Visitor perceptions and acceptability ratings of recreation impacts: Comparison between visitors and OSMP employees

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Executive Summary: Visitor perceptions and acceptability ratings of recreation impacts: Comparison between visitors and OSMP employees, February 12, 2017

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This study sought to determine visitor perceptions and acceptability of recreation impacts as compared to OSMP employee perceptions with a secondary goal to determine if visitors attribute any of the responsibility for recreation impacts to themselves as compared to OSMP employees. Three primary alternative hypotheses were posed:

- H_1 Visitor perceptions of recreation impacts on resource conditions differ from OSMP employee perceptions.
- H_2 Visitor acceptability ratings of recreation behaviors differ from OSMP employee ratings.
- H3 Visitor ascription to responsibility for recreation impacts differ from OSMP employee ascription.

Methods: The area for data collection included three sites pre-determined by OSMP to be shared-use, having varied visitation volumes, and varied levels of visitor infrastructure, all selected sites were trailhead areas to reduce the chance of researchers encountering "through" visitors. Study sites were Marshall Mesa (high use area with paid parking for out of Boulder county license plates), Doudy Draw (medium use area with paid parking for out of Boulder county license plates), and East Boulder Gunbarrel (low use residential area access with street parking). Methods included a visitor on-site survey (n=547; response rate 61%) at three sites (Marshall Mesa, n=242; Doudy Draw, n=162; and East Boulder Gunbarrel, n=143) with 15 dates selected at random to represent three weekday and two weekend days per month (June to August) and an online survey (Aug. 9 through Sept. 9, 2016 with three email reminders) via Survey Monkey for OSMP employees (N=245; n=105; 43% response rate).

Data analysis. The analysis includes descriptive statistics and measures of central tendency for each of the variables followed by bivariate statistics (inferential statistics for hypothesis testing including one-way analysis of variance, *t*-test for independent sample means, and Chi-square test for measures of association) to examine differences between visitors and OSMP employees on their preferences and acceptability of recreational impacts at OSMP designated areas and difference(s) between three survey locations.

Results: For H_1, visitor perceptions of recreation impacts on resource conditions differed from OSMP employee perceptions for all six-resource condition statements. Employees perceived resource condition impacts a much greater problem than visitors especially for presence of trail/soil erosion, undesignated side trails, and multiple parallel trails with percentages for moderate to extreme problem(s) as compared to visitors. Meanwhile a majority of visitors did not find standing water or muddy trails a problem versus OSMP employees, while exposed tree roots on trail was not a problem for either group. Further, independent sample *t*-tests examined differences between visitors' and employees' statements that measured satisfaction, beliefs, and expectations about trail conditions on OSMP sites with significant differences found for all five statements. Visitors are significantly more satisfied with the trail conditions than employees at OSMP, which correlates with employee beliefs that recreation can result in negative impacts to plants and wildlife more so than visitors. Employees noted eroded trails, undesignated trails, and soil loss more so than visitors. There was no difference between survey locations among visitors on these statements. Finally pertinent to H_1, OSMP employees consider site conditions as more severe than visitors as noted from the photo scenarios shown to the visitors on-site and to employees online asking them to rate the level of severity of the conditions they viewed in the three different photographs. From visitor comments especially among the mountain bikers, they

like rougher terrain thus noting the lower ratings for eroded/trail braiding issues than OSMP employees.

For H_2, that examined differences between visitors and OSMP employees on trail use behavior, visitors and OSMP employees had similar acceptability ratings. Neither group found it acceptable for people going off trail to avoid obstacles, standing water on trail, or walking on trailside vegetation, dogs off trail, or people taking undesignated trails. Yet, visitors tend to accept people going off trail to get around other people versus more than employees.

For H_3, as expected, visitors have slightly more ascription to responsibility for recreation impacts than OSMP employees and more likely to accept some responsibility for trail erosion since they are the primary users of the resource. Neither visitors nor employees feel they can or should go off trail nor do they feel responsible for the creation of undesignated trails. There were no differences between the three study site visitor samples on personal responsibility for their recreation behavior.

Conclusions: Hypotheses one and two were supported while findings related to hypothesis three, personal responsibility, was relatively inconclusive. Visitors overall are less concerned about the negative impacts of recreation on resource conditions than agency employees. In general, visitors are quite positive about resource conditions at OSMP whether at Marshall Mesa, Doudy Draw or East Boulder Gunbarrel. The East Boulder site has more regular repeat visitation since many live in Boulder County and adjacent to the area nearby.

Management Implications: Conduct a problem analysis to include problem definition via a trail inventory, assess impact acceptability including other factors as environmental and use related factors, evaluate causes and effects of trail conditions, apply site or visitor management actions, and clarify internal acceptability levels for trail conditions and share these with the public.

Abstract

The purpose of this study was to examine visitor perceptions and acceptability of recreation impacts at City of Boulder Open Space Mountain Parks as compared to agency perceptions and to assess to what extent visitors attribute any of the responsibility to themselves for recreation impacts. Methods included a visitor on-site survey (developed from a literature review of outdoor recreation research) and an online survey of OSMP employees. Recreation impacts studied include trail braiding and erosion. Visitors overall are less concerned about the negative impacts of recreation on resource conditions than agency employees. In general, visitors are quite positive about resource conditions at OSMP whether at Marshall Mesa, Doudy Draw or East Boulder Gunbarrel. Results will be used to inform visitor management for OSMP.

Key Words: resource conditions, recreation impacts, trail braiding, visitor perceptions

Introduction

Natural resource management agencies work to provide high quality recreation experiences yet, not everyone shares the same set of preferences for setting attributes, facilities, and services offered. Some individuals, for instance, may want nothing more than the chance to hike, watch wildlife, and enjoy nature with minimal facilities and services. Others are more demanding in the services they need (Vaske and Donnelly 2008). With increased participation in outdoor recreation opportunities that may lead to increased visitor impacts, management must manage for those impacts to maintain the quality and integrity of outdoor resources to meet the desires and expectations of the visitor clientele. Understanding visitor preferences and acceptability of visitor impacts that may detract from the visitor experience is necessary for targeted management practice. Recreation impacts in natural areas are defined as ecological impacts of natural settings from outdoor recreation use (Hammitt and Cole 1998; Liddle 1997). Recreation such as hiking,

jogging, horseback riding, and photography can cause negative ecological impacts to ecosystems, plants, and wildlife including trampling, soil compaction, erosion, disturbance (due to noise & motion), pollution, nutrient loading, and introduction of non-native invasive plant species. Corridors such as trails and roads also cause habitat fragmentation and edge effects, which may impact some plant and animal species. Impacts to be studied include trail braiding and erosion as these are easily observed by visitors and less subjective then other types of impacts.

In order to study perceived ecological impacts, a normative theory approach was used. A norm can be defined as "... any standard or rule that states what human beings should or should not think, say, or do under given circumstances" (Blake and Davis 1964, p. 456). Norms that are widely shared by most members of society (e.g., littering, dumping human waste) are often formalized into legal mandates complete with formal sanctions (e.g., fines) for noncompliance. Such norms are also likely to be internalized, becoming " ... part of the individual's motivational system in the sense that he is committed to it as being right, legitimate, and hence obligatory" (Blake and Davis 1964, p. 478). The examination of norms among outdoor recreationists refer to normative beliefs, which are defined as judgments about what is appropriate in a specific situation (Zinn et al. 1998). Normative beliefs are the standards that individuals use for evaluating what behavior or conditions should exist (Shelby et al. 1996). Because normative beliefs are more situational specific (e.g., more land should be set aside for wilderness in the Arapaho National Forest) than value orientations, they are also subject to change depending on the circumstance being evaluated. For example, normative beliefs for acceptable conditions (e.g., developed facilities) in a front-country national park are often different than what is judged appropriate for a backcountry wilderness area (Donnelly et al. 2000). This study was based on a

normative/attribution theory approach (Van Liere and Dunlap 1978) to determine preferences and acceptability of recreation impacts at OSMP sites.

Study Goal

The goal of this study was to determine *visitor perceptions and acceptability of recreation impacts as compared to agency perceptions. A secondary goal was to determine if visitors attribute any of the responsibility for recreation impacts to themselves as compared to OSMP.*

Data necessary for this project was visitor demographics, trip characteristics, activity type, time of day, weekend vs. weekday, perceptions and acceptability ratings of recreation impacts, and assessing visitor personal responsibility for behaviors that could lead to recreational impacts at OSMP sites.

Study hypotheses are:

- H_1 Visitor perceptions of recreation impacts on resource conditions differ from OSMP employee perceptions.
- H_2 Visitor acceptability ratings of recreation behaviors differs from OSMP employee ratings.
- H3 Visitor ascription to responsibility for recreation impacts differ from OSMP employee ascription.

Methods

Survey methods were used for both on-site visitors to three OSMP designated areas and an online survey of agency personnel.

More specifically, methods included the following:

Literature review. A literature review of current and past research and academic documents related to assessing visitor perceptions of recreational impacts in outdoor recreation was done to determine the most pertinent items to include in a survey of visitors and of OSMP employees.

On-site visitor survey – of their perceptions and acceptability of recreation impacts noted at OSMP sites. This task was accomplished via on-site visitor surveys on randomly selected

weekdays and weekends and at three OSMP designated sites. The survey was based on a review of literature about visitor impacts and the needs of OSMP.

*OSMP employee online survey. S*ome questions from the visitor on-site survey were included in the online (via Survey Monkey) to OSMP employees. The online survey was distributed among OSMP staff via a list of email addresses provided by OSMP between August 9 and September 9, 2016 (see https://www.surveymonkey.com/r/OSMP_Employee_survey).

Survey Design. Survey questions were based on an initial literature review of norm and attribution theory as used in the social psychology of environmental related studies (Stern et al., 1999), responsible environmental behavioral studies (Cottrell 2003; Cottrell and Graefe 1997), and cognitive hierarchy theory studies (Czaja and Cottrell 2014; Donnelly et al. 2000). A concept matrix of key variables (see Table 1) for the study was developed from the literature review of related documents in outdoor recreation research (Veal 1997). This conceptualization process guided survey development. A draft survey was reviewed by OSMP personnel and pilot tested among a convenience sample (n=20) of OSMP visitors at Marshall Mesa, June 4, 2016.

Sampling Design. A stratified random sampling design was used for visitor surveys at three OSMP sites June through August 2016. The stratification variables included: (1) day of week (weekday & weekend) and (2) time of day (a.m. – 8 to 11:00 a.m.; mid-day 12:00 to 3:00; evening 4 to 7:00 p.m.).

Day of Week Stratum. All weekend days (Saturday and Sunday) and weekdays (Monday through Friday) within the study period were considered for inclusion in the study to include two-weekend days/month for the summer drawn at random and three weekdays per month to represent each day of the week for the summer season. Total sample days included six weekend days and nine weekdays for a total of 15 sampling days.

Time of Day Stratum. Three "time of day" sampling periods were selected (a.m., mid-day, p.m.). A.M. was defined as 8:00 a.m. to 11:00 a.m.; mid-day 11:00 a.m. to 3:00 p.m., and P.M. (late afternoon) 4:00 p.m. to 7:00 p.m. Sampling hours provided coverage from 8:00 a.m. until 7:00 p.m. during the summer months. Three-hour sampling segments were randomly assigned to monitoring locations within each daily sampling time period that resulted in nine hours of observation per sample day with one hour to get from the a.m. site to the mid-day and one hour between the mid-day and p.m. shifts.

Study sites. The area for data collection included three sites pre-determined by OSMP to be shared-use, having varied visitation volumes, and varied levels of visitor infrastructure, all selected sites were trailhead areas to reduce the chance of researchers encountering "through" visitors. The study sites were Marshall Mesa (high use area with paid parking for visitors with out of Boulder county license plates), Doudy Draw (medium use area with paid parking for out of Boulder county license plates), and East Boulder Gunbarrel (low use residential area access with street parking). Each site was surveyed 15 times across 3 weekdays and 2 weekend days, with 3 sample periods per day during June, July, and August 2016. Days were selected randomly with a random start for all three sites (Veal 1997). At each survey site, surveyors were stationed at trailheads to best capture the most exiting visitors. Surveyors wore appropriate attire with identifier shirt that associated the surveyor with OSMP. During the 3-hour shift, the surveyor approached each potential respondent with a self-administered survey. Once the interaction was complete, the surveyor took notes, filed the survey and approached the next visitor to pass the survey point to ask them to participate in the study (Veal 1997). The goal was to try to get all visitors that passed by the survey point. A surveyor script was used to

standardize what was said to each potential respondent. If the person refused, each refusal was recorded to determine the response (acceptance) rate.

The total sample included 547 respondents for a 62% response rate at three sites. The most respondents were recorded at Marshall Mesa (n=242) which had the lowest response rate (55%) attributed mostly to the high volume of bikers rushing through the area who refused to stop. Doudy Draw had 162 respondents with the highest response rate at 73% while East Boulder Gunbarrel had 143 respondents (60% response rate) mostly in the morning and late afternoon because of the mid-day heat. This group represents a residential area with many dog walkers and the most repeat visitors (26%) (People previously surveyed). Doudy Draw had the least repeat visitors (8%) followed by Marshall Mesa (13%).

Data analysis. The analysis includes descriptive statistics and measures of central tendency for each of the variables (data presented in Appendix A & B) followed by bivariate statistics (inferential statistics for hypothesis testing including One-way Analysis of Variance, *t*-test for independent sample means, and Chi-square for measures of association) to examine differences between visitors and OSMP employees on their preferences and acceptability of recreational impacts at OSMP designated areas and difference(s) between three survey locations.

Results

Results provide an overview of visitor characteristics, trip characteristics, perceptions and acceptability assessments of recreation impacts and resource conditions on OSMP lands. In addition, OSMP employee perceptions of the recreational impacts were assessed as well along with a comparison of differences between employees and the visitors. A detailed overview of data for each survey question (both visitor on-site and OSMP employee online surveys) is given in the appendices document. Reference to the appendices will be given when appropriate while the tables included in this document present data analyzed to address the study hypotheses.

Visitor Profile. The gender ratio was about even; Marshall Mesa had the most male respondents (54%) with the most females surveyed at East Boulder Gunbarrel (55%). Average age was 43 overall with the oldest respondents at East Boulder Gunbarrel (M = 51). The 40 to 49 (23%) age bracket and 50 to 59 (22%) were the largest age range categories among on-site visitors with the oldest age grouping (60 to 69) represented at East Boulder Gunbarrel (19%). The youngest (<20) were recorded at Marshall Mesa as many biking youth groups use that trail during the summer. Most respondents have a BS degree or higher education level (76%) with similar proportions across all three-study sites. Thirty-eight percent of the visitors live within Boulder city limits with 19% living in unincorporated Boulder County (Figure 1). Eight-one percent live in Boulder County with 19% out of county visitors.

Visitor Trip Characteristics. The average years visitation (Figure 2) was 12.9 years (as compared to 11.9 by OSMP employees) with East Boulder Gunbarrel coming the most years (M = 17.8) followed by Doudy Draw (M = 12.1) and Marshall Mesa (M = 10.5) having similar visitation patterns (F-value = 13.96; p < .001) (results given in Appendix A).

During the past 12 months, average visitation was 64 times (Median = 20) (Figure 3) with most visits being to East Gunbarrel (M = 118; Median = 70) followed by Doudy Draw (M = 51; Median = 20) and Marshall Mesa (M = 41; Median = 20) (F-value = 42.8; p < .001). Average visits per month were 9 times (Figure 4) with the most monthly visits to East Boulder Gunbarrel (M = 15), Doudy Draw (M = 8) and Marshall Mesa (M = 7) (F-value = 37.3; p < .001).

The activity done the most was hiking (n=256; 20.6%), followed by biking (n = 193; 15.5%), running (n = 179; 14.4%), and walking dog(s) (n = 144; 11.6%) (Figure 5). Hiking was done most at Marshall Mesa and East Boulder Gunbarrel with running done most at Doudy

Draw. Dog walking was done most at East Boulder Gunbarrel. Visitors were asked to indicate their primary activity done by circling from a list of activities. Only 149 people completed this question with the most circling biking followed by running, hiking and walking dog(s) (see Appendix?). When asked if "*Are you aware that some trails in…OSMP are "undesignated" or not official trails?*" 63% marked 'Yes'. East Boulder Gunbarrel (70%) visitors were more aware about undesignated trails in OSMP areas than Marshall Mesa (64%) or Doudy Draw visitors (56%) (Chi-square = 6.04; $p < .05$).

OSMP Employee Profile. Fifty-eight percent of the employee respondents are male. Average age was 39 with 33% in the 30 to 39 age category, followed by 24% age 20 to 29, 21% age 50 to 59; 58% have a BS degree and 32% graduate or professional degree. Employee respondents have been working for OSMP for an average of 7.8 years (Median = 4.8; *Std* = 7.5) (Figure 6).

Forty percent of the respondents work in the resources and stewardship division, 22% trails and facilities, 19% community connections and partnerships, 14% central, and 4% on the executive team. Seventy-two percent are standard full-time with 19% seasonal full-time.

OSMP Employee Trip Characteristics. Employee respondents have been recreating in OMSP locations 11.9 years (Figure 7) and they have visited OSMP locations for personal recreation 1.7 times in the last 12 months (Figure 8) for hiking (24%) predominantly followed by viewing scenery (10.5), wildlife viewing (10%), photography (8%), contemplation/meditation (7.1%), and biking and walking dog(s) (6.8 %). When asked "*Which ONE activity did you most likely to participate in when recreating on OSMP?*" hiking was listed most (64%). Fifty-six percent of the employee respondents tend to visit the same 2-4 areas while 37% try new areas with each visit. Ninety-nine percent of the employee respondents are aware that some trails are undesignated or not official trails. For OSMP locations visited for personal recreation in the last

12 months, 38% of the respondents indicated they were able to clearly distinguish undesignated trails from designated trails almost every time, 31% occasionally, and 21% every time.

Hypothesis testing

For H_1, *visitor perceptions of recreation impacts on resource conditions differs from OSMP employee perceptions* as a similar overall question with six items was posed to visitors on-site and OSMP employees online. For visitors, respondents were asked "*To what extent do you think each of the following resource conditions is a problem you noted at OSMP areas today*". The same six items were posed for the OSMP employee online survey with a slight differentiation of the overall question: *To what extent do you think each of the following resource conditions is a problem that you have personally seen while recreating at OSMP areas during the past 12 months?*

A cross tabulation analysis with a Chi-square test for association was run to examine the association between on-site visitors and OSMP employees on the six resource condition perception items noting differences ($p < .001$) on all six items. Employee respondents perceived resource condition impacts a much greater problem than visitors especially for presence of trail/soil erosion (78%), undesignated side trails (79%), and multiple parallel trails (77%) with percentages for moderate to extreme problem(s) as compared to a 14% to 17% range for visitors on-site (Table 2). Eighty-two percent of visitors did not find standing water or muddy trail a problem versus 8% and 12% consecutively for OSMP employee respondents. Exposed tree roots on trail did not seem to be much of a problem for either sample.

Several survey questions measured satisfaction, beliefs, and expectations about trail conditions on OSMP using a 5-point Likert agreement scale. To further address H_1, independent sample *t*-tests examined differences between visitors and employees on five statements (Table

3). Visitors ($M = 4.3$) are significantly more satisfied with the trail conditions than employee respondents ($M = 3.7$) ($t = 6.08$; $p < .001$) at OSMP, which correlates with employee beliefs ($M = 4.2$) that recreation can result in negative impacts to plants and wildlife more so than visitors ($M = 3.5$) ($t = -7.85$; $p < .001$). Employees noted eroded trails, undesignated trails, and soil loss (mean scores 4 or >) more than visitors' on-site (mean scores 2.8 or <).

As a supplemental analysis, a one-way analysis of variance between the three on-site locations and the five statements showed no difference except for satisfaction with designated trail conditions (item a). Doudy Draw visitors were slightly more satisfied with trail conditions than at the other sites; however, the mean scores were all high for this item ($p < .001$) (see data shown in Appendix A).

A third approach to assess perceptions about recreation impacts was done via three site condition photograph scenarios (Figure 9). Respondents were asked to review the photographs and rate the site condition on a 5-point impact scale: 1 = no impact to 5 = severe impact.

Independent sample *t*-test(s) were used to examine differences between visitors and OSMP employees (Table 4). OSMP employee respondents rated site conditions as more severe than on-site visitors with all three *t*-tests significant at the .001 level.

For H_2, visitor acceptability ratings of recreation behaviors differs from OSMP employee ratings, six trail use behavior statements were given for both samples by asking respondents to rate their level of acceptability of visitor behavior on a 5-point acceptability scale (-2 Very Unacceptable to +2 Very Acceptable). A *t*-test for independent sample means was used to examine differences between the visitor on-site and OSMP employees (Table 5). Although slight differences were noted for four of the six behavior statements, both samples considered *"going off trail to avoid obstacles"* (M = -.16 for visitors vs. -.42 for OSMP; $p < .05$) and *"standing*

water on trail" (M = -.07 for visitors vs. -.60 for OSMP; p < .001) as well as *"walking on trailside vegetation unacceptable"* (M = -.75 for visitors vs. -.94 for OSMP; p < .05). Meanwhile visitors, were more *"accepting of people going off trail to get around other visitors" than OSMP employees (M = .20 for visitors vs. -.20 for OSMP; p < .01). "People taking undesignated trails*" and *"dogs going off trail*" were unacceptable for both visitors and OSMP employee respondents.

A one-way analysis of variance to examine locational differences on the acceptability of the six behavior items (see Appendix A for results for Question 6B) for the visitor on-site data, Doudy Draw visitors were more critical of visitor behavior for "*people going off trail to avoid standing water"*, "*taking undesignated trails"*, and "*dogs going off trail"* than Marshall Mesa or East Boulder Gunbarrel visitors. Meanwhile Marshall Mesa recreationists had a problem with "*people going off trail"* in comparison to OSMP employees.

For H_3, visitor ascription to responsibility for recreation impacts differ from OSMP employee ascription, four questions measured level of agreement about personal responsibility for recreation impacts at OSMP areas on a 5-point Likert agreement scale (1 = strongly disagree to 5 = strongly agree). On-site visitors were asked to *indicate the extent to which you agree or disagree with each of the statements* while OSMP employees were asked to *consider each statement in the context of personal recreation only* and not during their work time. Independent sample *t*-tests were used to examine mean differences between the visitor on-site and OSMP employees (Table 6).

Three of the four *t*-tests were significant with visitors (M = 3.9) on-site slightly more likely to accept some responsibility for recreation impacts than OSMP employee respondents (M = 3.5) (p < .01) and more likely to accept some responsibility for trail erosion (M = 3.5 vs. 3.3; p

< .01). Both visitors (M = 1.9) and employees (M = 2.4) disagree with the statement "*it is OK for me to go off-trail…*" (p = .001). Neither group felt they contribute to the "*creation of undesignated trails…*".

A one-way analysis of variance between the three on-site locations showed relatively little differences on the four personal responsibility items as visitors at all three locations accept some responsibility for recreation impacts on OSMP (items c and e), do not feel they contribute to creation of undesignated trails (item i), and do not think its OK to go off trail (item l).

Discussion

This study sought to determine visitor perceptions and acceptability of recreation impacts as compared to agency perceptions. A secondary goal was to determine if visitors attribute any of the responsibility for recreation impacts to themselves as compared to OSMP employees. Three primary alternative hypotheses were posed with each partially supported.

For H_1, visitor perceptions of recreation impacts on resource conditions differed from OSMP employee perceptions for all six-resource condition statements. Employees perceived resource condition impacts a much greater problem than visitors especially for presence of trail/soil erosion, undesignated side trails, and multiple parallel trails with percentages for moderate to extreme problem(s) as compared to visitors. Meanwhile a majority of visitors did not find standing water or muddy trails a problem versus OSMP employees, while exposed tree roots on trail was not a problem for either group.

To further address H_1, independent sample t-tests examined differences between visitors and employees on five additional survey statements that measured satisfaction, beliefs, and expectations about trail conditions on OSMP sites with significant differences found for all five statements. Visitors are significantly more satisfied with the trail conditions than employees at

OSMP, which correlates with employee beliefs that recreation can result in negative impacts to plants and wildlife more so than visitors. Employees noted eroded trails, undesignated trails, and soil loss more so than visitors. There was no difference between survey locations among visitors on these statements.

Finally, pertinent to H_1, OSMP employees consider site conditions as more severe than visitors as noted from the photo scenarios shown to visitors on-site and to employees online asking them to rate the level of severity of the conditions they viewed in the three different photographs. From visitor comments, especially among the mountain bikers, they like rougher terrain, thus noting the lower ratings for eroded or trail braiding issues on trail than OSMP employees.

For H_2, that examined differences between visitors and OSMP employees on trial use behavior, for the most part visitors and OSMP employees had similar acceptability ratings. Neither group found it acceptable for people going off to trail to avoid obstacles, standing water on trail, or walking on trailside vegetation, dogs off trail, or people taking undesignated trails. Yet, visitors tend to accept people going off trail to get around other people more than OSMP employees.

For H_3, as expected, visitors have slightly more ascription to responsibility for recreation impacts than OSMP employees and more likely to accept some responsibility for trail erosion since they are the primary users of the resource. Neither visitors nor employees feel they can or should go off trail nor do they feel responsible for the creation of undesignated trails. There were no differences between the three visitor samples for personal responsibility for their recreation behavior.

In summary, the first two hypotheses were supported while findings related to hypothesis three, personal responsibility, were relatively inconclusive. Visitors overall are less concerned about the negative impacts of recreation on resource conditions than agency employees. In general, visitors are quite positive about resource conditions at OSMP whether at Marshall Mesa, Doudy Draw or East Boulder Gunbarrel. The East Boulder site has more regular repeat visitation since many of the people surveyed live in Boulder County and adjacent to the area nearby.

Management Implications

The increase and degradation of visitor-created "informal" trails in protected areas can be a challenging problem for resource managers (Marion et al., n.d.). This study provides useful information about visitor and staff perceptions of undesignated trails OSMP. This section is a starting point to place study results in the context of a larger OSMP program to manage for resource protection and positive visitor experiences (through sustainable trail design and maintenance). The American Trails website (Marion, 2008) provides guiding principles that OSMP can apply when evaluating strategies for managing designed and undesignated trails. This study helps inform management decisions on undesignated trail management, yet there are a variety of factors to consider. Not all undesignated trails are created equal, and a problem analysis such as the following could help guide OSMP on strategies for managing trails:

1) Define problem - the first step is an inventory of the informal trail network within an area of management concern. OSMP plans a follow-up to the 2012 trail inventory in 2017 and 2018.

2) Assess impact acceptability – this study provides data to aid in understanding visitor and OSMP employee perceptions of acceptability, however there are other considerations necessary such as:

- Environmental factors. Informal trails located in sensitive or fragile plant/soil types, near rare plants and animals or in critical wildlife habitats are less acceptable than when located in areas that are resistant to trampling damage and lack rare species. Informal trails that directly ascend steep slopes and/or will easily erode are less acceptable than trails with a side-hill design. Informal trails prone to muddiness and widening are less acceptable, as are trails that may contribute soils to water resources (Marion, 2008).

- Use-related factors. If the trails result from illegal or inappropriate types of uses then the informal trail impacts are less acceptable than if they are caused by permitted uses. Is visitor behavior a factor? Impacts that can be easily avoided are less acceptable – such as when three informal trails in close proximity to each other access a location that could be accessed by a single trail. Why is a trail in a particular location and what are the visitors trying to access? Impacts caused by visitors seeking to shortcut a longer, more resistant route are less acceptable, as are impacts caused by visitors who could alternately access their intended destination by staying on resistant durable surfaces (e.g., rocks gravel, sand) (Marion, 2008).

3) Evaluate causes and alternatives – several potential causes of trail impacts were assessed in this study to include perceptions of erosion and trail braiding as well as acceptability ratings of visitor behavior (i.e., going off trail). Evaluating alternatives includes:

- No action needed for trails found to be acceptable – consider basic management:
    - Limited maintenance of tread/vegetation
    - Reroute non-sustainable/problem sections - when rerouting trails, assessments by trail design and maintenance staff should precede any further management actions. Important considerations include trail alignment to the slope (always favor side-hill designs over direct-ascent alignments), trail grade (<10-15%), and substrates (rocky soil is less erosive).

- Close trails with unacceptable impacts, from illegal uses, and those representing avoidable impact.

- Implement actions and monitoring as part of an adaptive management program. Use a phased approach that applies indirect to more direct actions.

- Integrated site management and education actions are always more effective than single actions.

4) Apply site or visitor management actions

- Visitor education to ensure what visitors should be aware of (i.e., remaining on trail protects OSMP resources)
- Visitor regulations to ensure visitors know what is permitted, discouraged, or prohibited
- It would also be useful for OSMP to clarify internal acceptability levels for trail conditions and then share these with the public.

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Table 1 Concept Matrix

Table 1 Concept Matrix		
Concept	**Definition**	**Operationalization**
Visitor Characteristics	Visitor party demographics	Gender, Age, Zip code, Education
Trip Characteristics	Activity type, duration of visit, mode of access, time of day, weekend vs. weekday	Ordinal data
Impact acceptability ratings	Acceptability ratings of trail braiding and erosion	9 point scale from 4 extremely acceptable to -4 extremely unacceptable with a 0-neutral point
Perceptions of trail conditions	Visitor perceptions of trail conditions and problems	5 point Likert Agreement scale
Norm prevalence	What is acceptable recreation behavior	4 point acceptance scale
Visitor Satisfaction	Satisfaction with trail conditions	5 point Likert agreement scales
Ascription to Responsibility	Feelings of personal responsibility to themselves for recreation impacts	5 point Likert agreement scales
Recreation behavior	Observed recreation impact behavior	Number of times observed
Perceived erosion severity	Observed soil damage condition severity along the trail	Yes or no response and circling on map soil damage severity – mild, moderate and severe
Perceived trail braiding severity	Observed multiple tread condition severity along the trail	Yes or no response and circling on map soil damage severity – mild, moderate, severe, & recovering damage

Note: Table 1 shows concept (variable name(s), how it's defined, and how measured (operationalization))

Table 2. Visitor on-site vs. OSMP employee perceptions of resource conditions

Resource Conditions	Visitors on-site (n=547)	OSMP employees (n=105)	Chi-square	Cramer's V
a. Presence of trail/soil erosion			177.34	0.53
Not at all	42%	4%		
Slight Problem	40%	18%		
Moderate Problem	15%	51%		
Extreme Problem	2%	27%		
b. Presence of undesignated side trails			208.22	0.575
Not at all	57%	3%		
Slight Problem	30%	19%		
Moderate Problem	12%	53%		
Extreme Problem	2%	26%		
c. Presence of multiple parallel trails			182.04	0.537
Not at all	60%	6%		
Slight Problem	25%	18%		
Moderate Problem	12%	49%		
Extreme Problem	3%	28%		
d. Standing water on the trail			247.15	0.624
Not at all	82%	8%		
Slight Problem	15%	51%		
Moderate Problem	3%	36%		
Extreme Problem	0%	5%		
2 cells (25%) with expected count <5				
e. Exposed tree roots on trail			20.58	0.180
Not at all	72%	50%		
Slight Problem	23%	40%		
Moderate Problem	5%	8%		
Extreme Problem	0%	2%		
2 cells (25%) with expected count <5				
f. Muddy trail			216.57	0.585
Not at all	82%	12%		
Slight Problem	14%	47%		
Moderate Problem	4%	34%		
Extreme Problem	0%	6%		
1 cell (12.5%) with expected count <5				

Note: Chi-square tests significant at .001

Table 3. Differences between visitor and OSMP employees on satisfaction and beliefs about trail conditions (*t*-test for independent sample means)

	Visitor on-site			OSMP employee			Total		
	Mean	N	*Std*	Mean	N	*Std*	Mean	N	*Std*
Q8a. I am generally satisfied with the designated trail conditions at OSMP***	4.3	544	0.79	3.7	97	0.92	4.2	641	0.83
Q8b. I believe recreation can result in negative impacts to plants and wildlife***	3.5	539	1.02	4.2	97	0.76	3.7	636	1.01
Q8f. I noticed eroded trails TODAY on OSMP***	3.0	534	1.08	4.2	97	0.68	3.2	631	1.12
Q8h. I have avoided my favorite part of OSMP because of poor trail conditions***	2.0	536	1.10	2.5	97	1.21	2.1	633	1.13
Q8j. I noticed undesignated trails TODAY on OSMP***	2.6	539	1.17	4.1	97	0.73	2.8	636	1.25
Q8k. I noticed areas of soil loss TODAY on OSMP***	2.8	540	1.11	4.0	96	0.81	3.0	636	1.15

5 point Likert Agreement scale: 1 = strongly disagree; 3 = Neutral; 5 = Strongly Agree

** t-test significant at .01; *** significant at .001

Note: The word "TODAY" was not used in statements f, j, and k for the employee online survey because it was not about their personal recreation on a particular day.

Table 4. Visitors versus OSMP employee rating of site conditions

	Visitors on-site			OSMP employees			Total		
Photographs of Site Conditions	Mean	N	*Std*	Mean	N	*Std*	Mean	N	*Std*
a. Rating of the site 1 condition***	2.6	539	0.94	3.5	97	0.90	2.7	636	0.99
b. Rating of the site 2 condition***	3.9	539	0.96	4.5	97	0.69	4.0	636	0.95
c. Rating of the site 3 condition***	3.7	539	1.24	4.6	97	0.64	3.9	636	1.21

5-point impact scale: 1=no impact; 2=slight impact; 3=somewhat impacted; 4=moderate impact; 5=severe impact
** *t*-test significant at .01; *** significant at .001

Table 5. Visitor on-site visitor and OSMP employee mean scores for acceptable behaviors

	Visitor on-site			OSMP employee			Total		
Behavior statements	Mean	n	*Std*	Mean	N	*Std*	Mean	n	*Std*
a. People going off-trail to avoid obstacles on the designated trail*	-0.16	504	1.33	-0.42	99	1.11	-0.21	603	1.30
b. People going off-trail to avoid standing water on the designated trail***	-0.07	494	1.27	-0.60	98	1.02	-0.16	592	1.25
c. People taking undesignated trails	-0.61	489	1.35	-0.52	97	1.00	-0.59	586	1.30
d. People going off-trail to get around other visitors**	0.20	502	1.22	-0.20	99	1.04	0.13	601	1.20
e. People walking on trailside vegetation**	-0.75	496	1.30	-0.94	95	0.91	-0.78	591	1.24
f. Dogs going off trail	-0.11	504	1.33	-0.39	97	1.14	-0.16	601	1.31

* *t*-test significant at .05; ** significant at .01; *** significant at .001

Measurement scale -2=Very Unacceptable; -1=Unacceptable; 0=Neutral; 1=acceptable; 2=Very Acceptable

Table 6. Mean differences between visitor and OSMP employees (*t*-test for independent sample means)

	Visitor on-site			OSMP employee			Total		
Personal responsibility statements	Mean	N	*Std*	Mean	N	*Std*	Mean	N	*Std*
c. I accept some responsibility for recreation impacts on OSMP**	3.9	532	.84	3.7	97	0.93	3.9	629	.86
e. I accept some responsibility for trail erosion on OSMP**	3.5	530	.94	3.3	97	1.06	3.5	627	.96
i. I contribute to the creation of undesignated trails on OSMP	1.8	537	.95	2.0	97	0.91	1.8	634	.95
l. I think it is Ok for me to go off-trail at OSMP***	1.9	542	.96	2.4	97	1.18	2.0	639	1.02

5 point Likert Agreement scale: 1 = strongly disagree; 3 = Neutral; 5 = Strongly Agree
** *t*-test significant at .01; *** significant at .001

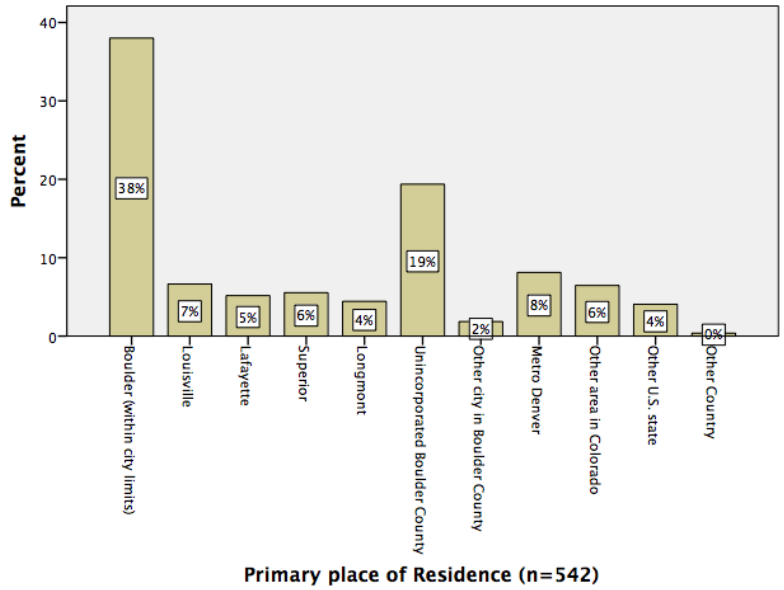

Figure 1. On-site visitors place of residence

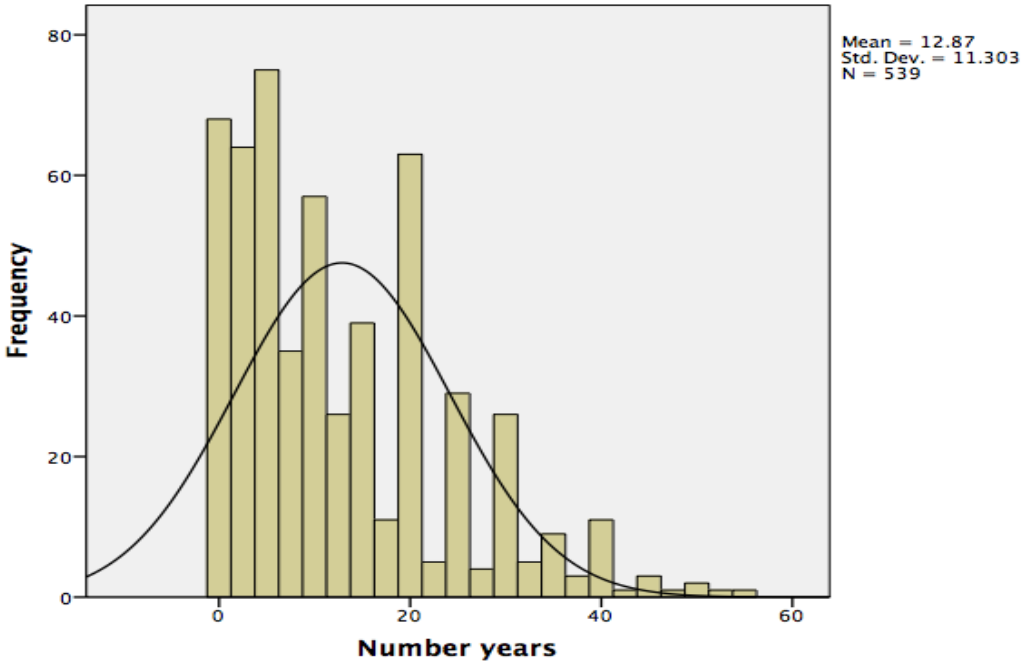

Figure 2. Visitor on-site years coming to OSMP

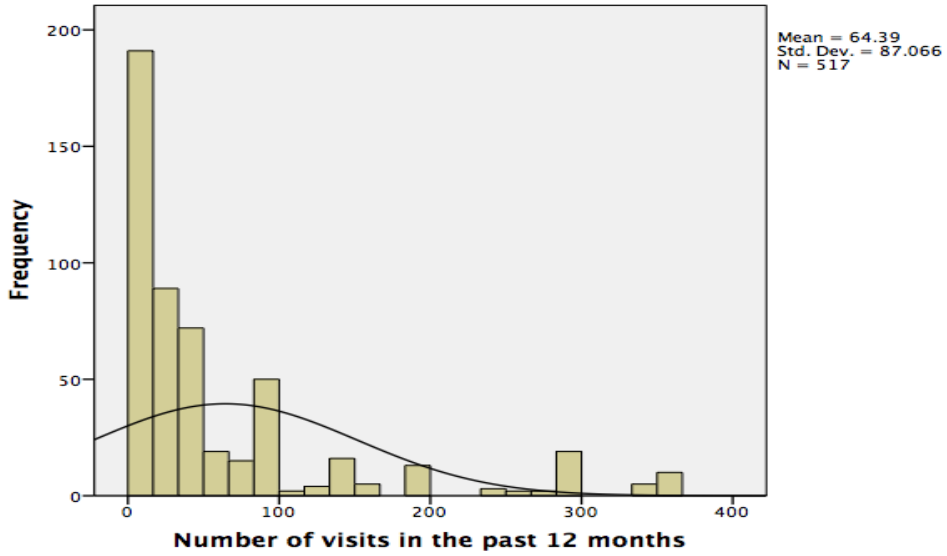

Figure 3. On-site visits to OSMP areas in past year

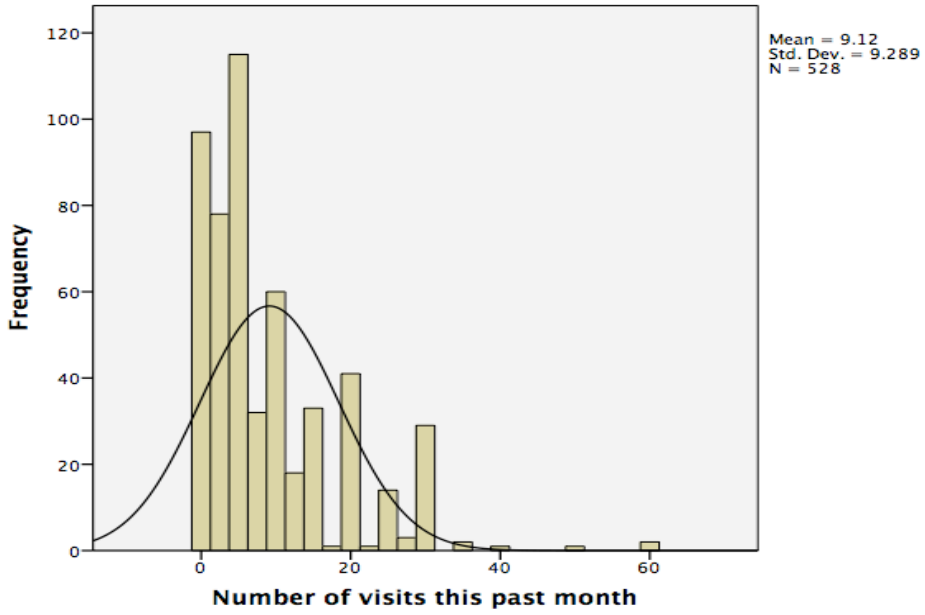

Figure 4. On-site visits to OSMP in past month

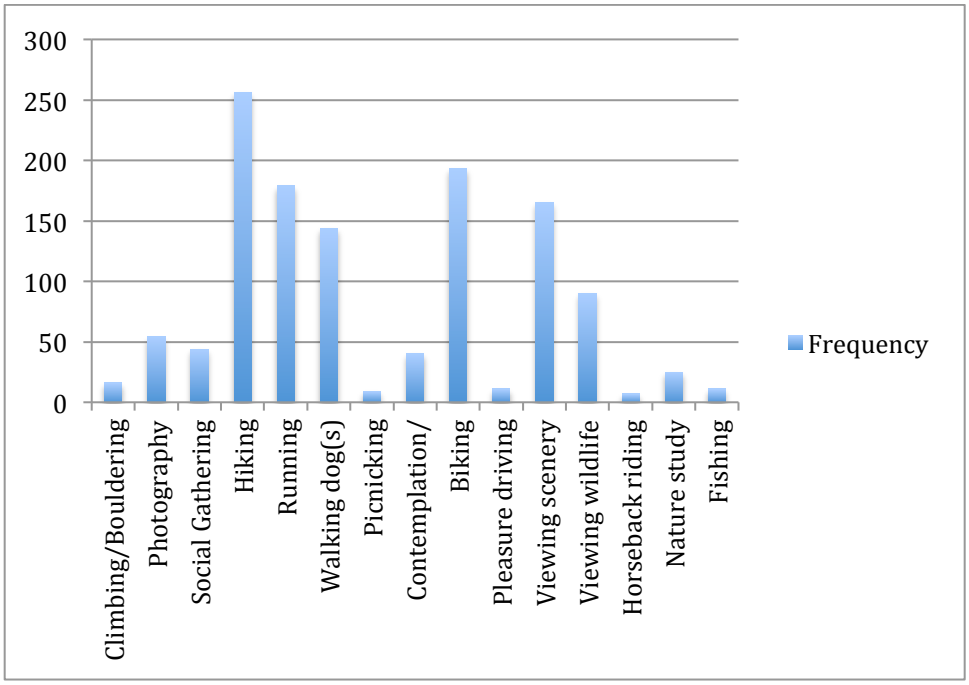

Figure 5. Activities done for all visitors on-site (total responses=1244)

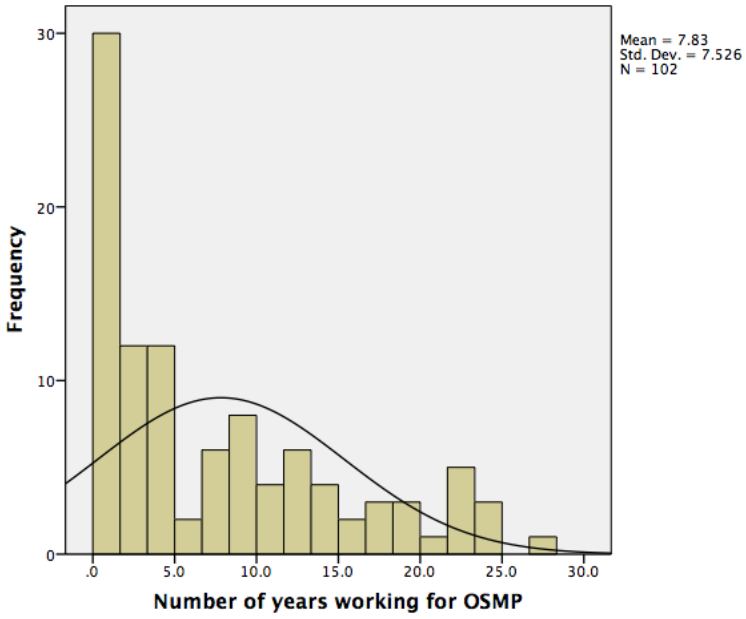

Figure 6. Years working for OSMP

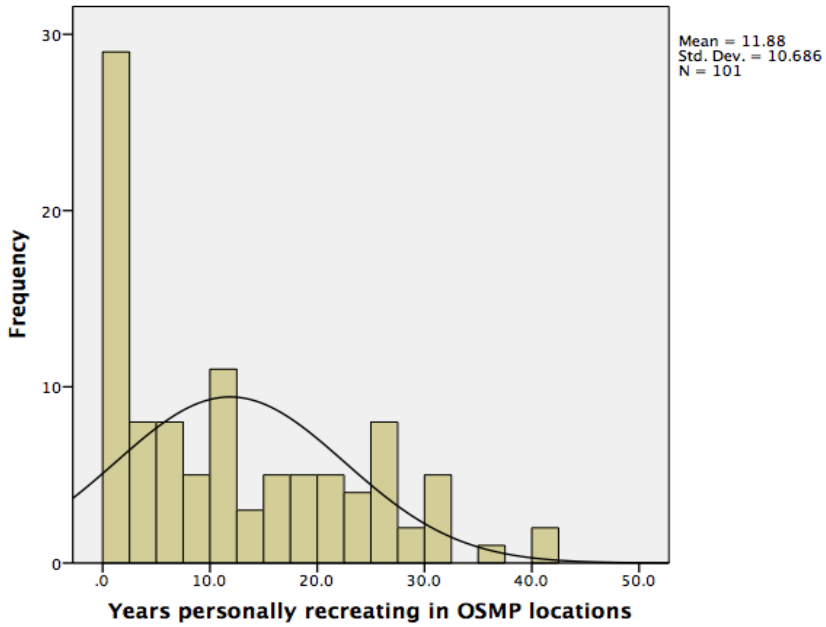

Figure 7. OSMP employee years recreating at OSMP

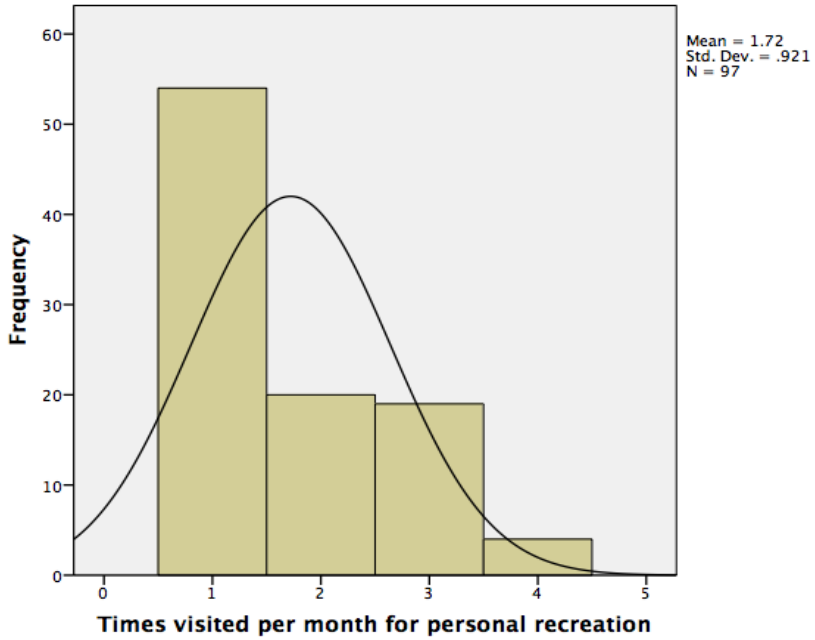

Figure 8. OSMP Employee visits per month in last 12 months

Figure 9. Trail conditions photo scenarios

Appendices

for

Visitor perceptions and acceptability ratings of recreation impacts: Comparison between visitors and managers

Submitted to

Open Space and Mountain Parks

Boulder, CO

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Appendices Overview

The goal of this study was to determine *visitor perceptions and acceptability of resource conditions as compared to agency perceptions. Secondly, do visitors attribute any of the responsibility to themselves?* Data were collected for the City of Boulder Open Space Mountains Parks. Methods included a visitor onsite survey (n=547; response rate 61%) at three sites (Marshall Mesa, n=242; Doudy Draw, n=162; and East Boulder Gunbarrel, n=143) with 15 dates selected at random to represent three weekday and two weekend days per month and an online survey (launched Aug. 9 through Sept. 9, 2016 with three email reminders) via Survey Monkey for OSMP employees (N=245; n=105; 43% response rate) during summer 2016. Appendices provided document the visitor onsite and OSMP employee online survey data with associated frequencies, percentages and measures of central tendency when appropriate depending on the level of measurement of the data. Inferential statistics (bivariate analysis) was done to compare responses to similar questions between onsite visitors and OSMP employees including Oneway Analysis of Variance, *t*-test for independent sample means, and Chi-square for measures of association.

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Appendix A. Frequencies of Onsite Survey compared with OSMP Employee Survey

Date of survey by location (values in percent)

Survey Date	Marshall Mesa (n=242)	Doudy Draw (n=162)	East Boulder Gunbarrel (n=143)	Total (n=547)
Mon. 6/13/16	17.0%	1.9%	9.8%	10.6%
Sat. 6/18/16	8.7%	16.7%	32.2%	17.2%
Sun. 6/19/16	23.7%	3.7%	2.1%	12.1%
Fri. 6/24/16	5.0%	9.9%	2.8%	5.9%
Wed. 6/29/16	5.0%	3.7%	11.2%	6.2%
Thurs. 7/7/16	5.4%	4.9%	2.8%	4.6%
Tues. 7/12/16	2.1%	7.4%	1.4%	3.5%
Sat. 7/16/16	5.0%	24.7%	4.2%	10.6%
Sun. 7/24/16	13.7%	7.4%	2.8%	9.0%
Mon. 7/25/16	4.6%	3.1%	5.6%	4.4%
Wed. 8/3/16	1.7%	0.6%	0%	0.9%
Sat. 8/6/16	4.1%	0.6%	11.2%	4.9%
Fri. 8/12/16	2.1%	6.8%	0.7%	3.1%
Tues. 8/16/16	0.4%	1.2%	5.6%	2.0%
Sun. 8/21/16	1.7%	7.4%	7.7%	4.9%
Totals	100%	100%	100%	100%

Note: 15 sample days (drawn at random) with 5 days per month (June, July, August) representing three-week days and two weekend days per month. Monday, July 25th was substituted for July 18th due to surveyor bee sting onsite early that morning.

Day of week of survey by location (values in percent)

Day of Week	Marshall Mesa (n=242)	Doudy Draw (n=162)	East Boulder Gunbarrel (n=143)	Total (n=547)
Monday	21.6%	4.9%	15.4%	15.2%
Tuesday	2.5%	8.6%	7.0%	5.5%
Wednesday	6.6%	4.3%	11.2%	7.1%
Thursday	5.4%	4.9%	2.8%	4.6%
Friday	7.1%	16.7%	3.5%	9.0%
Saturday	17.8%	42.0%	47.6%	32.7%
Sunday	39.0%	18.5%	12.6%	26.0%
Total	100%	100%	100%	100%

Note: the most surveys were collected on weekends (n=321; 59%) vs. weekdays (n=226; 41%) with Saturday having the greatest number of surveys completed (33%) on the weekend and Monday (15%) for weekdays.

Time of survey by location

Time period of Survey	Marshall Mesa (n=242)	Doudy Draw (n=162)	East Boulder Gunbarrel (n=143)	Total (n=547)
8 to 11 am	149	91	94	334
	61.6%	56.2%	65.7%	61.1%
12 to 3 pm	38	57	24	119
	15.7%	35.2%	16.8%	21.8%
4 to 7 pm	55	14	25	94
	22.7%	8.6%	17.5%	17.2%
Total counts	242	162	143	547
Total percentage	100%	100%	100%	100%

Note: 61% of the surveys were gathered during the 8 to 11 am shift with the least (17%) collected from 4 to 7 pm.

Q1. How many years have you been coming to OSMP?

Location	n	Mean	Median	*Std*	*F-value*
Marshall Mesa	237	10.5[b]	8	10.25	13.96***
Doudy Draw	161	12.1[b]	10	10.60	
East Boulder Gunbarrel	141	17.8[a]	16	12.27	
Total onsite	539	12.9	10	11.30	
OSMP Employees	101	11.9	10	10.68	

*** Oneway AOV test significant at .001; shaded row mean score differs from other locations (Scheffe's test - Mean scores with different superscripts differ significantly at .05 level)

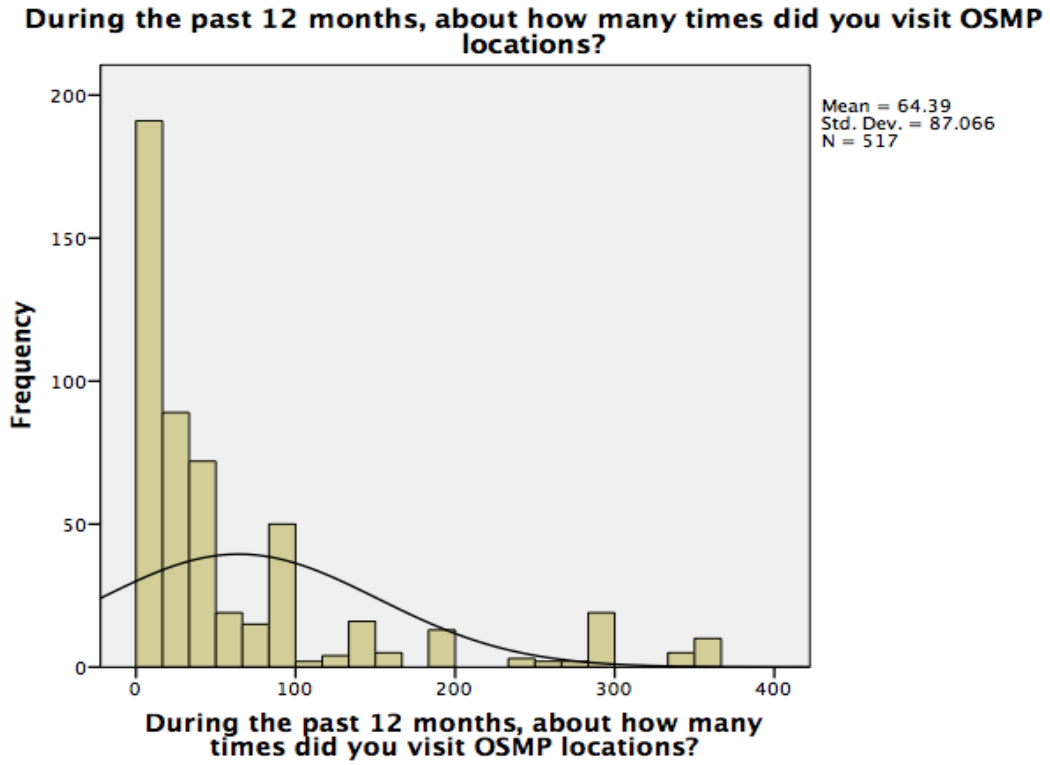
Note: Visitors to East Boulder Gunbarrel came the most years (*M* = 17.8).

Q1a. Frequency of first visit by location

Year	Marshall Mesa	Doudy Draw	East Boulder Gunbarrel	Total
1970	0	2	0	2
1978	0	0	1	1
1979	0	1	0	1
1981	0	1	0	1
1983	1	0	0	1
1985	0	1	1	2
1986	1	0	0	1
1987	0	0	1	1
1992	1	0	0	1
1993	1	0	1	2
1994	0	0	1	1
1996	1	0	0	1
1997	1	0	0	1
1999	0	0	1	1
2000	3	0	0	3
2001	0	1	0	1
2003	0	1	0	1
2005	1	0	1	2
2006	0	2	0	2
2008	2	0	0	2
2011	0	1	0	1
2012	1	0	0	1
2013	0	1	0	1
2014	1	0	0	1
2016	33	16	2	51
Total	47	27	9	83

Note: Only 83 people answered the question by indicating the year of their first visit with 51 of those in 2016.

Q2. During the past 12 months, about how many times did you visit OSMP locations?



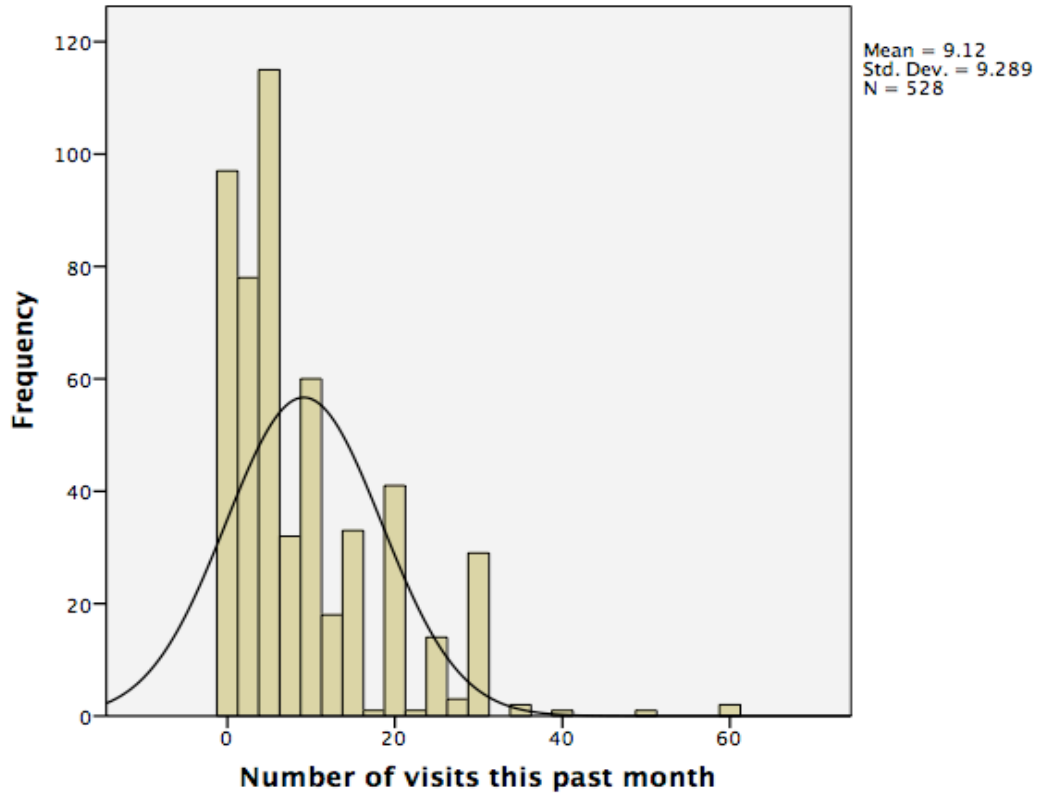
Location mean scores on number of visits this past 12 months

Location	n	Mean	Median	*Std*	*F-value*
Marshall Mesa [a]	223	40.6	20	54.27	42.8***
Doudy Draw [a]	158	51.2	20	70.69	
East Boulder Gunbarrel [b]	140	118.3	70	118.9	
Total onsite	517	64.4	20	87.07	
OSMP Employees [c]	97	1.7	1	0.92	

*** Oneway AOV test significant at .001; Locations with different superscripts differ significantly at .05 level (Scheffe's test - Mean scores with different superscripts differ significantly at .05 level)
Note: Outlier values greater than 400 set to missing

Note: East Boulder Gunbarrel visitors visited the most in the past 12 months with a median of 64 times per year followed by Marshall Mesa and Doudy Draw (Median = 20) while OMSP employees visited one or two times per year.

Q3. During this past month, about how many times did you visit OSMP locations?



Location mean scores on number of visits this past 12 months

Location	n	Mean	Median	*Std*	*F-value*
Marshall Mesa	230	6.8[b]	5	6.23	37.3***
Doudy Draw	159	7.8[b]	5	8.74	
East Boulder Gunbarrel	139	14.5[a]	12	11.69	
Total	528	9.4	6	11.12	

*** Oneway AOV test significant at .001; shaded row mean score differs from other locations (Scheffe's test - Mean scores with different superscripts differ significantly at .05 level)

Note: One outlier of 150 times visited set to missing

Note: East Boulder Gunbarrel visited the most in the past month (M = 15.5) with similar visitation patterns for Marshall Mesa and Doudy Draw.

Q4. Activities done *today* by location for visitors onsite and OSMP employee data when visiting for personal recreation for those activities they generally participate in.

	Marshall Mesa (n=240)		Doudy Draw (n=162)		East Boulder Gunbarrel (n=143)		Total (n=545)		OSMP Employees	
Activity	n	%	n	%	n	%	n	%	n	%
Climbing/Bouldering	10	1.8	2	0.6	4	1.1	16	1.3	13	3.4
Photography	30	5.5	12	3.5	12	3.3	54	4.3	30	7.9
Social Gathering	21	3.9	13	3.8	10	2.8	44	3.5	18	4.7
Hiking	**117**	**21.5**	65	19.1	**74**	**20.5**	**256**	**20.6**	91	23.9
Running	62	11.4	**77**	**22.6**	40	11.1	179	**14.4**	21	5.5
Walking dog(s)	44	8.1	28	8.2	**72**	**19.9**	144	**11.6**	26	6.8
Picnicking	4	0.7	3	0.9	2	0.6	9	0.7	12	3.2
Contemplation/Meditation	17	3.1	9	2.6	14	3.9	40	3.2	27	7.1
Biking	107	19.7	57	16.8	29	8.0	193	**15.5**	26	6.8
Pleasure driving	6	1.1	4	1.2	1	0.3	11	0.9	10	2.6
Viewing scenery	72	13.3	41	12.1	52	14.4	165	13.3	40	10.5
Viewing wildlife	43	7.9	17	5.0	30	8.3	90	7.2	38	10.0
Horseback riding	0	0.0	3	0.9	4	1.1	7	0.6	2	0.5
Nature study	6	1.1	5	1.5	14	3.9	25	2.0	17	4.5
Fishing	4	0.7	4	1.2	3	0.8	11	0.9	9	2.4
Total Responses	543	100	340	100	361	100	1244	100	380	100

Bold items indicate those done most. As a multiple response question, more than one response was selected by most respondents.

Note: The activity done the most was hiking (20.6%), followed by biking, running, and walking dog(s). Hiking was done most at Marshall Mesa and East Boulder Gunbarrel with running done most at Doudy Draw. Dog walking was done most at East Boulder Gunbarrel.

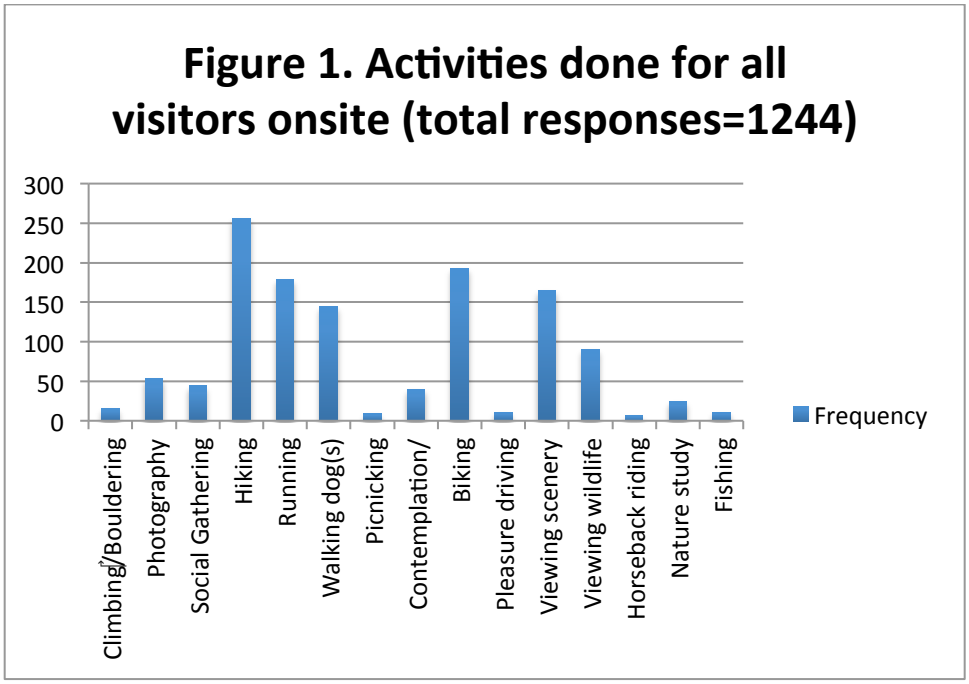


Figure 1. Activities done for all visitors onsite (total responses=1244)
300
250
200
150
100
50
0
Climbing/Bouldering
Photography
Social Gathering
Hiking
Running
Walking dog(s)
Picnicking
Contemplation/
Biking
Pleasure driving
Viewing scenery
Viewing wildlife
Horseback riding
Nature study
Fishing
Frequency

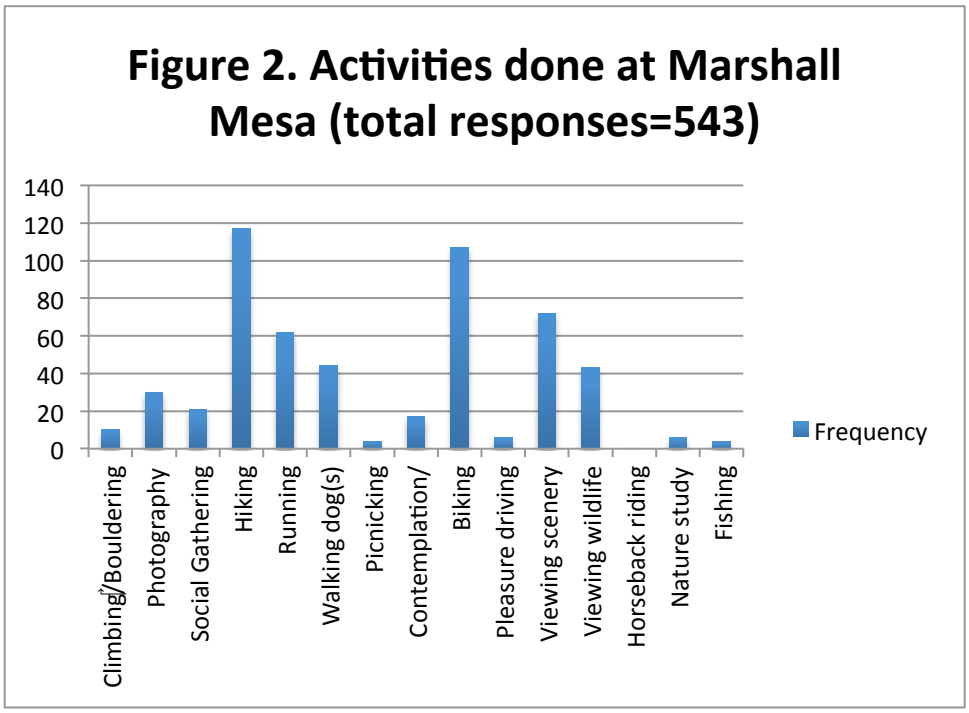


Figure 2. Activities done at Marshall Mesa (total responses=543)
140
120
100
80
60
40
20
0
Climbing/Bouldering
Photography
Social Gathering
Hiking
Running
Walking dog(s)
Picnicking
Contemplation/
Biking
Pleasure driving
Viewing scenery
Viewing wildlife
Horseback riding
Nature study
Fishing
Frequency

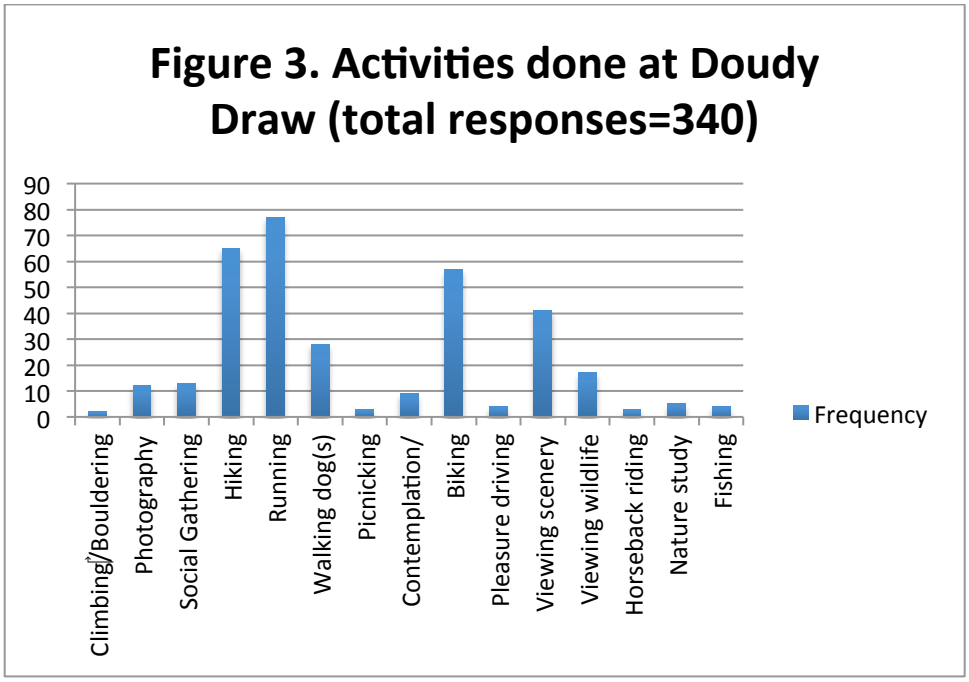


Figure 3. Activities done at Doudy Draw (total responses=340)
90
80
70
60
50
40
30
20
10
0
Climbing/Bouldering
Photography
Social Gathering
Hiking
Running
Walking dog(s)
Picnicking
Contemplation/
Biking
Pleasure driving
Viewing scenery
Viewing wildlife
Horseback riding
Nature study
Fishing
Frequency

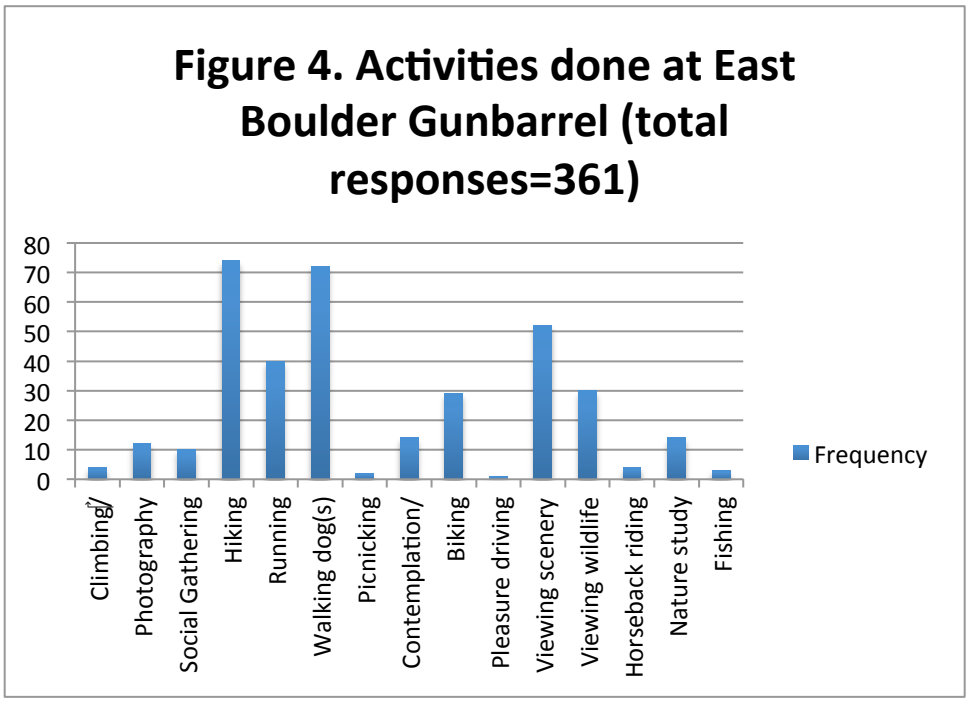


Figure 4. Activities done at East Boulder Gunbarrel (total responses=361)
80
70
60
50
40
30
20
10
0
Climbing/
Photography
Social Gathering
Hiking
Running
Walking dog(s)
Picnicking
Contemplation/
Biking
Pleasure driving
Viewing scenery
Viewing wildlife
Horseback riding
Nature study
Fishing
Frequency

Q4a. Primary Activity by Location

Primary Activity	Marshall Mesa	Doudy Draw	East Boulder Gunbarrel	Total	OSMP employee
Biking	83	31	13	127	5
Climbing	1	0	0	1	4
Contemplation	1	0	0	1	---
Hiking	35	16	19	70	64
Horseback riding	0	1	4	5	1
Running	23	38	14	75	6
Viewing scenery	1	0	0	1	1
Walking dog(s)	5	3	31	39	5
Total	149	89	81	319	
Fishing					2
Mountain Biking					1
Nature study					2
None					3
Photography					1
Picnic					1
Social gathering					1
Viewing wildlife					2
Walking dog(s)					5
Total					99

Note: Visitors were asked to indicate their primary activity done by circling from a list of activities. Only 149 people completed this question with the most for biking followed by running, hiking and walking dog(s).

Q5. Are you aware that some trails in City of Boulder OSMP are "undesignated" or not official trails?

	Marshall Mesa	Doudy Draw	East Boulder Gunbarrel	Total	Chi-Square	OSMP employees
No	85	70	41	196	6.04*	1
	36.5%	43.8%	29.7%	36.9%		4.0%
Yes	148	90	97	335		101
	63.5%	56.3%	70.3%	63.1%		99.0%
Total	233	160	138	531		102

* Chi-square test significant at .05

Note: East Boulder Gunbarrel (70%) visitors were more aware about undesignated trails in OSMP areas than Marshall Mesa (64%) or Doudy Draw visitors (56%).

Q6A. Number of times you personally observed each of the following behaviors on your visit today to OSMP?

	Marshall Mesa			Doudy Draw			East Boulder Gunbarrel			Total		
Observed Behavior	Mean	N	*Std*	Mean	n	*Std*	Mean	n	*Std*	Mean	n	*Std*
a. Going off-trail to avoid obstacles on the designated trail	0.33	186	0.78	0.36	136	1.24	0.16	116	0.54	0.29	438	0.90
b. Going off-trail to avoid standing water on the designated trail	0.18	187	0.55	0.1	136	0.42	0.09	113	0.64	0.13	436	0.54
c. Taking undesignated trails	0.15	184	0.52	0.09	136	0.39	0.27	113	0.94	0.16	433	0.63
d. People going off-trail to get around other visitors***	1.19[a]	186	2.41	1.63[a]	137	2.85	0.28[b]	113	0.80	1.09	436	2.33
e. Walking on trailside vegetation**	0.4[a]	186	1.07	0.66[b]	135	1.49	0.19[ac]	113	0.68	0.43	434	1.15
f. Dogs going off trail***	0.82[a]	181	1.42	0.18[b]	134	0.68	0.60[ac]	111	1.12	0.56	426	1.19
g. Other	0.88	24	2.40	0.62	26	1.06	0.12	26	0.43	0.53	76	1.52

Shaded row mean score differs from other locations.
** Oneway AOV test significant at .01
*** Oneway AOV test significant at .001
[a b] Mean scores with different superscripts differ significantly at .05 level

Note: Marshall Mesa and Doudy Draw visitors observed more people going off-trail to get around other visitors; meanwhile Doudy Draw visitors observed more people walking on trailside vegetation followed by Marshall Mesa. The most dogs going off trail was observed by Marshall Mesa and East Gunbarrel visitors than at Doudy Draw.

Q6B. In general please rate how acceptable ***each*** of the behaviors is at OSMP areas:

	Marshall Mesa			Doudy Draw			East Boulder Gunbarrel			Total Onsite			OSMP Employees		
Behavior statements	Mean	N	*Std*	Mean	N	*Std*	Mean	n	*Std*	Mean	n	*Std*	Mean	N	*Std*
a. People going off-trail to avoid obstacles on the designated trail	-0.15	217	1.33	-0.27	153	1.38	-0.07	134	1.27	-0.21	603	1.29	-0.42	99	1.12
b. People going off-trail to avoid standing water on the designated trail***	0.01[a]	212	1.29	-0.28[b]	150	1.30	0.05[ad]	132	1.17	-0.16	592	1.25	-0.6[c]	98	1.02
c. People taking undesignated trails*	-0.61	210	1.39	-0.81[a]	146	1.27	-0.39[b]	133	1.35	-0.59	586	1.29	-0.52	97	1.00
d. People going off-trail to get around other visitors**	0.29[a]	214	1.19	0.1	154	1.30	0.18	134	1.18	0.13	601	1.20	-0.2[b]	99	1.04
e. People walking on trailside vegetation	-0.74	212	1.37	-0.9	151	1.23	-0.62	133	1.25	-0.78	591	1.24	-0.94	95	0.91
f. Dogs going off trail**	0.01[a]	218	1.34	-0.37[b]	150	1.28	-.02[abd]	136	1.35	-0.16	601	1.31	-.39[c]	97	1.14
g. Other	-0.32	28	1.54	-0.74	19	1.41	0	15	1.07	-0.37	62	1.41	na	Na	na

Measurement scale -2=Very Unacceptable; -1=Unacceptable; 0=Neutral; 1=acceptable; 2=Very Acceptable
Shaded row mean score differs from other locations.
* Oneway AOV test approaching significance at .05; ** significant at .01; ***significant at .001
[a b c] Mean scores with different superscripts differ significantly at .05 level (Scheffe's Test)

Note: Doudy Draw visitors were more critical of visitor behavior for people going off trail to avoid standing water, taking undesignated trails, and dogs going off trail than Marshall or East Gunbarrel visitors. Meanwhile Marshall Mesa had a problem with people going off trail in comparison to OSMP employees.

Table. Onsite and OSMP employee mean scores for acceptable behaviors

	Visitor onsite			OSMP employee			T
Behavior statements	Mean	n	*Std*	Mean	N	*Std*	Mean
a. People going off-trail to avoid obstacles on the designated trail*	-0.16	504	1.33	-0.42	99	1.11	-0.21
b. People going off-trail to avoid standing water on the designated trail***	-0.07	494	1.27	-0.60	98	1.02	-0.16
c. People taking undesignated trails	-0.61	489	1.35	-0.52	97	1.00	-0.59
d. People going off-trail to get around other visitors**	0.20	502	1.22	-0.20	99	1.04	0.13
e. People walking on trailside vegetation**	-0.75	496	1.30	-0.94	95	0.91	-0.78
f. Dogs going off trail	-0.11	504	1.33	-0.39	97	1.14	-0.16

* *t*-test significant at .05; ** t-test significant at .01; *** significant at .001
Measurement scale -2=Very Unacceptable; -1=Unacceptable; 0=Neutral; 1=acceptable; 2=Very Acceptable
Shaded rows indicate significant differences

Notes: although differences between onsite and OSMP employees were noted for four of the six behaviors, both samples considered going off trail to avoid obstacles and standing water on trail as well as walking on trailside vegetation unacceptable. Meanwhile visitors, were more accepting of people going off trail to get around other visitors than OSMP employees.

Q7. To what extent do you think each of the following resource conditions is a problem you noted at OSMP areas today (visitors) or for OSMP employees previously?

	Marshall Mesa			Doudy Draw			East Boulder Gunbarrel			Total Onsite			OSMP Employee		
Resource Conditions	*Mean*	*N*	*Std*	*Mean*	*n*	*Std*	*Mean*	*n*	*Std*	*Mean*	*n*	*Std*	*Mean*	*n*	*Std*
a. Presence of trail/soil erosion	0.73	237	0.76	0.74	159	0.83	0.89	142	0.75	0.77	538	0.78	2.01	95	0.79
b. Presence of undesignated side trails	0.63	234	0.78	0.57	160	0.77	0.55	139	0.78	0.59	533	0.78	2.01	97	0.76
c. Presence of multiple parallel trails	0.57	233	0.84	0.6	161	0.79	0.6	141	0.81	0.59	535	0.82	1.98	97	0.84
d. Standing water on the trail	0.26	236	0.52	0.21	160	0.50	0.15	141	0.39	0.22	537	0.49	1.38	97	0.71
e. Exposed tree roots on trail***	0.41[a]	237	0.60	0.45[a]	161	0.68	0.11[b]	140	0.35	0.34	538	0.59	0.63	97	0.73
f. Muddy trail	0.27	237	0.57	0.22	160	0.54	0.14	139	0.37	0.23	536	0.52	1.34	97	0.78

0 Not at all a problem; 1 Slight problem; 2 Moderate problem; 3 Extreme problem
Shaded row mean score differs from other locations.
*** Oneway AOV test significant at .001
[a b] Mean scores with different superscripts differ significantly at .05 level

Notes: Exposed trees roots on trail were slightly more of a problem for Doudy Draw and Marshall Mesa visitors than at East Boulder Gunbarrel.

Table. Visitor onsite vs. OSMP employee mean scores for perceptions of resource conditions

	Visitors onsite			OSMP employees			Total				
Resource Conditions	Mean	n	Std	Mean	n	Std	Mean	N	Std	t-value	Eta
Q7a. Presence of trail/soil erosion	0.77	538	0.78	2.01	95	0.79	0.96	633	0.900	-14.02	0.49
Q7b_Undesignated b. Presence of undesignated side trails	0.59	533	0.78	2.01	97	0.76	0.81	630	0.927	-16.89	0.55
Q7c. Presence of multiple parallel trails	0.59	535	0.82	1.98	97	0.84	0.8	632	0.963	-15.08	0.52
Q7d. Standing water on the trail	0.22	537	0.49	1.38	97	0.71	0.39	634	0.674	-15.45	0.62
Q7e. Exposed tree roots on trail	0.34	538	0.59	0.63	97	0.73	0.39	635	0.621	-3.68	0.17
Q7f. Muddy trail	0.23	536	0.52	1.34	97	0.78	0.4	633	0.693	-13.61	0.58

[1]Equal variances not assumed for all 6 items
[2]Significant at the .001 level

Q8. Please indicate the extent to which you **agree** or **disagree** with each of the following statements.

	Marshall Mesa			Doudy Draw			East Boulder Gunbarrel			Total Onsite			OSMP Employee		
	Mean	*n*	*Std*	*Mean*	*n*	*Std*	*Mean*	*n*	*Std*	*Mean*	*n*	*Std*	*Mean*	*n*	*Std*
a. I am generally satisfied with the designated trail conditions at OSMP*	4.24	240	0.75	4.39[a]	161	0.73	4.12[b]	143	0.88	4.25	544	0.79	3.71	97	0.92
b. I believe recreation can result in negative impacts to plants and wildlife	3.51	238	1.01	3.49	160	1.08	3.65	141	0.95	3.54	539	1.02	4.24	97	0.76
c. I accept some responsibility for recreation impacts on OSMP	3.88	234	0.85	3.99	158	0.85	3.91	140	0.81	3.92	532	0.84	3.68	97	0.93
d. I expected to see people going off of the designated trail TODAY on OSMP	2.64	234	0.99	2.63	160	1.03	2.73	140	0.99	2.66	534	1.00	3.57	97	1.09
e. I accept some responsibility for trail erosion on OSMP	3.5	238	0.94	3.6	157	0.92	3.45	135	0.96	3.52	530	0.94	3.25	97	1.06
f. I noticed eroded trails TODAY on OSMP	2.91	235	1.05	2.9	156	1.09	3.11	143	1.10	2.96	534	1.08	4.22	97	0.68
g. I expected to see eroded trails TODAY on OSMP	3.07	235	1.048	3.01	160	1.01	3.1	141	1.12	3.06	536	1.05	3.66	94	0.89
h. I have avoided my favorite part of OSMP because of poor trail conditions*	1.91[a]	235	1.047	1.99	160	1.10	2.21[b]	141	1.16	2.02	536	1.10	2.52	97	1.21
i. I contribute to the creation of undesignated trails on OSMP**	1.77[a]	237	0.96	1.65[ac]	161	0.86	1.99[b]	139	1.03	1.79	537	0.95	1.98	97	0.91
j. I noticed undesignated trails TODAY on OSMP	2.64	236	1.17	2.43	160	1.16	2.64	143	1.12	2.58	539	1.17	4.12	97	0.73
k. I noticed areas of soil loss TODAY on OSMP	2.85	237	1.07	2.73	160	1.14	2.82	143	1.12	2.8	540	1.11	4.02	96	0.81
l. I think it is Ok for me to go off-trail at OSMP**	1.77[a]	240	0.89	1.82[ac]	159	0.98	2.15[b]	143	1.01	1.88	542	0.96	2.43	97	1.18

5 point Likert Agreement scale: 1 = strongly disagree; 3 = Neutral; 5 = Strongly Agree
Shaded row mean score differs from other locations.
* Oneway AOV test significant at .05; ** significant at .01
[a b] Mean scores with different superscripts differ significantly at .05 level (Scheffe's test)

Notes: A oneway analysis of variance between the three onsite locations showed relatively little differences except for items a, h, I, and j. Doudy Draw visitors were slightly more satisfied with trail conditions than at the other sites; however, the mean scores where all high for this item. For the most part, visitors tend to disagree with items overall for Question 8.

When the OSMP employee data is included in the AOV test, there is a distinct difference between OSMP employees and visitors onsite for each item with OSMP employees tending more towards agreement on those items related to resource impacts. Meanwhile, employees are less satisfied with trail conditions while they are less likely to agree that they contribute to resource issues (i.e., creation of undesignated trails, etc.).

Differences between visitor and OSMP employees (t-test for independent sample means)

	Visitor onsite			OSMP employee			Total		
	Mean	N	*Std*	Mean	N	*Std*	Mean	N	*Std*
Q8a. I am generally satisfied with the designated trail conditions at OSMP***	4.3	544	0.79	3.7	97	0.92	4.2	641	0.83
Q8b. I believe recreation can result in negative impacts to plants and wildlife***	3.5	539	1.02	4.2	97	0.76	3.7	636	1.01
Q8c. I accept some responsibility for recreation impacts on OSMP**	3.9	532	0.84	3.7	97	0.93	3.9	629	0.86
Q8d. I expected to see people going off of the designated trail TODAY on OSMP***	2.7	534	1.00	3.6	97	1.09	2.8	631	1.07
Q8e. I accept some responsibility for trail erosion on OSMP**	3.5	530	0.94	3.3	97	1.06	3.5	627	0.96
Q8f. I noticed eroded trails TODAY on OSMP***	3.0	534	1.08	4.2	97	0.68	3.2	631	1.12
Q8g. I expected to see eroded trails TODAY on OSMP***	3.1	536	1.05	3.7	94	0.89	3.2	630	1.05
Q8h. I have avoided my favorite part of OSMP because of poor trail conditions***	2.0	536	1.10	2.5	97	1.21	2.1	633	1.13
Q8i. I contribute to the creation of undesignated trails on OSMP	1.8	537	0.95	2.0	97	0.91	1.8	634	0.95
Q8j. I noticed undesignated trails TODAY on OSMP***	2.6	539	1.17	4.1	97	0.73	2.8	636	1.25
Q8k. I noticed areas of soil loss TODAY on OSMP***	2.8	540	1.11	4.0	96	0.81	3.0	636	1.15
Q8l. I think it is Ok for me to go off-trail at OSMP***	1.9	542	0.96	2.4	97	1.18	2.0	639	1.02

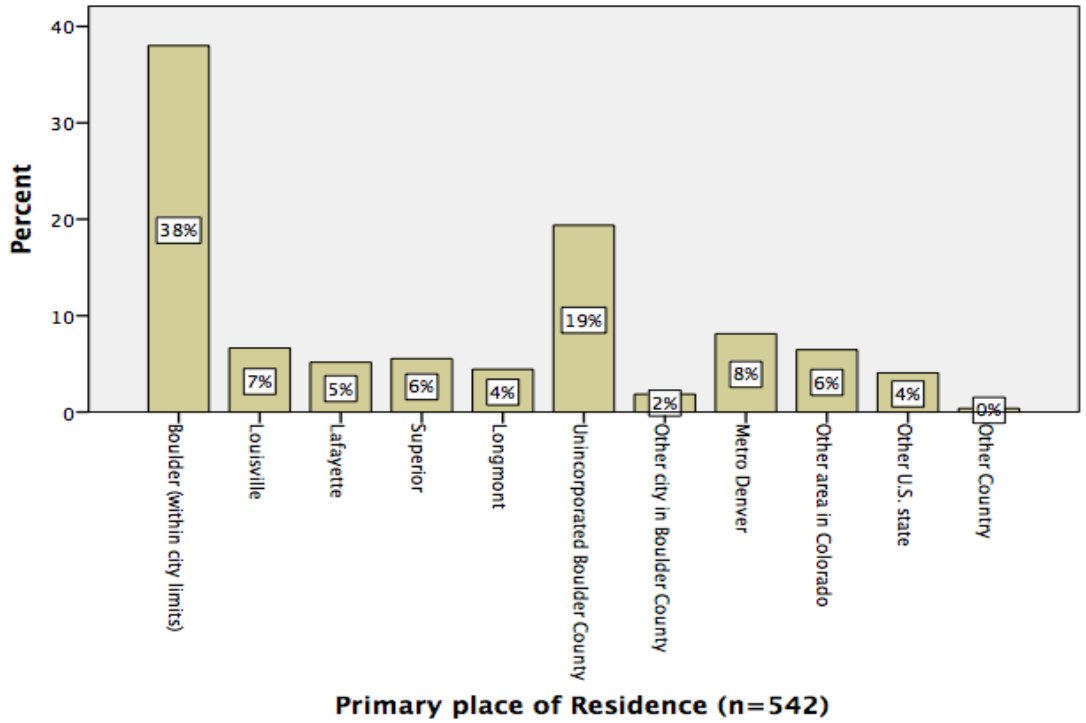
** t-test significant at .01; *** significant at .001
Shaded row indicates no difference

Note: Comparing onsite visitors with OSMP Employees via a *t*-test for independent sample means, differences were noted for 11 of the 12 statements for Question 8. In general, OSMP employees were more negative about site conditions and site expectations than visitors.

Q9. Primary place of residence by location

	Marshall Mesa (n=239)	%	Doudy Draw (n=161)	%	East Boulder Gunbarrel (n=142)	%	Total (n=542)	%
Boulder (within city limits)	107	44.8	63	39.1	36	25.4	206	38.0
Louisville	14	5.9	20	12.4	2	1.4	36	6.6
Lafayette	12	5.0	12	7.5	4	2.8	28	5.2
Superior	23	9.6	7	4.3	0	0.0	30	5.5
Longmont	11	4.6	5	3.1	8	5.6	24	4.4
Unincorporated Boulder County	16	6.7	12	7.5	77	54.2	105	19.4
Other city in Boulder County	4	1.7	0	0.0	6	4.2	10	1.8
Metro Denver	24	10.0	20	12.4	0	0.0	44	8.1
Other area in Colorado	16	6.7	13	8.1	6	4.2	35	6.5
Other U.S. state	12	5.0	7	4.3	3	2.1	22	4.1
Other Country	0	0.0	2	1.2	0	0.0	2	0.4
Total	239	100	161	100	142	100	542	100

81% (n=439) are in county residents versus 19% (n=103) out of county (n=542).



Q10. Gender for onsite and employee data by Location

Gender	Marshall Mesa (n=236)	Doudy Draw (n=160)	East Boulder Gunbarrel (n=141)	Total Onsite (n=537)	OSMP Employee (n=91)
Male	54.7%	48.1%	45.4%	50.3%	58.2%
Female	45%	51%	55%	49%	40.0%
Other	<1%	<1%	0	<1%	2.2%
Total	100%	100%	100%	100%	100%

Q11. Age for onsite and employee data by Location

	Marshall Mesa (n=233)	Doudy Draw (n=162)	East Boulder Gunbarrel (n=138)	Total Onsite (n=533)	OSMP Employee (n=80)
Mean	40.1	39.1	51.4	42.7	39.4
Median	41	38.5	52	44	35.5
Std	15.65	15.42	13.75	15.94	12.46

Q11a. Age categories for visitor onsite and employee data by Location

Age	Marshall Mesa (n=233)	Doudy Draw (n=162	East Boulder Gunbarrel (n=138)	Total Onsite (n=533)	OSMP Employee (n=80)
<20	13.7%	9.3%	2.9%	9.6%	
20-29	15.0%	25.3%	3.6%	15.2%	23.80%
30-39	17.2%	17.3%	10.9%	15.6%	32.50%
40-49	24.5%	21.0%	23.2%	23.1%	17.50%
50-59	20.6%	17.3%	31.2%	22.3%	21.30%
60-69	6.0%	7.4%	18.8%	9.8%	3.80%
70-79	3.0%	1.2%	7.2%	3.6%	
80-89		0.6%	2.2%	0.8%	1.30%
90-99		0.6%		0.2%	
Total	100.0%	100.0%	100.0%	100.0%	100.0%

Note: 40-49 and 50-59 were largest age ranges among onsite visitors with the oldest age grouping represented at East Boulder Gunbarrel (age 60-69; 19%). The youngest (<20) were recorded at Marshall Mesa as many biking youth groups use that trail.

Q12. Highest education level for onsite and employee data by location

Education	Marshall Mesa (n=236)	Doudy Draw (n=160)	East Boulder Gunbarrel (n=141)	Total onsite (n=540)	OSMP Employee (n=91)
Some high school	10.6%	8.6%	2.1%	7.8%	
High School graduate	5.9%	1.9%	2.8%	3.9%	2.20%
Some college, no degree	10.2%	10.5%	8.5%	9.8%	4.50%
Associate's degree	1.7%	1.2%	3.5%	2.0%	
Bachelor's Degree	37.7%	42.0%	42.3%	40.2%	58.40%
Graduate or professional degree	27.1%	32.1%	36.6%	31.1%	31.50%
PhD	6.8%	3.7%	4.2%	5.2%	3.40%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

Note: Most respondents have a BS degree or higher education.

Q14. Review the provided photographs and provide your rating of the site condition (for onsite & employee data)

	Marshall Mesa			Doudy Draw			East Boulder Gunbarrel			Total Onsite			OSMP Employee		
Photographs	*Mean*	*N*	*Std*	*Mean*	*n*	*Std*	*Mean*	*n*	*Std*	*Mean*	*n*	*Std*	*Mean*	*n*	*Std*
a. Rating of site 1 condition***	2.48[a]	236	0.89	2.56[a]	162	0.93	2.87[b]	141	0.98	2.6	539	0.93	3.51	97	0.90
b. Rating of site 2 condition	3.83	236	0.94	3.84	162	1.00	3.99	141	0.95	3.87	539	0.96	4.51	97	0.69
c. Rating of site 3 condition	3.69	236	1.24	3.86	162	1.25	3.62	141	1.21	3.72	539	1.24	4.62	97	0.64

5-point impact scale: 1=no impact; 2=slight impact; 3=somewhat impacted; 4=moderate impact; 5=severe impact

Shaded row mean score differs from other locations.

*** Oneway AOV test significant at .001

[a b] Mean scores with different superscripts differ significantly at .05 level (Scheffe's test)

Note: Visitors rated site conditions for site 2 and 3 the same while site 1 photograph was rated as slightly more impacted at East Boulder Barrel than at Marshall Mesa and Doudy Draw.

T-test of sample means for Visitors and OSMP employees

	Visitors onsite			OSMP employees			Total		
	Mean	N	*Std*	Mean	N	*Std*	Mean	N	*Std*
a. Rating of the site 1 condition***	2.6	539	0.94	3.5	97	0.90	2.7	636	0.99
b. Rating of the site 2 condition***	3.9	539	0.96	4.5	97	0.69	4.0	636	0.95
c. Rating of the site 3 condition***	3.7	539	1.24	4.6	97	0.64	3.9	636	1.21

** t-test significant at .01; *** significant at .001

Note: OSMP employees rating of photographs of site conditions more severe than visitors.

Q15. Comments by location

Marshall Mesa	Frequency
After rain closed too long. Other communities open sooner every time	1
Allow more dog blue/green tag areas	1
Awesome ride. A dangerous downhill on Doudy Draw was fixed. since last year - nice.	1
Bikes need to be more controlled not to hit dogs and have bells	1
Difficult with hikers - prefer them on bike trails	1
Dogs off leash	1
Eliminate prairie dog holes on trail	1
Fill in deep ditch on Mesa trail as you descent to Shannon south	1
Fun hot	1
Good use of resources	1
Govern for intent. The amount of dog violations for behavior that is not compliant yet does not violate the intent of the laws in an absolute waste of government / taxpayer resources, officials times and citizens time	1
Great Ride	1
I hate when you close the trails	1
I have had a golden retriever that has been green tagged and I very much appreciate off-leash trails - am without dog at the present	1
Install trash cans at top of Mesa by 93 and Marshall Mesa. It would be easy for OSMP to access and empty. Would help with trash. Bikes need to be licensed and regulated	1
Keep up the good work	2
Like Betasso, we recommend bikers going one way only. Hikers can choose. Also Betasso has 2 non-bike days a week.	1
Love it	1
Love spot - only place I come. I think bikes and people work well. Although I do avoid running and dogs after 5 pm and the weekends	1
Love the open space	1
Love the OSMP system	1
Love the trail, except the mountain bikers	1
Love this place	1
Make it a one-way for bikes on Weekends	1
Marshall Valley is busy on weekends and causes conflicts due to high visitation and fast riders in both directions	1
N/A	1
Need A/B lines for broken sediment. Trials by new bridge too easy now	1
None	2
Noticed today that the trails have been worked on making downhill single track smoother for me	1
On weekends might be a good idea to designate one-way on Marshall Mesa. Need to poste and reinforce yield rules for bikers	1
Parking $5 - really. Is that intended to keep Latinos and blacks off the trail. Boulder's bublee of upper class with privilege thickets	1

Please work on the Flat Iron Trail	1
Some of these are terrible, poorly worded questions / statement. Like 8.1 for example	1
Spring Break loop make oneway	1
Stop ???? on signs of use. That is what it is here for. Budget for maintenance.	1
thank you for all of the trails so we can all enjoy this wonderful place	1
Thank you	2
Thank you for keeping our lands awesome	1
Thank you for open space	1
Thank you for OSMP. Love having dogs and horses on the trail	1
Thank you for the endless open space opportunities and off leash areas	1
Thanks for asking	1
The parks are awesome	1
This area is a treasure. Trails are generally in good shape and closures I've observed are appropriate-such as when trails are muddy.	1
this is one of my favorite trails and I come here every time I visit	1
To many mountain bikers	1
Use of trail on alternate hours	1
Walking on the trails having to move over multiple times for bikers	1
You guys shouldn't close trials when it rains and these are poor conditions. get people to volunteer and fix the damage get high school , people to fix.	1
Total	49

Doudy Draw	**Frequency**
1) Too many mountain bikers, 2) Consider flag staff monitors to traffic once a year closing, 3) I'd love mountain hiking tours to see wildflowers	1
Appreciate that the sites are horse-friendly with broad steps we can stay on the trail	1
Beautiful	1
City of Boulder has too many parallel hiking trails without enough designated mountain biking trails	1
Close on muddy days	1
Code sections of trail with ski run type markers i.e., green dot, blue square, black diamond (provide maps of trail signs)	1
Disappointed trails have not been repaired after the flood. Money seems to be spent more on new equipment and labor than maintain trails	1
Education about trail use and different use - i.e., climbing, biking, running, walking	1
Education for visiting of our open spaces is greatly needed as our communities grow and open spaces become more significantly used	1
Education is key especially when it comes to keeping people on the travail even when muddy or longer - bikers especially need to be conscientious	1
Fantastic	1
Had a great day hiking	1
Have Fun	1
I enjoy visiting the trails at night	1

I liked that many trails were closed for mud this spring. Too many were have the mentality "I'm avoiding the rules" or My impact won't have negative results. Thank you.	1
I love it	1
I love this area - appreciate trail condition updates on web and Face book	1
I really love living in Boulder County and having open space and trails and letting us experience our great nature here.	1
I sure wish horses had to wear poop bags. I know the poop breaks down but fresh poop is left and I won't walk through big piles of it.	1
I think Spring Brook should be designated clockwise / counter clock wise each day on the weekend - too many blind corners and narrow trails	1
I wish Spring Brook N and S were designated 1-way like Betaiso	1
It would be good if there were NO dogs on this trail	1
Keep open space open for all dogs, bikes, runners climbers, hikers, etc.	1
Keep up the good work	1
Love OSMP. Thank you	1
Love this place	1
Make a connecting trail that goes across the street.	1
More bike and moto trails	1
Mountain bikers when muddy is a problem	1
N/A	1
Please keep maintaining trails. (I know it's hard to post this) Please enforece dog restrictuions with no leniency. Do it over -closed non-designated trails, as they disperse population.	1
Please open more Mtn. Biking trails. Please do not close county road on snow days	1
Rattle Snakes north trail of this parking lot	1
Spring Brook loop should be one way on the weekends. Very busy	1
Strongly consider separate bike trail . Stopped probably 20-30 times. Maybe consider having ranger writing tickets 1-day a month for dog feces, can be a deterrent if random	1
Suggestions for direction of travel on loops	1
Thank you	3
Thank you for awesome trails	1
Thanks	1
Thanks for all the great trails	1
Trail was in great shape. Lots of traffic. but polite walkers, runners and cyclists alike	1
Very Beautiful Colorado	1
Very polite bikers today	1
Wasp nest in 2nd gate to restrooms at Doudy Draw - got stung	1
We ride ouir horses to the side (off-trail) when bikers / hikers pass	1
Work on Fish passage and minimum flow. Clockwise type diversion to avoid entrapment	1
You do a great job, the public is oblivious out here	1
You guys are doing an awesome job	1
Your group does a great job. I am a mtn. biker and a trail runner. I appreciate that there are places I can ride and places I can run	1
Total	49

East Boulder Gunbarrel	
Appreciate you trying to accommodate multiple users.	1
As a dog owner I feel it is necessary to get off trail to allow a stranger to proceed on the trail = 2 feet maximum	1
Awesome	1
Confusing Survey	1
Dave Sutherland's talk was amazing. I didn't know he would be here - very informative.	1
Dog poop on trails	1
Dogs without voice and sight control tags are a problem and I rarely see any enforcement of the dog regulations by officials	1
East Boulder Gunbarrel needs a toilet. Please fix the bridge.	1
Enforce sight/voice commanding laws	1
Fix the trail finally	1
Grasses along trails growing out toward Lookout Rard hard to be cut.	1
Great job- hope things work out	1
Great trails	1
Hardening main trail, regular mowing	1
Heard about rider issues pushing people off the trail	1
Highly valuable, hope it is not frack	1
Horses are the problem mostly. They go farther off trail, l. Have to walk aournd them so you don't spook them.	1
Horses need to clean up poo	1
Horses. Pick up your poop too	1
I appreciate the provided dog waste bags and trash bins	1
I HAVE SEEN MAN NEW TRACTS form in the 20+ years I have lived in this neighborhood	1
I like the mix of designated trails overall	1
I love the Boulder Trail System.	1
I think its ok to go off trail to pick up dog waste.	1
I'm delighted they are here.	1
It would be great to have the bridge repaired over the Boulder Creek	1
It's nice having open space available closely	1
Love it here	1
Love it. Thank you	1
Love our open space.	1
Love the trails and the maintenance of them - thank you	1
Love these trails	1
More signs to locate bike paths and trail heads	1
Need a bathroom @ East Boulder Gunbarrel	1
Need sign. Nice if trash could be moved once in a while.	1
No more fences	1
Not everything needs Boulder's heavy handed mgmt. Leave some places alone. They're fine the way they are.	1

People should stay off trails when it is muddy	1
Perfer trails marked better	1
Please cut grass	1
Please fix the E. Boulder/White Rocks Bridge	1
Please maintain Gunbarrel trailhead – cut shrubbery on the trail and I am allergic to bees and wasps	1
Please no more plague vectors (prairie dogs) out here. I no longer bring my bike on this trail because of the health hazard.	1
Some of the trails are so travelled that its sometimes difficult to tell what is and isn't designated by the city	1
Staff person says there are lots of wasps by the gate at the trailhead. she and I both have allergies. I'll have to avoid the trailhead. Could you put up a sign at the entrance about the nest?	1
Thank you	2
Thank you for existing, best part of Boulder	1
Thanks	1
Thanks for all that you do!	1
Thanks for maintaining our open spaces	1
The Big Problem, Dog poop and lazy owners not taking responsibility	1
The plowing this winter up the grawl trail the water tower was a mess. They went off the side of the road, them made a large gravel snow pile blocking the path	1
There are a lot of heavily used undesignated trails here that deserve to be "adopted" by OSMP. It would make the hiking so much more pleasant, but ignoring them won't stop the usage. Why not make the users happy by mowing the weeds.	1
This is a wonderful safe place. As a 70 year old female I feel comfortable. Here at White Rocks. I see many OSMP people here and they are helpful	1
Thanks for all you do	1
Trim the wild grass around the running trails	1
We live next to this open space and have for 20 years. Would love to see some more trash cans as most people loop around the trails and don't always return to the main trash can. Would love if you could come mow especially the trail heading to lookout - can't see my dogs or my feet. Also some signs about a horse manure. We get a lot of horses here now and poop on the streets can be nasty.	1
We love our open space, and we would strongly advocate for its preservation	1
We want you to continue pesticides/herbicides on trails	1
Weed control on heavily used undesignated trails would help.	1
when will the White Rocks Bridge over Boulder Creek be repaired?	1
Would like to see the undesignated trails to be designated.	1
Would like more bike access at this site	1
You do a great job. Would love to see more experience of TZAFL cutting	1
Total	64
OSMP Employee	
# 12-14 ""somewhat"" and ""moderately"" are synonymous. The site's in the photo's and options to select lack context.	1

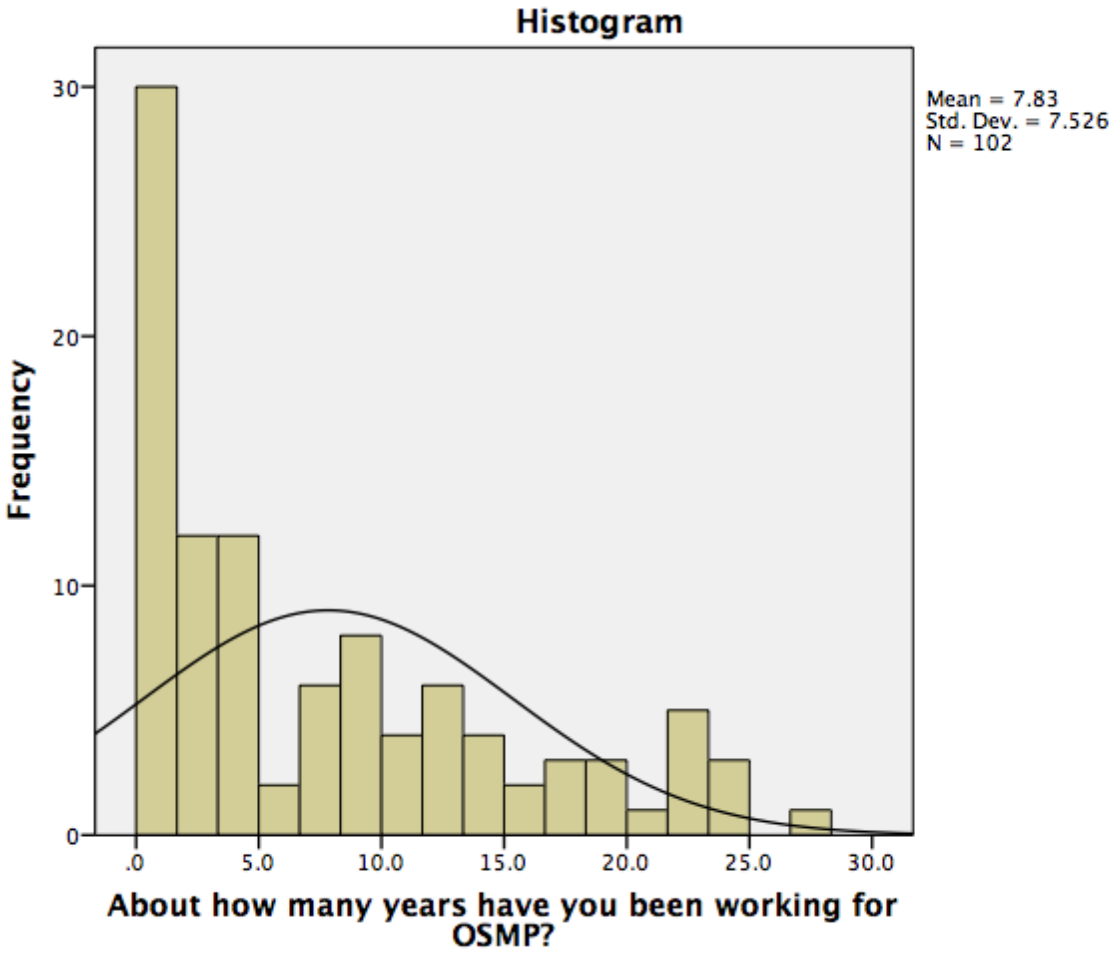
As OSMP managers it is important to acknowledge that with use, there will be some level of impact. We have the ability to decide what those acceptable levels of impacts will be and when we should mitigate the impacts, and when we should shift use patterns. However in order to understand the impacts, we need to understand the use impact relationship. For example, what is causing the impact? Is it behavior, is it the amount of use (related to capacity), or is it the resiliency of the resource use	1
Considering what all needs to be done, repair of overuse, Sept. 2013 flood damage etc. I think OSMP is doing a good job. The new trails such as Lion's Lair, Royal Arch & upper sections of Bear Canyon are excellent. The Rangers do a super job at connecting with the public. The thing that bothers me the most is the amount of dog waste (in & out of bags) that is left behind & dogs/guardians that don't obey Sight & Sound. Personally, I much prefer the dog leash regulations of Boulder Co. Open Spa	1
Forgot about our campground and what if I someone uses OSMP less than once a month (should have been an option).	1
I don't think recreation is bad. I'm concerned about the numbers of people on the system.	1
I hike on OSMP (personal) three times a year when I can't persuade others to go elsewhere. This is due to crowds, heavy dog and/or bike use and general disrespect for the resource.	1
I tend to go other places to recreate to get away from the job. I end up less than once a month on OSMP.	1
I think we prioritize trails like fools. The Chat-meadow is our number one trail and its the worst as well. The signage and trail boards are a joke as are most of the signs in our system. There is no connection between signs and other groups that has competent educated people involved.	1
I'm privileged to work for OSMP and to serve the people who also love it. The Mountain Parks is the reason I moved to the area 24 years ago. I spent nearly everyday of the week exploring the Mountain Parks for rock climbing and then volunteering as a raptor monitor for many years. I love it and I know it like the back of my hand. In my career that followed that period of time, I have laughed, cried, sweat, bled, and risked personal injury and at times my life trying to protect it and the people	1
Most trails got significantly worse after the flood and many remain that way. I think we should spend more time and resources fixing what we have and less on building new trails and developing new plans	1
OSMP does the best job they can. There is a very large amount of people using our trails. These issues are hard to avoid in OSMPs situation	1
OSMP is being severely impacted by visitors and we can't keep up with all of the impacts. Social trails in high use areas are not addressed and end up becoming high use detours. Single track trails are now roads all across the system. We don't close areas because we don't want to offend the public and the public does not respect voluntary closures (look at Dry creek). Good luck!	1
Please remember that OSMP only began in 2001 and prior to that there was Open Space and separately Mountain Parks. The first question could be answered differently depending on how specifically to work for OSMP or work for the City or OS or MP. There are community members who know that OSMP has only been a department for 15 years.	1
Question #3 is invalid. It doesn't include enough choices. I picked the first answer as it is closest but I only recreate once or twice per year on OSMP.	1
Question about acceptability of dogs off designated trails forces survey taker to answer with a black/white answer - when acceptability certainly varies across the OSMP designated trail system. Question about expecting people off trail is unclear - I would expect occasionally to see people off designated trails (but I chose ""disagree"" - I think that it is unacceptable for people to be frequently off trail and I don't see that many people off designated trails in the areas where I hike. I ""a	1
Recreational impacts vary in many ways. Some may be temporary, even if they appear pronounced, where as others may be subtle but have long term effects. It is not clear to me as a professional if it is possible to definitively relate visual impacts to more objective ecological impacts. Trails with high use and close to trail heads are always wider and tend to have more (visual) impacts. To some	1

degree I have come to expect this. If you hike in a mile or more, or go to a less popular area, the trail	
Thanks for doing this.	1
The effect of having dogs on Open Space & Mountain Parks is great.	1
There are a host of undesignated trails that should be made designated either because of their short length, the access they provide to valuable resources and our inability to stop people from using them.	1
Time is managed very poorly which leads to wasted time which equals wasted money but none of my bosses care. It's shameful.	1
we need to designate more trails for recreation purposes, specifically climbing.	1
We need to find a way to educate people over dog waste. Every time I am on an OSMP trail there are a number of dog poop bags left on the trail. OSMP needs to either crack down on this or educate people on proper dog waste disposal.	1
We need to maintain our trail system and stop building new trails!!!!!	1
when you asked if trail was impacted, do you mean negatively impacted or just changed?	1
Total	24

Appendix B. Frequency data for OSMP online survey

Q1. About how many years have you been working for OSMP?

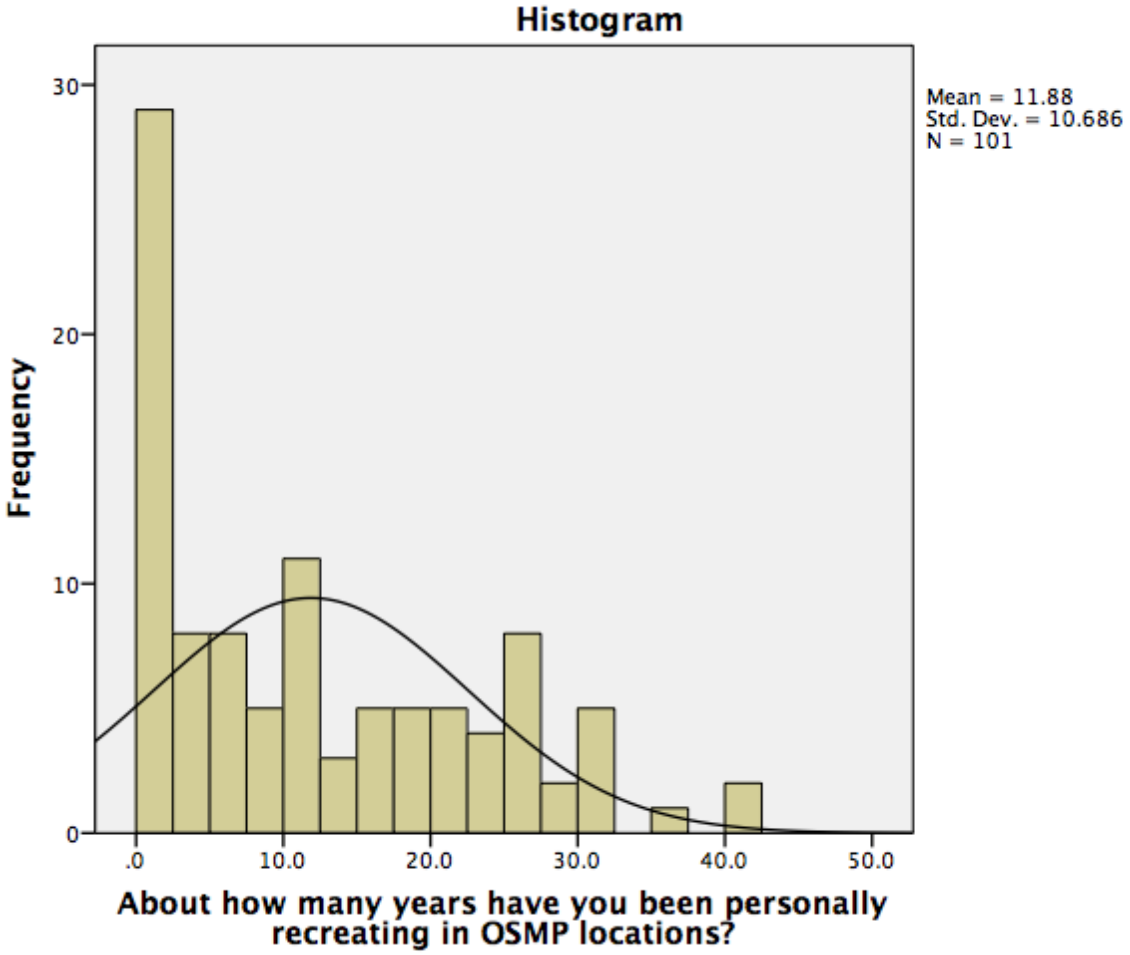
n	102
Mean	7.8
Median	4.8
Mode	1
Std	7.53



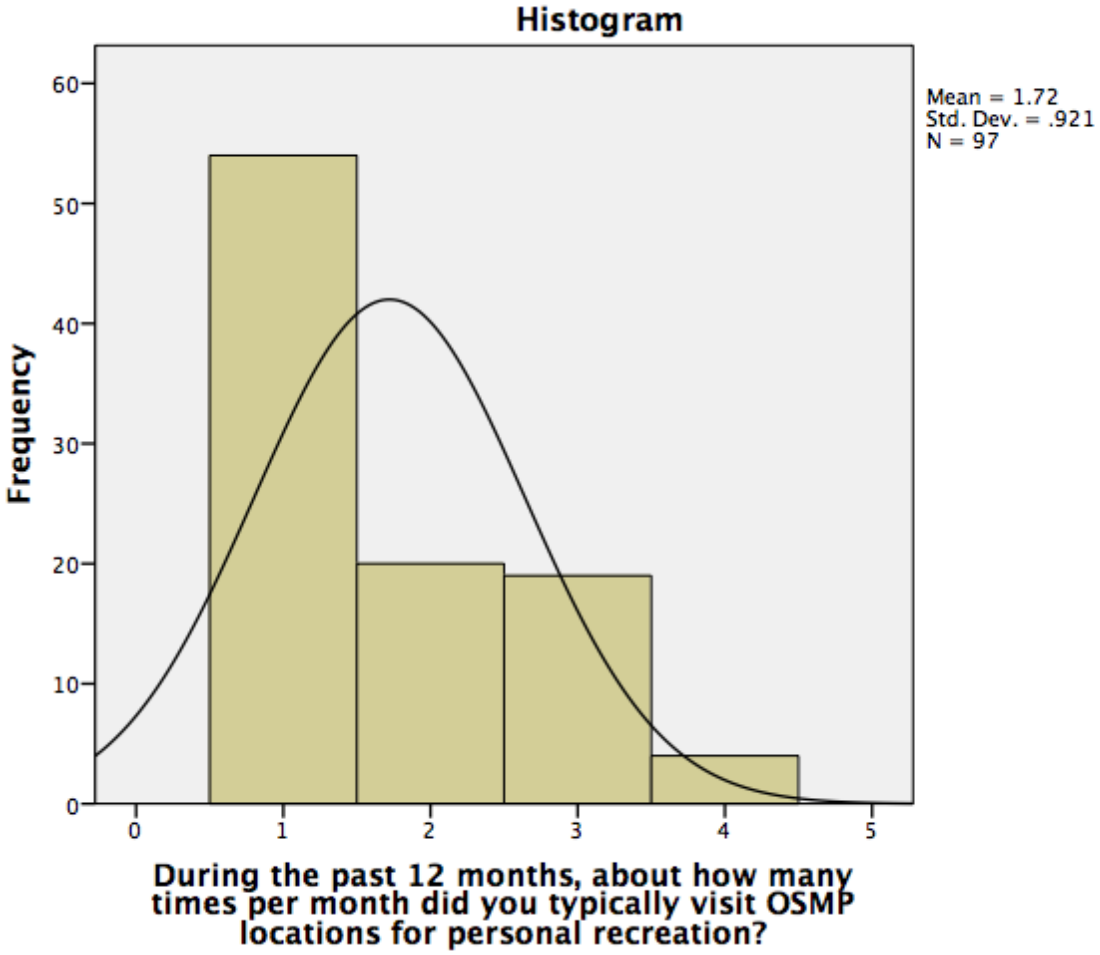
Q2. About how many years have you been personally recreating in OSMP locations?

n	101
Mean	11.9
Median	10.0

Mode	1
Std	10.69



Q3. During the past 12 months, about how many times per month did you typically visit OSMP locations for personal recreation?



Q4 When visiting OSMP for personal recreation, which activities do you generally participate in?

Activity	n	%
Climbing/Bouldering	13	3.4
Photography	30	7.9
Social Gathering	18	4.7
Hiking	91	23.9
Running	21	5.5
Walking dog(s)	26	6.8
Picnicking	12	3.2
Contemplation/Meditation	27	7.1
Biking	26	6.8
Pleasure driving	10	2.6
Viewing scenery	40	10.5

Viewing wildlife	38	10.0
Horseback riding	2	0.5
Nature study	17	4.5
Fishing	9	2.4
Total Responses	380	100.0

Q5. Which ONE activity from above are you most likely to participate in when recreating on OSMP?

Primary Activity	Frequency
Biking	5
Climbing	4
Hiking	64
Horseback riding	1
Running	6
Viewing scenery	1
Walking dog(s)	5
Fishing	2
Mountain Biking	1
Nature study	2
None	3
Photography	1
Picnic	1
Social gathering	1
Viewing wildlife	2
Walking dog(s)	5
Total	99

Q6. Are you aware that some trails in OSMP areas are “undesignated” or not official trails?

	Frequency	%
Yes	101	99
No	1	1
Total	102	100

Q7. For OSMP locations visited for personal recreation in the last 12 months, how often have you been able to clearly distinguish undesignated trails from designated trails?

	Frequency	%
Never	1	1
Almost Never	8	8.1
Occasionally / Sometimes	31	31.3
Almost every time	38	38.4
Every time	21	21.2
Total	99	100

Q8. When you visit OSMP for personal recreation, do you tend to:

	Frequency	%
Visit the same one area	6	6.1
Visit the same 2-4 areas	55	56.1
Try a new area with each visit	37	37.8
Total	98	100

Measurement scale -2 Very Unacceptable to 2 Very Acceptable

Q9. IN GENERAL, please rate how acceptable each of the behaviors is at OSMP areas.

Behavior statements	Mean	n	*Std*
a. People going off-trail to avoid obstacles on the designated trail	-0.42	99	1.107
b. People going off-trail to avoid standing water on the designated trail	-0.6	98	1.023
c. People taking undesignated trails	-0.52	97	1.001
d. People going off-trail to get around other visitors	-0.2	99	1.04
e. People walking on trailside vegetation	-0.94	95	0.909
f. Dogs going off trail	-0.39	97	1.142

Q10. To what extent do you think each of the following resource conditions is a problem that you have personally seen while recreating at OSMP areas during the past 12 months?

	OSMP Employee		
	Mean	*n*	*Std*
a. Presence of trail/soil erosion	2.01	95	0.792
b. Presence of undesignated side trails	2.01	97	0.757
c. Presence of multiple parallel trails	1.98	97	0.841
d. Standing water on the trail	1.38	97	0.714
e. Exposed tree roots on trail	0.63	97	0.726
f. Muddy trail	1.34	97	0.776

0 Not at all a problem; 1 Slight problem; 2 Moderate problem; 3 Extreme problem

Q11. Please indicate the extent to which you agree or disagree with each of the following statements. Consider each statement in the context of ***personal recreation*** only.

	Mean	*n*	*Std*
a. I am generally satisfied with the designated trail conditions at OSMP	3.71	97	0.924
b. I believe recreation can result in negative impacts to plants and wildlife	4.24	97	0.761
c. I accept some responsibility for recreation impacts on OSMP	3.68	97	0.93
d. I expected to see people going off of the designated trail TODAY on OSMP	3.57	97	1.089
e. I accept some responsibility for trail erosion on OSMP	3.25	97	1.061
f. I noticed eroded trails TODAY on OSMP	4.22	97	0.68
g. I expected to see eroded trails TODAY on OSMP	3.66	94	0.887
h. I have avoided my favorite part of OSMP because of poor trail conditions	2.52	97	1.209
i. I contribute to the creation of undesignated trails on OSMP	1.98	97	0.913
j. I noticed undesignated trails TODAY on OSMP	4.12	97	0.725
k. I noticed areas of soil loss TODAY on OSMP	4.02	96	0.808
l. I think it is Ok for me to go off-trail at OSMP	2.43	97	1.181

5 point Likert Agreement scale: 1 = strongly disagree; 3 = Neutral; 5 = Strongly Agree

Q12. For the next three questions a photograph of site conditions is given. Please rate your perception of the level of impact depicted in the photograph for questions. Review the provided photographs and provide your rating of the site condition

Photographs	*Mean*	*n*	*Std*
Q14a. Rating of site 1 condition	3.51	97	0.903
Q14b. Rating of site 2 condition	4.51	97	0.694
Q14c. Rating of site 3 condition	4.62	97	0.636

5-point impact scale: 1=no impact; 2=slight impact; 3=somewhat impacted; 4=moderate impact; 5=severe impact

Q13. What is your OSMP employee work group?

	Frequency	%
Executive team	4	4.2
Resources and stewardship division	38	40.0
Central services division	14	14.7
Trails and facilities division	21	22.1
Community connections and partnerships division	18	18.9
Total	95	100

Q14. What kind of OSMP position are you currently in?

	Frequency	%
Standard, full-time	68	71.6
Standard, less than full-time	1	1.1
Temporary, full-time	3	3.2
Seasonal, full-time	18	18.9
Seasonal, less than full-time	5	5.3
Total	95	100

One person indicated they are term full time

Q15. Gender

Gender	OSMP Employee (n=91)
Male	58.2%
Female	40.0%
Other	2.2%
Total	100%

Q16. Age categories

Age	OSMP Employee (n=80)
<20	
20-29	23.8%
30-39	32.5%
40-49	17.5%
50-59	21.3%
60-69	3.8%
70-79	
80-89	1.3%
90-99	
Total	100.0%

Mean=39.4; Median=35.5; *Std*=12.46

Q19. Highest education level for onsite and employee data by location

Education	OSMP Employee (n=91)
Some high school	0%
High School graduate	2.20%
Some college, no degree	4.50%
Associate's degree	0%
Bachelor's Degree	58.40%
Graduate or professional degree	31.50%
PhD	3.40%
Total	100.0%

Appendix C. City of Boulder Open Space and Mountain Parks: Visitor Survey Summer 2016

The City of Boulder Open Space & Mountain Parks (OSMP) Department is conducting this survey to better understand your perceptions of resource conditions and experiences during your visit today. Your participation is totally voluntary and your answers will be anonymous. Thank you — your input is appreciated!

1. About ***how many years*** have you been coming to Open Space & Mountain Parks? _____ Number of years
   _____ First visit!

2. ***During the past 12 months***, about how many times did you visit OSMP locations? _____ Number of times

3. ***During this past month***, about how many times did you visit OSMP locations? _____ Number of times

4. Which activities did you participate in ***TODAY*** at this particular OSMP location?

   (Check all that apply and then CIRCLE your PRIMARY activity)

❑ Climbing/Bouldering	❑ Walking dog(s)	❑ Viewing scenery
❑ Photography	❑ Picnicking	❑ Viewing wildlife
❑ Social gathering	❑ Contemplation/Meditation	❑ Horseback riding
❑ Hiking	❑ Biking	❑ Nature study
❑ Running	❑ Pleasure driving	❑ Fishing

5. Are you aware that some trails in City of Boulder OSMP are "**undesignated**" or not official trails? ☐Yes ☐No

6. In thinking about ***your visit TODAY*** to OSMP areas, please estimate:
   A. The number of times you ***PERSONALLY OBSERVED each*** of the following behaviors on your visit ***TODAY*** to OSMP.
   B. ***IN GENERAL***, please rate how acceptable ***each*** of the behaviors is at OSMP areas, where:
   -2 = very unacceptable, -1 = somewhat unacceptable, 0 = neither unacceptable nor acceptable,
   +1 = somewhat acceptable, +2 = very acceptable.

Behavior:	(A) Number of times ***observed on TODAY'S visit*** to OSMP?	(B) ***IN GENERAL***, how acceptable is this behavior at OSMP areas? Very unacceptable				Very acceptable
a. People going off trail to avoid obstacles on the designated trail	_____	-2	-1	0	+1	+2
b. People going off trail to avoid standing water on the designated trail	_____	-2	-1	0	+1	+2
c. People taking undesignated trails	_____	-2	-1	0	+1	+2
d. People going off trail to get around other visitors	_____	-2	-1	0	+1	+2
e. People walking on trailside vegetation	_____	-2	-1	0	+1	+2
f. Dogs going off trail	_____	-2	-1	0	+1	+2
g. Other_____	_____	-2	-1	0	+1	+2

7. To what extent do you think ***each*** of the following resource conditions is a ***problem you noted*** at OSMP areas ***TODAY***? (***Circle one number for each statement***)

Resource condition TODAY:	Not at all a problem	Slight problem	Moderate problem	Extreme problem
a. Presence of trail/soil erosion	0	1	2	3

8. Please indicate the extent to which you **agree** or **disagree** with each of the following statements. (**Circle *one* number for each**)

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
a. I am generally satisfied with the designated trail conditions at OSMP	1	2	3	4	5
b. I believe recreation can result in negative impacts to plants and wildlife	1	2	3	4	5
c. I accept some responsibility for recreation impacts on OSMP	1	2	3	4	5
d. I expected to see pople going off of the designated trail TODAY on OSMP	1	2	3	4	5
e. I accept some responsibility for trail erosion on OSMP	1	2	3	4	5
f. I noticed eroded trails TODAY on OSMP	1	2	3	4	5
g. I expected to see eroded trails TODAY on OSMP	1	2	3	4	5
h. I have avoided my favorite part of OSMP because of poor trail conditions	1	2	3	4	5
i. I contribute to the creation of undesignated trails	1	2	3	4	5
j. I noticed undesignated trails TODAY on OSMP	1	2	3	4	5
k. I noticed areas of soil loss TODAY on OSMP	1	2	3	4	5
l. I think it is Ok for me to go off trail at OSMP	1	2	3	4	5

9. Where is your primary place of residence?

- ❑ Boulder (within city limits)
- ❑ Louisville
- ❑ Lafayette
- ❑ Superior
- ❑ Longmont
- ❑ Unincorporated Boulder County
- ❑ Other city in Boulder County
- ❑ Metro Denver
- ❑ Other area in Colorado
- ❑ Other U.S. state
- ❑ Other Country

10. Are you? _____Male _____Female _____Other - please specify: _____

11. What year were you born? _____Year

12. What is the highest level of education that you have completed? (***Check one response***)

_____Some high school

_____High school graduate (includes equivalency)

_____Some college, no degree

_____Associate's degree

_____Bachelor's degree

_____Graduate or professional degree

_____Ph.D.

13. Please **MARK ON THE PROVIDED MAP** where you traveled ***TODAY*** using the highlighters.

14. **Lastly,** please **REVIEW THE PROVIDED PHOTOGRAPHS** and provide your rating of the site condition.

	No impact	Slight impact	Somewhat impact	Moderate impact	Severe impact
a. Site one	1	2	3	4	5
b. Site two	1	2	3	4	5

Appendix D. Photograph scenarios of resource impacts