaining freshwater quality), to supporting the lifestyles of residents and visitors (e.g., providing places to engage in desired outdoor recreation activities). However, not all OSMP lands provide the same set of benefits. For example, the rock-outcroppings of the Flatirons may serve a much different purpose than the agricultural lands east of the city. The aesthetic and biophysical characteristics of these landscapes influence the values users associate with them. Understanding how the values associated with OSMP lands vary across the region can provide managers with insights into how best to allocate resources to yield the maximum public benefit. A better understanding of the values associated with OSMP lands can also help managers decide where to target future land acquisitions based on specific needs. In addition to knowledge of the values visitors associate with OSMP lands, management can benefit from an awareness of how different landscape features impact user experiences, both positively and negatively. This information allows managers to pinpoint specific components of the visual landscape that can either be emphasized or avoided in future management actions, such as trail rerouting. The objectives of this study are to:

1. investigate the values visitors associate with OSMP lands; and
2. characterize the specific landscape features that affect visitors' experiences on Boulder OSMP lands.

The findings presented here are part of a larger project, *Identifying the Benefits of Cultural Resources and Iconic View Through Social Media*, which broadly compares visitor preferences for landscape features on OSMP lands to the landscape features found in photographs posted on social media. Our additional analysis of social media photographs will further contextualize public appreciation of these diverse lands and evaluate the landscape features that are valued most by visitors.

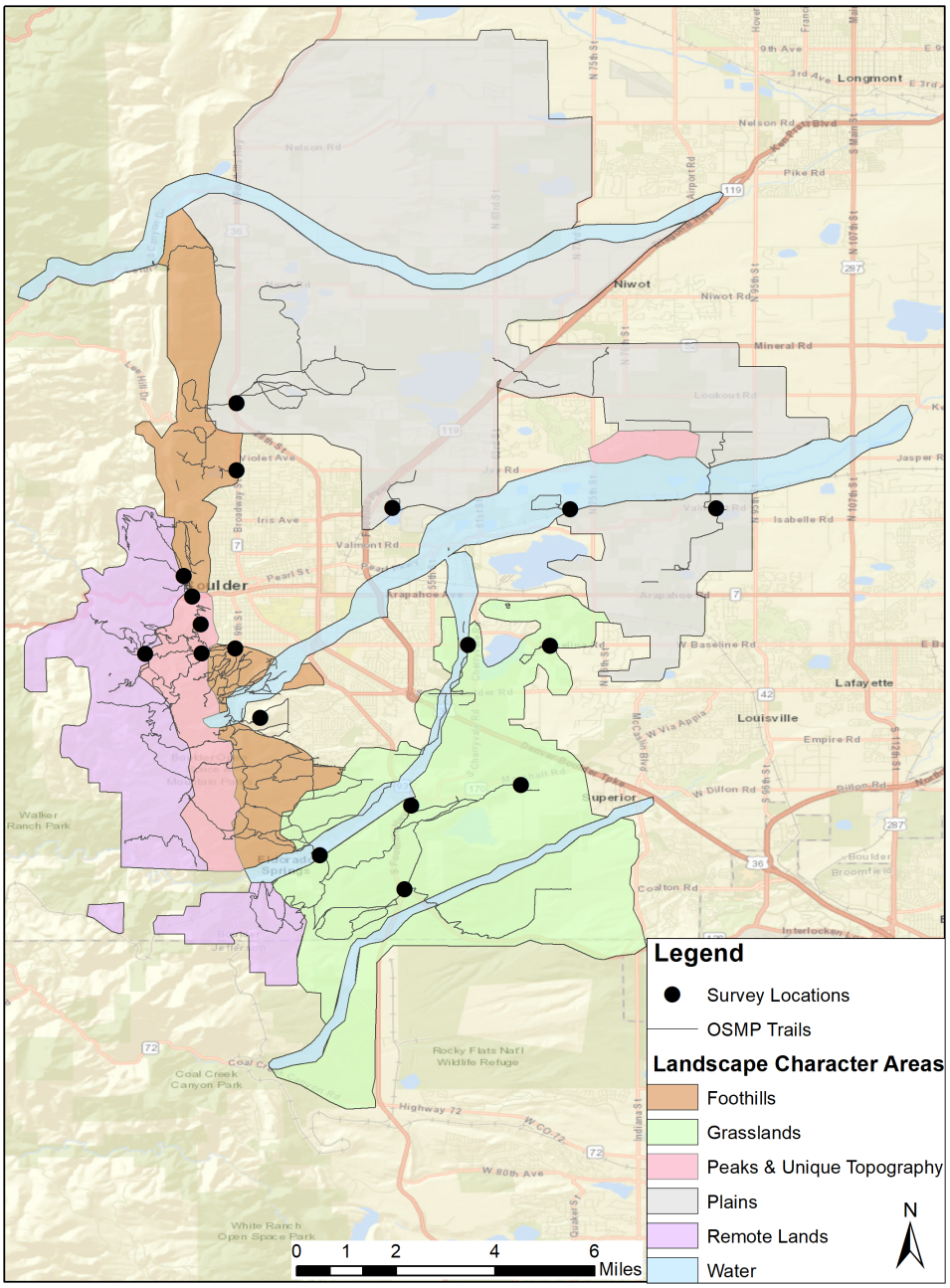

Figure 1. The Six Distinct Landscape Character Areas of Boulder OSMP Lands and Associated Survey Locations

Study Area

Boulder OSMP lands provide valuable cultural ecosystem services to the public, serving as places for recreation, relaxation, and inspiration. Scenic landscapes, like those managed by OSMP, improve overall psychological and emotional well-being and contribute to physical health through opportunities for exercise (e.g., Dorning et al., 2017; Seresinhe et al., 2015; Tieskens et al., 2017; van Zanten et al., 2016). Boulder OSMP managers have identified six distinctive landscape character areas within their jurisdiction (Figure 1). These include:

1. foothills;
2. peaks and unique topography;
3. grasslands;
4. plains;
5. remote lands; and
6. water.

We use these landscape character areas to frame our analysis. Doing so allows us to determine if visitors derive different benefits from Boulder OSMP lands, depending upon which type of area they choose to visit.

METHODS

Survey Questionnaire

To determine the values associated with each of the six different landscape character areas, we collected data through an on-site questionnaire administered in-person at systematically sampled trailheads across OSMP lands (Figure 1). In order to encourage participation and limit the burden placed on respondents, the questionnaire was designed to be succinct (two pages). Visitors were asked to rate the importance of different values provided by OSMP lands at the specific landscape character areas visited. Survey questions were designed based on previously tested methods for eliciting landscape values (Brown, Reed, & Harris, 2002). Visitors were also asked about how viewing different landscape features impacted their recreation experience. We provided a list of features frequently pictured in social media photographs on OSMP land and each respondent was asked to indicate how those features affected their experiences. Additionally, visitors were offered an opportunity to identify and write-in other features that were not included in the predefined list, but impacted their experience. The questionnaire also inquired about respondents' personal characteristics (e.g., age, gender, education, etc.) as well as the nature of their trip (e.g., group size, trip length, etc.). The survey questionnaire was approved by the Utah State University Institutional Review Board. The full questionnaire is provided in Appendix A.

Sampling Design

On-site questionnaires were distributed at eighteen OSMP trailheads between May 22, 2018 to June 14, 2018. Survey locations were selected using a stratified sampling approach based on the six OSMP landscape character areas (*foothills*, *peaks and unique topography*, *remote lands*, *grasslands*, *plains*, and *water*). We identified survey locations for targeted sampling using a spatial cluster analysis of geotagged *Flickr* and *Panoramio* posts from 2006 to 2014. We performed the cluster analysis on each landscape character area, identifying the three or four most prominent clusters within each area. For each cluster, we identified the most popular trailhead providing access to the trails included within the cluster. We consulted with OSMP staff to refine these sampling sites based on accessibility (open and popular for the season and capable to host the survey respondents) and recreational use (sites that would draw both active and passive recreationists).

The cluster analysis yielded 20 sampling locations. These sampling locations were then randomly assigned to sampling days and times. We ensured each landscape character area was sampled at least twice on weekdays and at least once on weekends. The sampling times were either in the morning (8am to 2pm) or afternoon (2pm to 8pm). Appendix B lists all survey sites and response rates.

Data Collection

We obtained permission from Boulder OSMP administrative staff to administer an on-site questionnaire at sampled trailhead locations. Recruitment protocols were reviewed by the research team to ensure consistent language and style was used in selecting respondents and obtaining consent to participate in the survey. In order to participate in the survey, respondents had to be over the age of 18. The adult in each group with a birthday closest to the day of the survey was selected to participate when a group was intercepted.

Table 1. Percent of the Sample from Each Landscape Character Area

Landscape Character Area	*n*	%
Foothills	138	26.5
Peaks & Unique Topography	88	16.9
Grasslands	57	11.0
Plains	86	16.5
Remote Lands	83	16.0
Water	68	13.1
TOTAL	**520**	

Respondents completed a paper questionnaire at the selected sampling site and their responses were entered into Qualtrics by the research team once all on-site data collection efforts were completed. The on-site research assistant recorded the number of visitors who declined to participate each day. Souvenirs and local maps were provided by Boulder OSMP as incentives to encourage participation.

Data Management and Analysis

All data were evaluated for completeness and errors, then uploaded into SPSS v.25 for analysis. We flagged and omitted 17 responses from our dataset in cases where respondents returned an incomplete survey or marked every item with the same response option. Descriptive statistics were used for the analyses presented in this report.

FINDINGS

Response Rate

The overall response rate was 84.3%, with 537 people responding to the survey, and 100 people refusing (Appendix B). Some surveys were not complete/usable (n = 17), so the final survey count of 520 represents an 81.6% response rate. The *foothills* landscape character area had the highest representation, and the *grasslands* area had the lowest representation (Table 1).

Table 2. Demographic Characteristics as Percentage of the Sample

	Category	*n*	%
Boulder Resident	Yes	238	46.6
	No	273	53.4
Age	18-29	111	22.0
	30-44	157	31.2
	45-65	185	36.7
	65+	51	10.1
Education	Less than a Bachelor's	59	11.7
	Bachelor's	222	43.9
	Master's	141	27.9
	Professional	27	5.3
	Doctoral	57	11.3
Household Income	< $50k	115	24.2
	$50k – $75k	61	12.8
	$75k - $100k	67	14.1
	$100k - $150k	91	19.1
	$150k - $200k	70	14.7
	$200k +	71	14.9
Race/Ethnicity*	White/Caucasian	452	91.5
	Asian	31	6.3
	Hispanic or Latino	24	4.9
	African American	8	1.6
	Other	4	0.8
Gender	Male	259	51.2
	Female	247	48.8
	Other	0	0.0

*Race categories are not mutually exclusive and therefore do not sum to 100%; out of 494 responses.

Table 3. Trip Characteristics as a Percentage of the Sample

	Category	*n*	%
Number of people in the group	1	250	48.1
	2	173	33.3
	3	45	8.7
	4	19	3.7
	5 - 12	32	6.2
Relationship with others in the group	Immediate family	179	34.4
	Friends	120	23.1
	Extended family	19	3.7
	Other	16	3.1
Number of hours spent at the site on the day intercepted	0.5	29	5.6
	1.0	141	27.1
	1.5	51	9.8
	2.0	179	34.4
	2.5	13	2.5
	3.0	57	11.0
	4.0 – 6.0	43	8.3
	7.0 +	1	0.2
Did you know this area was managed by City of Boulder OSMP?	Yes	401	77.4
	No	117	22.6
Activities the group participated in on the day intercepted*	Hiking/walking	422	81.5
	Photography	145	28.0
	Sightseeing	139	26.8
	Other	126	24.3
	Wildlife/birdwatching	93	18.0
	Picnicking	18	3.5
	Visiting historical/ archaeological sites	9	1.7

*Activities are not mutually exclusive and therefore don't sum to 100%; out of 518 responses.

Overall Findings

Survey respondents' demographic characteristics are described in Table 2. Slightly under half of the sample lived within Boulder. About half of the sample was between the ages of 18 to 44, with a mean age of 44.1; respondents ranged in age from 18 to 79. Almost 90% of the sample had a bachelor's degree or higher. The sample was predominately white and was very slightly more male than female.

Nearly half of the sample were visiting OSMP alone (Table 3). One-third were visiting with one other person. Most people who were traveling with others were with either immediate family or friends. The majority of the sample was planning to spend two hours or less during their visit to OSMP that day. Slightly more than three-fourths of the sample (77.4%) was aware the area they were visiting was managed by the City of Boulder OSMP. The majority of respondents were hiking during their visit, with photography also being popular. Those who stated doing an activity not listed in the predefined

Table 4. Percentage of the Sample Taking Photos During Their Visit and Sharing Them on Social Media

	n	%
Will you take photos today?		
Yes	318	61.3
No	201	38.7
Of those who took photos:		
Proportion who will share them on social media		
Yes	236	74.7
No	80	25.3
Of those who will share their photos on social media:		
The platforms they will share them on		
Instagram	155	65.7
Facebook	140	59.3
Other	27	11.4
Twitter	15	6.4
Flickr	3	1.3

Table 5. Perceived Importance of Different Landscape Values as a Percentage of the Sample

	n	Not important at all	Not that important	Neutral/ unsure	Slightly important	Very important
Biological Diversity	516	0.2	0.0	5.4	22.5	71.9
Therapeutic	516	0.0	0.0	2.1	12.0	85.9
Economic	515	6.8	9.1	27.4	23.1	33.6
Spiritual	515	5.6	4.9	23.5	21.7	44.3
Recreational	516	0.0	0.2	2.7	11.6	85.5
Aesthetic	516	0.0	0.0	1.6	8.5	89.9
Historical and Cultural	514	1.0	2.9	19.8	33.3	43.0
Other	21	0.0	4.8	28.6	0.0	66.7

Figure 2. Sunrise from Eldorado Canyon (Photo: Max and Dee Bernt)

Table 6. The Effect of Specific Landscape Features on Recreation Experiences as a Percentage of the Sample

	n	Major negative impact	Slight negative impact	Neutral/ Did not see	Slight positive impact	Major positive impact
Unique rock formations (stone slab, outcrops, etc.)	497	0.0	0.0	13.1	19.5	67.4
Forested areas	502	0.2	0.0	6.4	22.7	70.7
Open plains and grasslands	511	0.0	0.2	7.4	29.2	63.2
Water (wetlands, lakes, and streams)	508	0.0	0.4	15.0	17.1	67.5
Old or historic buildings/structures	485	0.0	0.6	54.2	22.7	22.5
Infrastructure (fences, power lines, water tanks, etc.)	493	12.0	40.8	35.3	5.1	6.9
Development (residential, industrial, and commercial)	490	18.8	31.0	38.4	7.1	4.7
Other people	508	0.8	11.4	33.9	37.8	16.1
Plants and other vegetation	508	0.0	0.0	4.7	28.9	66.3
Agricultural land	493	0.6	4.9	42.8	24.9	26.8
Other	33	3.0	3.0	15.2	3.0	75.8

list were most frequently biking (n = 45) or running (n = 29).

Over half of the sample took photos during their visit to OSMP on the day they were intercepted, and of those who took photos, three-fourths (74.7%) planned to share them on social media (Table 4). The most popular platforms to share photos from OSMP lands were *Instagram* and *Facebook*. Those who planned to share photos on any other platform than those listed on the predefined list most frequently reported using *Strava* (n = 9) or *Snapchat* (n = 5).

The majority of the sample believed that all of the values listed in the survey that are provided by OSMP were important, with aesthetic, recreational, and therapeutic values eliciting the most positive responses (Table 5).

The majority of visitors reported that seeing unique rock formations, forested areas, open plains and grasslands, water, plants and other vegetation, and agricultural

Table 7. Demographic Characteristics as a Percentage of the Sample Within Each Landscape Character Area

	Category	Foothills (%)	Peaks & Unique (%)	Grasslands (%)	Plains (%)	Remote Lands (%)	Water (%)
Do you live in Boulder	Yes	44.5	34.9	54.4	57.1	46.3	46.3
	No	55.5	65.1	45.6	42.9	53.8	53.7
Age	18-29	24.3	40.0	14.0	6.0	26.9	15.4
	30-44	33.8	28.2	28.1	18.1	39.7	38.5
	45-65	30.9	24.7	45.6	56.6	30.8	38.5
	65+	11.0	7.1	12.3	19.3	2.6	7.7
Education	Less than a Bachelor's	9.0	20.9	5.3	12.8	9.1	12.1
	Bachelor's	42.5	39.5	47.4	40.7	61.0	33.3
	Master's	27.6	22.1	29.8	24.4	22.1	45.5
	Professional	7.5	5.8	3.5	4.7	2.6	6.1
	Doctoral	13.4	11.6	14.0	17.4	5.2	3.0
Household Income	< $50k	20.9	43.0	20.8	10.1	22.4	30.5
	$50k – $75k	14.0	19.0	11.3	10.1	9.2	11.9
	$75k - $100k	14.0	8.9	11.3	15.2	18.4	16.9
	$100k - $150k	21.7	12.7	15.1	24.1	21.1	16.9
	$150k - $200k	15.5	7.6	17.0	15.2	18.4	15.3
	$200k +	14.0	8.9	24.5	25.3	10.5	8.5
Race/ ethnicity	White/Caucasian	94.7	88.4	96.3	96.4	92.2	77.4
	Asian	5.3	7.0	3.7	3.6	3.9	16.1
	Hispanic or Latino	5.3	5.8	3.7	1.2	7.8	4.8
	African American	2.3	1.2	0.0	1.2	1.3	3.2
	Other	0.0	2.3	1.9	0.0	0.0	1.6
Gender	Male	43.4	56.5	61.4	45.9	51.3	58.5
	Female	56.6	43.5	38.6	54.1	48.7	41.5

Note. Foothills: *n* = 129-138; Peaks: *n* = 79-88; Grasslands: *n* = 53-57; Plains: *n* = 79-86; Remote lands:

Table 8: Trip Characteristics as a Percentage of the Sample Within Each Landscape Character Area

	Category	Foothills (%)	Peaks & Unique (%)	Grass-lands (%)	Plains (%)	Remote Lands (%)	Water (%)
Number of people in the group	1	42.0	44.3	66.7	48.8	54.2	41.2
	2	40.6	29.5	24.6	39.5	25.3	32.4
	3	8.0	12.5	3.5	7.0	13.3	5.9
	4	2.2	5.7	3.5	0.0	6.0	5.9
	5 - 12	7.2	8.0	1.7	4.7	1.2	14.6
Relationship with others in the group	Immediate family	33.3	20.5	38.6	41.9	34.9	41.2
	Extended family	2.9	5.7	1.8	4.7	3.6	2.9
	Friends	28.3	37.5	7.0	12.8	19.3	25.0
	Other	4.3	1.1	1.8	4.7	1.2	4.4
Number of hours spent at the site on the day intercepted	0.5	4.3	1.1	14.0	7.0	6.0	4.4
	1.0	19.6	23.9	35.1	33.7	31.3	26.5
	1.5	7.2	11.3	7.0	15.1	8.4	10.3
	2.0	39.1	29.5	28.1	26.7	41.0	38.2
	2.5	4.3	1.1	1.8	2.3	3.6	0.0
	3.0	13.8	15.9	7.0	7.0	7.2	11.8
	4.0 – 6.0	11.6	14.8	14.0	12.8	1.2	5.9
	7.0 +	0.0	0.0	0.0	1.2	0.0	0.0
Did you know this area was managed by City of Boulder OSMP?	Yes	78.3	59.1	91.2	93.0	71.1	75.8
	No	21.7	40.9	8.8	7.0	28.9	24.2
Activities the group participated in on the day intercepted*	Hiking/walking	97.8	93.0	54.4	61.6	89.2	72.1
	Photography	36.2	41.9	1.8	7.0	30.1	39.7
	Sightseeing	26.8	47.7	8.8	15.1	22.9	35.3
	Other	12.3	3.5	61.4	51.2	15.7	20.6
	Wildlife/birdwatching	22.5	22.1	10.5	12.8	15.7	19.1
	Picnicking	5.1	4.7	1.8	2.3	1.2	4.4
	Visiting historical/ archaeological sites	2.9	3.5	0.0	1.2	0.0	1.5

Note. Foothills: n = 138; Peaks: n = 86-88; Grasslands: n = 57; Plains: n = 86; Remote lands: n = 83; Water: n = 68; *Activities are not mutually exclusive and therefore don't sum to 100%

Figure 3. Boulder Sunrise (Photo: Max and Dee Bernt)

Table 9. Percentage of the Sample Within Each Landscape Character Area Taking Photos During Their Visit and Sharing Them on Social Media

	Foothills	Peaks & Unique	Grass-lands	Plains	Remote Lands	Water
Proportion of visitors who took photos or videos during visit	71.7 *n* = 99	76.1 *n* = 67	42.9 *n* = 24	32.6 *n* = 28	68.7 *n* = 57	63.2 *n* = 43
Of those who took photos: **Proportion who will share them on social media**	74.5 *n* = 73	77.6 *n* = 52	87.5 *n* = 21	64.3 *n* = 18	59.6 *n* = 34	90.5 *n* = 38
Of those who will share their photos on social media, **the platforms they will share them on:**						
Facebook	65.8 *n* = 48	50.0 *n* = 26	47.6 *n* = 10	66.7 *n* = 12	50.0 *n* = 17	71.1 *n* = 27
Instagram	58.9 *n* = 43	69.2 *n* = 36	61.9 *n* = 13	55.6 *n* = 10	70.6 *n* = 24	76.3 *n* = 29
Twitter	4.1 *n* = 3	5.8 *n* = 3	9.5 *n* = 2	5.6 *n* = 1	5.9 *n* = 2	10.5 *n* = 4
Flickr	0.0 *n* = 0	1.9 *n* = 1	0.0 *n* = 0	0.0 *n* = 0	5.9 *n* = 2	0.0 *n* = 0

Note. Foothills: *n* = 138; Peaks: *n* = 88; Grasslands: *n* = 56; Plains: *n* = 86; Remote lands: *n* = 83; Water: *n* = 68

land positively impacted their recreation experience (Table 6). The majority of visitors thought that seeing infrastructure negatively affected their experience. Appendix C lists all open-ended responses for other visible features and/or conditions visitors encountered that either decreased or increased their experience.

Findings by Landscape Character Area

To assess variation between the landscape character areas, we analyzed respondents and responses broken down by each area (Table 7-10).

Our analysis of trip characteristics by landscape

Table 10. Perceived Importance of Different Landscape Values as a Percentage of the Sample Within Each Landscape Character Area

Value	Category	Foothills	Peaks & Unique	Grass-lands	Plains	Remote Lands	Water
Biological Diversity	Important	97.8	96.6	87.7	95.3	90.2	94.4
	Neutral/unsure	2.2	3.4	10.5	4.7	9.8	5.9
	Not important	0.0	0.0	1.8	0.0	0.0	0.0
Therapeutic	Important	100.0	97.7	94.7	97.7	96.3	98.5
	Neutral/unsure	0.0	2.3	5.3	2.3	3.7	1.5
	Not important	0.0	0.0	0.0	0.0	0.0	0.0
Economic	Important	57.0	61.4	49.1	57.0	65.9	44.8
	Neutral/unsure	31.9	26.1	31.6	27.9	19.5	25.4
	Not important	11.1	12.5	19.3	15.1	14.6	29.9
Spiritual	Important	70.4	77.3	52.6	62.8	62.2	62.7
	Neutral/unsure	20.0	17.0	35.1	24.4	26.8	23.9
	Not important	9.6	5.7	12.3	12.8	11.0	13.4
Recreational	Important	97.8	98.9	96.5	93.0	97.6	98.5
	Neutral/unsure	2.2	1.1	1.8	7.0	2.4	1.5
	Not important	0.0	0.0	1.8	0.0	0.0	0.0
Aesthetic	Important	97.1	100.0	98.2	97.7	100.0	98.5
	Neutral/unsure	2.9	0.0	1.8	2.3	0.0	1.5
	Not important	0.0	0.0	0.0	0.0	0.0	0.0
Historical and Cultural	Important	79.3	75.0	56.1	83.5	76.8	79.1
	Neutral/unsure	18.5	20.5	35.1	12.9	19.5	17.9
	Not important	2.2	4.5	8.8	3.5	3.7	3.0

Note. Foothills: *n* = 135-136; Peaks: *n* = 88; Grasslands: *n* = 57; Plains: *n* = 85-86; Remote lands: *n* = 82; Water: *n* = 67

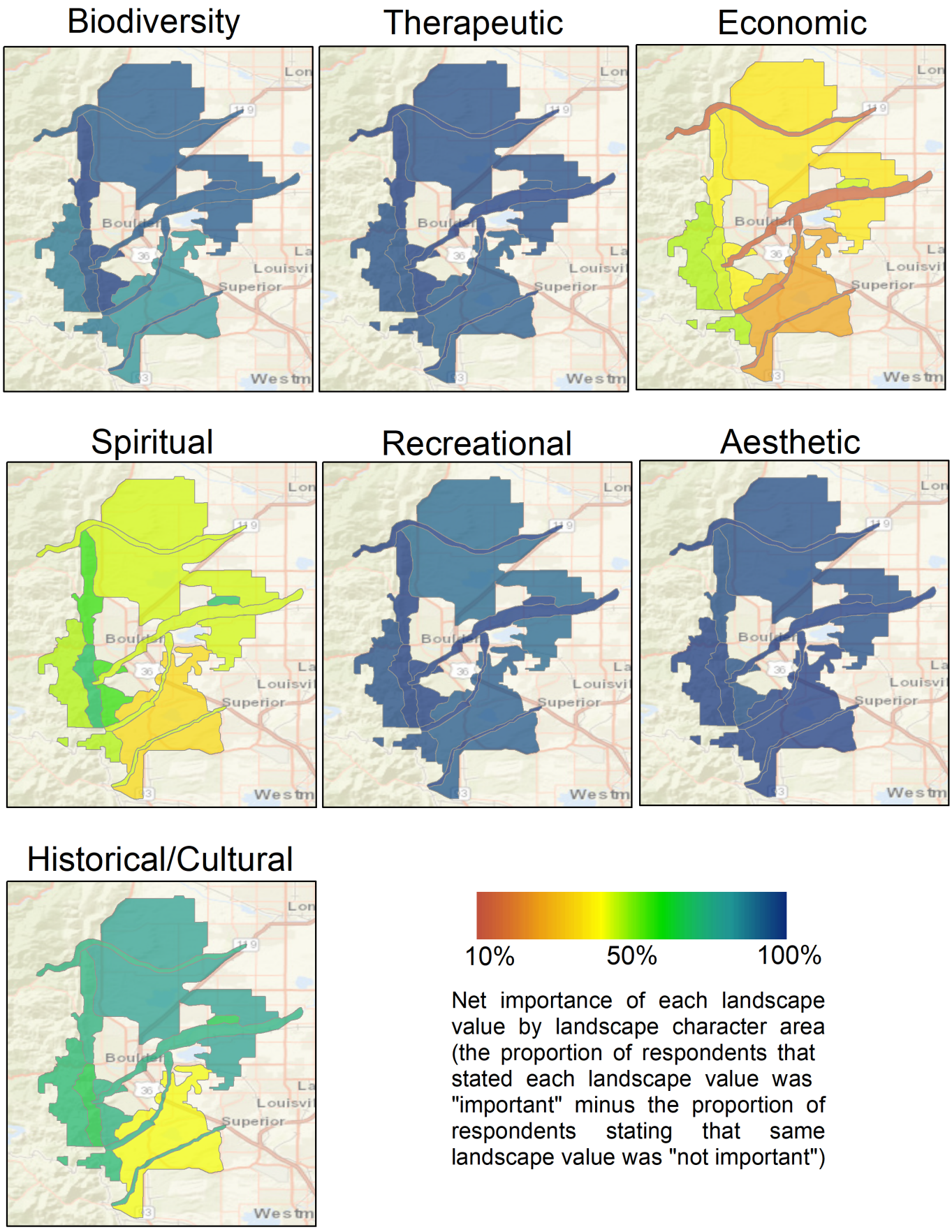

Figure 4. Net Importance of Each Landscape Value by Landscape Character Area

Table 11. The Effect of Specific Landscape Features on Recreation Experiences as a Percentage of the Sample Within Each Landscape Character Area

Feature	Category	Foot-hills (%)	Peaks & Unique (%)	Grass-lands (%)	Plains (%)	Remote Lands (%)	Water (%)
Unique rock formations	Positive impact	92.6	97.7	74.0	54.7	96.4	95.5
	Neutral/did not see	7.4	2.3	26.0	45.3	3.6	4.5
	Negative impact	0.0	0.0	0.0	0.0	0.0	0.0
Forested areas	Positive impact	94.0	98.9	88.7	79.5	97.6	100.0
	Neutral/did not see	5.2	1.1	11.3	20.5	2.4	0.0
	Negative impact	0.7	0.0	0.0	0.0	0.0	0.0
Open plains and grasslands	Positive impact	94.9	86.4	94.6	98.8	90.1	88.1
	Neutral/did not see	5.1	13.6	5.4	1.2	8.6	11.9
	Negative impact	0.0	0.0	0.0	0.0	1.2	0.0
Water	Positive impact	76.1	79.1	92.9	96.4	83.8	88.2
	Neutral/did not see	23.9	19.8	7.1	3.6	16.3	10.3
	Negative impact	0.0	1.2	0.0	0.0	0.0	1.5
Old or historic buildings/ structures	Positive impact	51.9	42.4	35.3	45.2	39.7	49.3
	Neutral/did not see	47.3	57.6	64.7	54.8	59.0	49.3
	Negative impact	0.8	0.0	0.0	0.0	1.3	1.5
Infrastructure	Positive impact	8.3	17.6	17.0	13.0	5.1	14.9
	Neutral/did not see	36.8	44.7	22.6	39.0	37.2	23.9
	Negative impact	54.9	37.6	60.4	48.1	57.7	61.2
Development	Positive impact	9.9	25.0	5.8	13.0	3.8	11.8
	Neutral/did not see	39.7	44.0	36.5	41.6	39.7	25.0
	Negative impact	50.4	31.0	57.7	45.5	56.4	63.2
Other people	Positive impact	44.1	61.6	51.9	58.3	56.8	56.7
	Neutral/did not see	43.4	26.7	37.0	31.0	29.6	29.9
	Negative impact	12.5	11.6	11.1	10.7	13.6	13.4
Plants and other vegetation	Positive impact	97.8	95.3	92.5	96.5	92.5	94.0
	Neutral/did not see	2.2	4.7	7.5	3.5	7.5	6.0
	Negative impact	0.0	0.0	0.0	0.0	0.0	0.0
Agricultural land	Positive impact	32.8	33.3	71.2	85.2	41.0	68.7
	Neutral/did not see	56.5	61.9	28.8	12.3	51.3	29.9
	Negative impact	10.7	4.8	0.0	2.5	7.7	1.5

Note. Foothills: n = 131-136; Peaks: n = 84-88; Grasslands: n = 50-57; Plains: n = 73-86; Remote lands: n = 78-82; Water: n = 66-68

character area revealed some interesting difference between responses (Table 8). People in the *grasslands* or *plains* landscape character areas had the highest rates of knowledge that they were using land managed by the City of Boulder OSMP, while people in the *peaks and unique topography* landscape character area had the lowest rates of knowing they were on land managed by the City of Boulder OSMP. Trips to the *foothills*, *peaks and unique topography*, *grasslands*, and *plains* landscape character areas were longer than those in *remote lands* and *water* landscape character areas.

Our samples from the *plains* and *grasslands* landscape character areas were the least likely to take photographs during their visit, while the samples in the *peaks and unique topography* landscape character area were most likely (Table 9).

Table 10 reports the values visitors associate with different landscape character areas, which are also shown spatially in Figure 4. Visitors to the *grasslands* and *water* landscape character areas were the least likely to value the economic importance of the area. Visitors to the *peaks and unique topography* landscape character areas were the most likely to indicate an importance of spiritual values, while visitors to the *grasslands* landscape character area were the least likely to perceive spiritual values as important (although the majority of all groups still reported this was an important value). Visitors to the *grasslands* landscape character area were also the least likely to list historical and cultural values as important.

Table 11 shows how specific landscape features impacted visitors' outdoor recreation experiences by landscape character area; this is also shown spatially in Figure 5. The majority of our samples from all landscape character areas thought seeing unique rock formations, forested areas, open plains and grasslands,

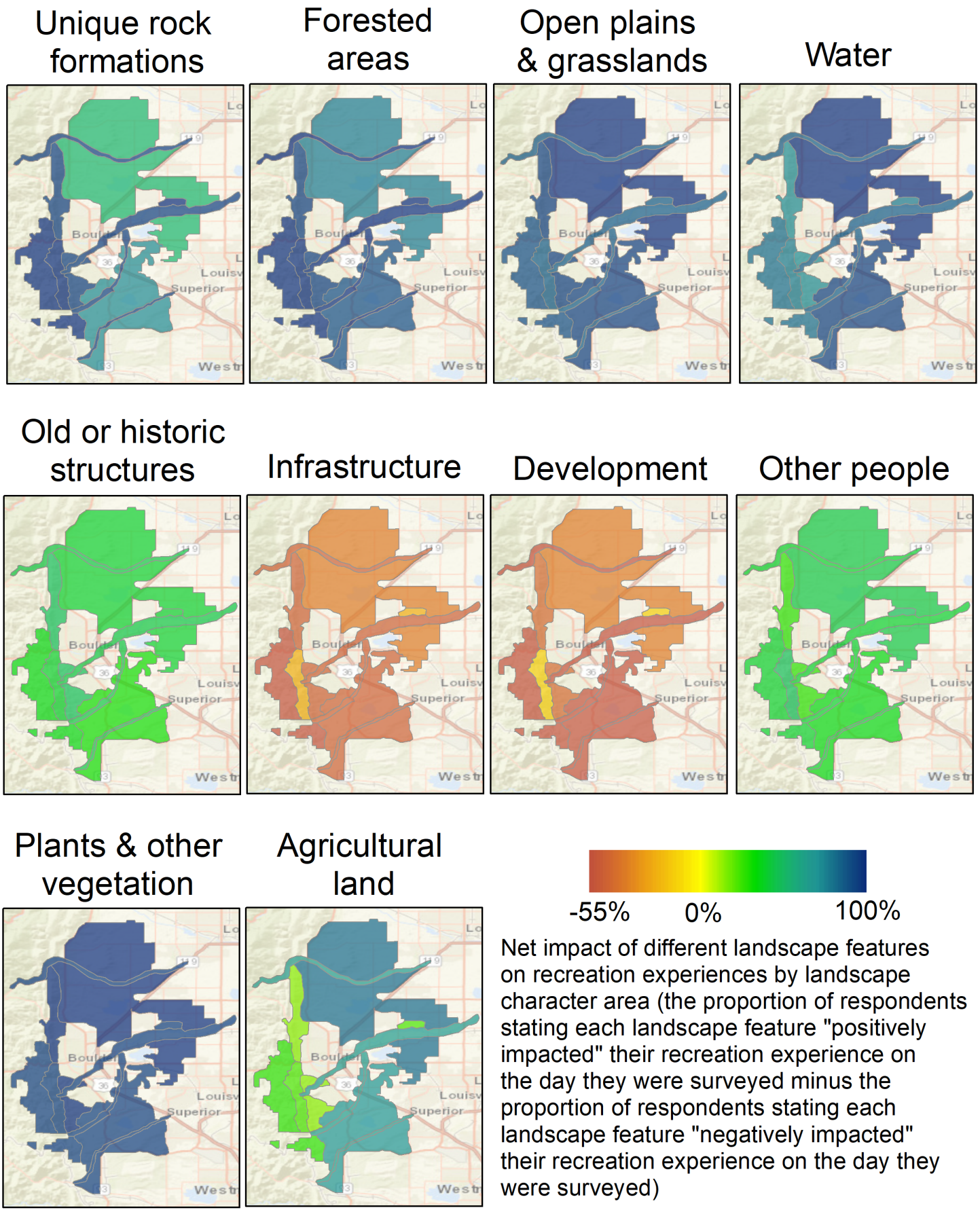

Figure 5. Net Impact of Different Landscape Features on Recreation Experiences by Landscape Character Area

water, and plants/vegetation positively impacted their recreation experience. Visitors to the *grasslands* and *water* landscape character areas were most likely to respond that infrastructure and development had a negative impact on their experience. Visitors to the *plains*, *grasslands*, or *water* areas were the most likely to report agricultural land having a positive impact on their visit.

DISCUSSION AND CONCLUSIONS

Our results offer a better understanding of the values that visitors associate with Boulder OSMP lands. They also provide insights into how specific landscape features affect the recreation opportunities offered across the Boulder OSMP system. The values associated with Boulder OSMP lands vary by landscape character area, sometimes in dramatic ways. For example, visitors generally associate historic and cultural values with the *foothills* and *water* landscape character areas (79.3 and 79.1 % of visitors said these values were important within the two areas respectively). However, historic and cultural values are not as strongly associated with the *grasslands* landscape character area. Understanding how these values vary across the system can provide managers with insights into how best to allocate resources so those resources yield the maximum public benefit (e.g., Figure 2).

Our results also shed light on how specific landscape features affect visitors' experiences on Boulder OSMP lands. Some landscape features have a moderately negative impact on the outdoor recreation opportunities offered in some places, while having a major negative impact on the opportunities offered in others. For example, visitors to the *peaks and unique topography* landscape character areas reported that seeing residential, industrial, and commercial structures had a marginally negative influence on their experiences; however, visitors to the *water* or *grasslands* landscape character areas reported that seeing development had a major negative impact on their experiences (63.2 and 57.7 % of respondents from these areas, respectively, said it had a major negative impact on their visit). This knowledge allows managers to pinpoint specific aesthetic components of the visual landscape that can either be emphasized or avoided in future management actions.

Limitations

Limitations related to the relatively short sampling schedule and bias within the sample population should be considered when interpreting these findings. On-site sampling was relatively short, only 20 days in duration, and occurred for a brief period during the early summer of 2018. Visitors to OSMP lands during other seasons may have different responses due to the different recreational activities they are engaging in and seasonal attributes like the weather and greenness of the vegetation. Additionally, survey respondents tended to be highly educated and predominately white. The opinions of visitors from minority populations may be underrepresented.

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APPENDIX A: SURVEY QUESTIONNAIRE

2018 SURVEY ON

CULTURAL AND SOCIAL VALUES PROVIDED BY BOULDER OPEN SPACE AND MOUNTAIN PARKS LANDS

Please use a black or blue pen

This is a quick and easy survey about your trip to Boulder Open Space and Mountain Parks Lands today.

All of your answers are completely confidential.

Participate in the survey to assist with decisions about how Boulder Open Space and Mountain Parks lands are managed.

1. How many people are in your group today?

Number of Individuals

2. How many of those people are...

Immediate Family

Extended Family

Friends

Others → Please specify

3. How many hours do you plan on spending out here today?

Number of Hours

4. Before being contacted, did you know this area was managed by City of Boulder Open Space and Mountain Parks?

- Yes
- No

5. What activities has, or will, your group participate in at this area today?

Check all that apply

- Hiking/walking
- Photography
- Wildlife/birdwatching
- Picnicking
- Sightseeing
- Visiting historical/archaeological sites
- Other → Please specify

6. Will you take photos or videos during your visit today?

- Yes → Will you share them on social media?
  - Yes → Which platform?
    - Facebook
    - Instagram
    - Twitter
    - Flickr
    - Other → Please specify
  - No
- No

7. If you saw any of the following items during your visit today, how did it affect your recreation experience?

	Major Negative Impact	Slight Negative Impact	Neutral/ Did Not See	Slight Positive Impact	Major Positive Impact
Unique rock formations (stone slabe, outcrops, etc.)	☐	☐	☐	☐	☐
Forested areas	☐	☐	☐	☐	☐
Open plains and grasslands	☐	☐	☐	☐	☐
Water (wetlands, lakes, and streams)	☐	☐	☐	☐	☐
Old or historic buildings/structures	☐	☐	☐	☐	☐
Infrastructure (fences, power lines, water tanks, etc.)	☐	☐	☐	☐	☐
Development (residential, industrial, and commercial)	☐	☐	☐	☐	☐
Other people	☐	☐	☐	☐	☐
Plants and other vegetation	☐	☐	☐	☐	☐
Agricultural land	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐

Please specify

8. What other visible features and/or conditions did you encounter that increased and/or decreased your enjoyment of the scenery?

Negative Influences	Positive Influences

9. How important to you are each of the following VALUES provided by this area?

	Not Important At All	Not That Important	Neutral/ Unsure	Slightly Important	Very Important
Biological Diversity Value (the variety of fish, wildlife, and plant life supported by the area)	☐	☐	☐	☐	☐
Theraputic Value (the ability of the area to make you feel better physically or mentally)	☐	☐	☐	☐	☐
Economic Value (the ability of the area to provide economic benefits to the Boulder community)	☐	☐	☐	☐	☐
Spiritual Value (sacred, religious, or spiritual feelings associated with the area)	☐	☐	☐	☐	☐
Recreational Value (the outdoor recreation activities that the area allows you to participate in)	☐	☐	☐	☐	☐
Aesthetic Value (the beauty you can enjoy because of the area)	☐	☐	☐	☐	☐
Historical and Cultural Value (the ability of the area to preserve local history and culture)	☐	☐	☐	☐	☐
Other Values _____ Please specify	☐	☐	☐	☐	☐

10. Do you live within the city limits of Boulder?

- ☐ Yes
- ☐ No

11. In what year were you born?

☐☐☐☐ Year

12. What is the highest level of education you have completed?

- ☐ Less than a Bachelor's degree
- ☐ Bachelor's degree
- ☐ Master's degree
- ☐ Professional degree
- ☐ Doctoral degree

13. What was your household's income, before taxes, in 2017?

- ☐ Less than $50,000
- ☐ $50,001 to $75,000
- ☐ $75,001 to $100,000
- ☐ $100,001 to $150,000
- ☐ $150,001 to $200,000
- ☐ Over $200,000

14. What race/ethnicity do you identify with?
Check all that apply

- ☐ White/Caucasian
- ☐ Asian
- ☐ Hispanic or Latino
- ☐ African American
- ☐ Other → _____ Please specify
- ☐ Prefer not to answer

15. What gender do you identify with?

- ☐ Male
- ☐ Female
- ☐ Other
- ☐ Prefer not to answer

Thank you for participating!
Your answers will help inform managers about how to best meet then needs of recreationists like yourself.

APPENDIX B: SURVEY RESPONSE RATES BY SAMPLING LOCATION

Location	Landscape character area	Groups Approached	Completed Surveys	Refusals	Total Group Passed by
South Mesa	Foothills	46	41	5	9
Wonderland Lake	Foothills	30	25	5	4
Chautauqua	Foothills	84	76	8	30
Gregory Canyon (day 1)	Peaks & unique	41	37	4	8
NCAR	Peaks & unique	24	19	5	7
Panorama Point	Peaks & unique	24	16	8	13
Gregory Canyon (day 2)	Peaks & unique	22	19	3	17
Dry Creek	Grasslands	32	25	7	3
Marshall Mesa	Grasslands	29	25	4	8
Greenbelt Plateau	Grasslands	11	8	3	6
Cottonwood	Plains	31	29	2	8
Teller's Farm North	Plains	51	47	4	9
Foothills	Plains	15	12	3	7
Settler's Park	Remote lands	21	17	4	9
Realization Point	Remote lands	25	13	12	18
Centennial (day 1)	Remote lands	32	29	3	15
Centennial (day 2)	Remote lands	27	26	1	8
Mayhoffer-Singletree	Water	39	32	7	18
Sawhill Ponds	Water	19	12	7	8
Boblink	Water	34	29	5	20
OVERALL		**637**	**537**	**100**	**225**

APPENDIX C: OPEN ENDED RESPONSES

Responses to an Open-Ended Question Regarding What Other Visible Features And/Or Conditions Visitors Encountered That Decreased Their Enjoyment of the Scenery
(All Items Were Mentioned Once Unless Noted in Parentheses)

a lot of people
airplane
animal waste bags
bags of dog waste, trash on trail- pollutes hills, kills small animals, unsanitary
barbed wire fencing
bugs
cars
children unsupervised throwing rocks
closing area for snails
construction (2)
coyote
dog poop
dog poop bags left on trail
dog poop trash
dog poop, fast bikes
dog waste
dog waste bags
dog waste bags left behind or on a post because no trash can available on Arapahoe side of viewpoint
doggie bags on trail
dogs (2)
dogs that look hot, heat
dogs. need to increase # of trails (sections of) where dogs are prohibits
don't love first 20 feet of road off baseline
equipment, concrete paths
fencing on trail
gas drilling
graffiti
hail
heat
heat, lack of shade
heat! (2)
helicopter (2)
helicopter, utility vehicles taking parking spaces
helicopters flying overhead
helicopters, construction
homeless people hanging out, people with dogs off leash
horse poop, disintegrating bridge and gates
horses because not required to remove feces
hot
i did not see as many trail markers as I would have hoped
i saw a bug trap and wanted to know more about that. I am not from here and I'm curios about invasives.
invasive dalmation, toad flat, dog poop
lack of social responsibility associated with dog poop (in bag) management, lack of pack it in pack it out awareness and education
loud music playing, construction
more people on weekend
mud, but that's inevitable
muddy trails
muddy trails, we've had a lot of rain
nail

Responses to an Open-Ended Question Regarding What Other Visible Features And/Or Conditions Visitors Encountered That Decreased Their Enjoyment of the Scenery
(All Items Were Mentioned Once Unless Noted in Parentheses)

need more "stay on trail" signs
new houses
no negatives
orange fencing on deck
parking
passing zone on road (Independence) at the same location as the crosswalk. dangerous!
people not staying on trail
people who ride their bikes way ahead of their dogs. they don't know dog is pooping!!
poop bags, trash
power lines
power lines (loud buzz)
power lines, dog poop bags
powerlines (s)
pumps
railroad trespassing
rattlesnake
rude bikers
ruts in trail, dangerous for bike tires
slightly crowded
smell of dog poop
smog (s)
snake (2)
sounds of vehicles
steep steps
survey taker
the parking situation at this lot is horrible!! inadequate for both anemone and sanitas... please do something to create more parking!!! Bad on weekdays, terrible on weekends!
too many cars (2)
traffic
traffic noise
traffic, noise
trail corrosion
trails not being followed
train whistle
trash (2)
trash on trail
trash, smoking, loud people
unfriendly people (2)
valuont road
weeds on narrow north side path of old kiln loop

Responses to an Open-Ended Question Regarding What Other Visible Features And/Or Conditions Visitors Encountered That Increased Their Enjoyment of the Scenery
(All Items Were Mentioned Once Unless Noted in Parentheses)

all positive, views, scenery
animals (2)
appreciated that all dog owners obeyed leash requirements
baby duckling
bald eagle
bald eagle sighting
bald eagle, owl
bald eagles, dog gets to swim
beautiful nature
beautiful scenery
birds (9)
birds and insects
birds, bunnies, flowers
birds, deer
birds, dogs (2)
birds, flowers
birds, horses (2)
birds, shade
birds, small mammals
birds, wildflowers, green!
birds, wildlife
blooming flowers
blue sky
Boulder from above
broad vistas are great here
cattle guards, open space
climbing rocks
cloud formations, crickets
coyote
creek (5)
decent weather
deer, dogs (2)
devils thumb, construction workers were interesting
diverse scenery
dogs (2)
dogs and other animals
dogs, birds
dogs, flowers
dogs, weather was great, beautiful vegetation
ducks, waterfowl, wildflowers, creek
easy accessibility
enjoyed the variety of birds
everything is so green at the moment!
flat iron
flat irons
flat irons!
flatirons
flowers, birds
flowers, birds, animals

Responses to an Open-Ended Question Regarding What Other Visible Features And/Or Conditions Visitors Encountered That Increased Their Enjoyment of the Scenery
(All Items Were Mentioned Once Unless Noted in Parentheses)

flowers, birds, bird song, coyote
flowers, insects, shade
flowers, redrocks
footbridge well maintained trail, my running partner
forest, water, rocks
fox, birds, prairie dogs
fresh running cool water
friend, green grass
friendly grad students
friendly people (3)
friendly people and dogs
friendly people. everyone greets one another on trail
friends
glad to see the park being worked on
great helicopter bulls
great trail maintenance
great trails, mountain views
great weather
great weather, great wildflowers, listening to birds sing
green!
happy people, people pushing their physical boundaries, community, happy dogs
helicopter
hills, paragliding
horses
horses obstacles- fun
horses, birds, dogs
horses, other dogs
i like the steepness of the area as it keeps me fit
i liked the bug sounds
i love that ladder on green mt trail
i love the fact that compostable waste bags are available
incredible weather. well kept trail system.nice people
it was finally dry and open today
it would be helpful to post signs suggesting "on your left" when passing
kind of fun to watch work in progress on power lines
lake mountain backdrop
lake, birds
lake, tunnel, snake, cows
landmark plaques
large dandelions
large tree
logs
lots of folks with smiling faces!
love all of it!
love the water, wildlife and beauty
lush grass, maintained stream
maintained trails (2)
meadow larks
mountain view (2)

Responses to an Open-Ended Question Regarding What Other Visible Features And/Or Conditions Visitors Encountered That Increased Their Enjoyment of the Scenery
(All Items Were Mentioned Once Unless Noted in Parentheses)

mountains (2)
mountains- scenery, ponds, grass
mountains, fresh air, silence, effort, green mountain
mountains, lake
mountains!
mud
natural landscapes
new stins on lions lair
newly rocked and groomed trails are improving! good work!
nice fences and outhouse very nice, great garbage bins
nice views!!!
no dog poop, plants look healthy, saw a milkweed, birds
no dogs
no litter anywhere on the trail
no trash, inclines were all safe (built) so didn't worry about safety
open space
open space, old houses
open spaces!
other children
other dogs
other dogs! my dog was very happy
peacefulness
people enjoying the trail. Views of undeveloped ag land. Lushness. Views of foothills
people out working to maintain grounds
people outside make me happy
people who smile, horses and riders
picnic benches, rock climbing
pleasant smells
ponds, unpaved paths, irrigation canals, trees
recent trail work and improvements
rock formation
rock formations
rocks
royal arch
running ditches ducks heron
running stream
secluded areas with vegetation, mountains, dogs, bees, water bottle fill area
seeing flatirons
seeing the flatirons close up
shade, views from top
sights, dogs on leash, greenery
snake
so many different birds
sound of bugs
spring flowers
stacked rocks by river bank
starbucks cup... I am sure they would get it coming down (but I got it!)
sun (3)
sunshine, breeze
survey

Responses to an Open-Ended Question Regarding What Other Visible Features And/Or Conditions Visitors Encountered That Increased Their Enjoyment of the Scenery
(All Items Were Mentioned Once Unless Noted in Parentheses)

the lake, playground
the mountains
the open view (2)
the scenery!
the trail is still in a semi natural state
the trail maintained! Easy access with parking. This survey
the view and hike trails were awesome. we saw a snake
the views are so relaxing (red rocks trail), beautiful flowers, snakes and birds
tom
town
trail building has improved
trail signs
turkey, snakes
unique dead trees
vegetation, mountain views
view deck 2)
view from the top
view of mountains, shade of tree, stream
view of the mountain range (2)
views are spectacular
views, forest
water
water fowl, deer, songbirds
water fowl!
water, cows, horse, birds, grass, dogs, people
weather (2)
weather, view, varied trail
well maintained and well marked
well maintained trails
wild flowers, streams
wildflowers (2)
wildflowers and wildlife (deer)
wildflowers, birds, grasses
wildflowers, nature, critters
wildlife (6)
wildlife (deer, birds, etc.)
wildlife (hawks, birds, fox)
wildlife (specifically deer)
wildlife, mountain views, open space
wildlife, osmp presence
wildlife, quiet
wildlife: birds, bugs
xcel people were very friendly

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