

Indicators and Standards for Quality Visitor Experiences
at City of Fort Collins Soapstone Prairie Natural Area

Jerry J. Vaske
Colorado State University
Human Dimensions of Natural Resources
Fort Collins, Colorado 80523

Support for this report was provided by the City of Fort Collins, Natural Areas Department.

Executive Summary

The City of Fort Collins conducted visitor surveys ($n = 584$) at Soapstone Prairie Natural Area during 2017 and 2018. Respondents were randomly selected throughout the year on both weekdays and weekends. Interviews were conducted in three shifts (i.e., 8 am to 11 am, 11 am to 2 pm, and 2 pm to 5 pm). Table 2 summarizes this data collection effort.

This report compares respondents engaged in three primary activities: hiking ($n = 155$), mountain biking ($n = 199$) and wildlife viewing ($n = 203$).¹ Results focus on indicators and standards of quality for visitor satisfaction, perceived conflict, and perceived crowding.

Demographics (Tables 3 – 5)

- Over three-quarters (79%) of the mountain bikers were male, compared to 52% of the hikers and 46% of the wildlife viewers. This difference was statistically significant (Table 3).
- The participants in the three activities did not differ in their average ages. The mean age ranged from 44.24 (mountain bikers) to 51.59 (wildlife viewers).
- Nearly all respondents were not Hispanic or Latino (97%+) and the predominant race was white (90%+). There were some statistical differences among the activity participants in terms of race, but this can be attributed to the large sample size.
- Respondents in all three activities were highly educated. For example, over three-quarters (77%) of the hikers had completed a bachelor's degree (42%) or masters / Ph.D. (35%). Comparable numbers for mountain bikers and wildlife viewers were 85% and 80%, respectively.
- Thirty-seven percent of the hikers reported an income of \$100,000 or more. The mountain bikers (43%) and wildlife viewers (39%) reported similar income levels.
- Approximately 90% of the respondents were residents of Larimer County. Hikers had lived in the county an average of 17.91 years, mountain bikers for 14.52 years, and wildlife viewers for 15.31 years on average (Table 4).
- Over half of the participants in all three activities were from Fort Collins: hikers (54%), mountain bikers (67%), and wildlife viewers (56%) (Table 5).

¹ A primer on statistics:

In this report, two types of statistics are presented: (a) Chi-square (χ^2) and (b) F -values. The choice of statistic depends on how the dependent variable was coded, for example: if the dependent variable is dichotomous (e.g., male vs. female) or categorical (level of education), χ^2 was used. If the dependent variable is continuous (e.g., number of people in a group), F was used. The independent variable was always categorical (e.g., hiker, mountain biker, wildlife viewer). If the p -value for a given statistic is $\leq .05$, the groups being compared differ statistically.

The χ^2 and F -values highlight when differences exist, but do not indicate the strength of the relationship. The latter is conveyed via two effect size measures: (a) Cramer's V (or simply V) for χ^2 and (b) eta (η) for F -values. The cutpoints for these two effect sizes are: for V : .1 = a minimal relationship, .3 = a typical relationship, and .5 = a substantial relationship; for η : .1 = a minimal relationship, .243 = a typical relationship, and .371 = a substantial relationship.

Visitation (Tables 6 – 8)

- In the past 12 months, hikers visited Soapstone an average of 1.51 times; bikers visited an average 3.43 times, and wildlife viewers visited 1.71 times on average (Table 6).
- There was no statistical difference between the number of visits by residents ($M = 2.76$) and non-residents ($M = 2.00$) (Table 7).
- As might be expected, over three-quarters of the visitation occurred on weekends for hikers (77%), mountain bikers (77%), and wildlife viewers (80%) (Table 8).

Group Characteristics (Tables 9)

- Nearly two-thirds of mountain bikers (61%) visited with a group, compared to about three-quarters of the hikers (74%) and wildlife viewers (75%) (Table 9).
- On average, people in all three activities visited in groups of two adults: hikers ($M = 2.06$), mountain bikers ($M = 1.79$), and wildlife viewers ($M = 2.16$).
- Three-quarters or more did not visit with children: hikers (77%), mountain bikers (92%), and wildlife viewers (82%).

Reasons for visiting Soapstone and Other Natural Areas (Tables 10 – 14)

- In the past 12 months, over 40% of the hikers had visited Coyote Ridge (47%) and Bobcat Ridge (42%). Sixty percent of the mountain bikers had also visited Coyote Ridge and 53% had visited Pineridge. Among the wildlife viewers, the most popular natural areas were Bobcat Ridge (46%) and Fossil Creek (40%) (Table 10).
- Of the 11 natural areas listed in the survey, participants in the three activities only differed statistically in their visitation rates at four locations (i.e., Coyote Ridge, Maxwell, Pineridge, Gateway).
- Relatively few respondents wrote in other natural areas (e.g., Reservoir Ridge $n = 12$; Horsetooth Reservoir $n = 9$) (Table 11).
- Between 79% (hikers) and 90% (mountain bikers) visited Soapstone because it was less crowded (Table 12).
- Over 90% of all three activity participants did not avoid particular natural areas: hikers (94%), mountain bikers (92%), and wildlife viewers (97%) (Table 13).
- Of those places where respondents no longer visit Horsetooth Mountain was mentioned by five people; Blue Sky and Gustave Swanson was listed by four people each (Table 14).

Visitor Satisfaction (Tables 15 – 18)

- Based on the literature, the standard of quality for visitor satisfaction was set at 80% or more of the visitors should be satisfied with their experiences at City of Fort Collins natural areas.
- Over 90% of respondents in all three activities rated all facilities (e.g., restrooms, parking lots, trails) at Soapstone as “good” or “very good” (Table 15). These findings are within the standard of quality.
- In an open-ended question asking individuals to explain their perceived quality ratings, 146 said “well maintained and clean facilities.” Another 67 people commented on the well-maintained and paved trails. Fifty respondents thought Soapstone was a “special place” (Table 16).

- Overall, 85% + rated the perceived quality of their experience as “excellent:” hikers (90%), mountain bikers (85%), and wildlife viewers (89%) (Table 17). These findings are within the standard of quality.
- Respondents’ reasons for their overall evaluations included scenic beauty ($n = 89$), special place ($n = 76$), uncrowded ($n = 48$), and well maintained ($n = 37$) (Table 18).

Perceived Conflict (Tables 19 – 21)

- Nearly all (98 – 100%) respondents “never” *observed* hikers, mountain bikers or equestrian riders behaving unsafely or discourteously (Table 19).
- Nearly as many (82 – 89%) “never” *perceived a problem* with hikers, mountain bikers or equestrian riders behaving unsafely or discourteously (Table 20).
- Recreation conflict has traditionally been defined in terms of goal interference (interpersonal conflict) where the physical presence or behavior of one individual or group interferes with the goals of another individual or group. Recent research has identified social values differences as an alternative explanation for conflict. Social values conflict can occur between users with different beliefs and values, even if there is no contact between users.

There are a variety of ways to operationalize interpersonal versus social values conflict. One approach suggests combining the frequency (observed vs. not observed) of seeing different events with corresponding perceived problem (problem vs. not a problem) variables (Figure 1). Individuals who have not observed a given event, or who have observed it yet do not perceive it to be a problem, are considered a no conflict group (either in terms of interpersonal or social values conflicts). Those who have never seen a particular event, but believe a problem exists for that event, are expressing a conflict in social values. Conversely, those who witness a particular situation and believe that the event has caused a problem are indicating an interpersonal conflict.

Figure 1. Conflict evaluation table

| | | Perceived Problem | |
|----------|-----|-------------------|------------------------|
| | | No | Yes |
| Observed | No | No Conflict | Social Values Conflict |
| | Yes | No Conflict | Interpersonal Conflict |

- Combining the observed behaviors in Table 19 with the corresponding perceived problem behaviors in Table 20 resulted in the distributions shown in Table 21. Across all three activities, between 82% and 90% of respondents reported no conflict. Between 10% and 16% experienced social values conflict. Two percent or less noted interpersonal conflict. These findings are well within the standard of quality for perceived conflict that no more than 25% of all respondents should feel interpersonal conflict.

Encounters with others and Perceived Crowding (Tables 22 – 23)

- Traditional crowding models assume that as the number of encounters with other visitors increases, crowding will increase. Crowding is defined as a negative evaluation of density and involves a value judgment that the density or number of encounters with other visitors is too many. Heberlein and Vaske (1977) developed a relatively simple measure of perceived crowding that asks people to indicate how crowded the area was at the time of their visit. Responses are shown in Figure 2.

How crowded did you feel by the number of visitors? (Circle one number)

| | | | | | | | | |
|------------|---|----------|---|---|------------|---|-----------|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Not at all | | Slightly | | | Moderately | | Extremely | |
| Crowded | | Crowded | | | Crowded | | Crowded | |

Figure 2. Example of crowding response scale.

- Across all three activities, the average number of reported encounters with other visitors at the trailhead and on the trail was consistently ≤ 3.30 people (Table 22).
- Given the findings in Table 22, it is not surprising that 4% or fewer reported any level crowding (i.e., scale points 3 thru 9 in Figure 2) (Table 23). These findings are well within the standard of quality for perceived crowding that no more than 35% of all respondents should feel any level of crowding.
- To put the crowding scores in perspective, Appendix A ranks perceived crowding scores from 82 studies / evaluation contexts in Colorado. Soapstone visitors consistently had the lowest crowding evaluations.

Table of Contents

| | Page |
|---|------|
| Executive Summary | i |
| Table of Contents | v |
| List of Tables and Figures | vi |
| Introduction | 1 |
| Study Objectives | 1 |
| Conceptual Distinctions | 1 |
| Satisfaction Indicator and Standard | 1 |
| Perceived Conflict Indicator and Standard | 2 |
| Crowding Indicator and Standard | 5 |
| Methods | 7 |
| Results | 7 |
| Conclusions..... | 19 |
| City of Fort Collins Soapstone Prairie Indicators and Standards | 19 |
| Criteria for Choosing Indicators | 19 |
| Characteristics of Good Standards | 22 |
| Sources for Selecting Indicators / Developing Standards | 23 |
| References | 25 |
| Appendix A – Ranking of perceived crowding for Colorado resources and evaluation contexts | 28 |
| Appendix B – Additional comments | 32 |

List of Tables and Figures

| Table | Page |
|--|------|
| 1. Carrying capacity judgments based on levels of perceived crowding | 6 |
| 2. Visitor survey data collection effort at Soapstone Prairie Natural Area | 7 |
| 3. Demographic profile of visitors to Soapstone Prairie Natural Area | 8 |
| 4. Residence of visitors to Soapstone Prairie Natural Area | 9 |
| 5. Top five specific primary residences of visitors to Soapstone Prairie Natural Area | 9 |
| 6. Number of visits to Soapstone Prairie Natural Area in the past 12 months | 10 |
| 7. Number of visits to Soapstone Prairie Natural Area | 10 |
| 8. Primary activities on weekdays and weekends | 10 |
| 9. Group characteristics of visitors to Soapstone Prairie Natural Area | 11 |
| 10. Visited other natural areas over the past 12 months | 12 |
| 11. Other natural areas respondents' visited | 12 |
| 12. Visit Soapstone Prairie Natural Area because less crowded | 13 |
| 13. Natural areas respondents no longer visit | 13 |
| 14. Specific natural areas respondents no longer visit | 13 |
| 15. Perceived quality of facilities at Soapstone Prairie Natural Area | 14 |
| 16. Respondents' reasons for facility ratings at Soapstone Natural Area | 14 |
| 17. Overall perceived quality of Soapstone Prairie Natural Area | 15 |
| 18. Respondents' reasons for overall perceived quality ratings | 18 |
| 19. Unsafe and discourteous behaviors witnessed at Soapstone Prairie Natural Area on the day of the interview | 16 |
| 20. Perceived problems with other visitors at Soapstone Prairie Natural Area on the day of the interview | 16 |
| 21. Perceived conflict at Soapstone Prairie Natural Area | 17 |
| 22. Reported number of other visitors seen at Soapstone Prairie Natural Area | 18 |
| 23. Perceived crowding at Soapstone Prairie Natural Area | 18 |
| A1 Ranking of perceived crowding for Colorado resources and evaluation contexts | 28 |
| B1 Additional comments | 32 |
| Figures | |
| 1 Conflict classification figure | 4 |
| 2 Example of crowding response scale | 5 |

Introduction

Natural resource management agencies strive to provide high quality recreation experiences (Decker, Brown & Siemer, 2001). Not all visitors, however, share the same set of preferences for setting attributes, facilities, and services offered. Some individuals, for example, may desire nothing more than the opportunity to enjoy nature, hike, and watch wildlife; activities that require only a natural setting with minimal agency provided facilities or services. Other visitors are more demanding in the services they believe should be offered (Donnelly, Vaske, DeRuiter, & King, 1996).

Recognizing this diversity of desires found among recreationists, researchers and managers have attempted to differentiate users into more homogeneous groups (Bryan, 1977). Segmentation strategies have been developed that evaluate the benefits sought by individuals in a variety of situations or occasions. For example, several studies highlight the importance of segmenting visitors based on geographic location or type of visitor (e.g., Donnelly et al., 1996; Vaske, Beaman, Stanley, & Grenier, 1996).

Study Objectives

This report compared hikers, mountain bikers and wildlife viewers to the City of Fort Collins Soapstone Prairie Natural Area. More specifically, the objectives were to describe the three types of visitors in terms of their:

1. Demographic characteristics (e.g., sex, age, place of residence)
2. Prior visitation rates and trip characteristics (e.g., trip duration, activity participation)
3. Visitation to other natural areas
4. Visitor satisfaction
5. Perceived conflicts with other visitors
6. Perceived crowding.

The intent is to (a) provide managers with baseline information against which future research results can be compared and (b) to inform management decisions.

Conceptual Distinctions

Most planning frameworks recommend identifying and establishing quantitative impact indicators and standards (e.g., Visitor Impact Management, Graefe, Kuss, & Vaske, 1990; Visitor Experience and Resource Protection, National Park Service, 1997; Limits of Acceptable Change, Stankey, Cole, Lucas, Petersen, & Frissell, 1985). Indicators are specific, measurable variables that reflect the current situation. A standard of quality is the minimum acceptable condition for each indicator. Standards identify conditions that are desirable (e.g., no litter), as well as conditions that managers do not want to exceed (e.g., encounters with other people). Comparing existing conditions against the standards provides a quantitative estimate of whether the experiences provided are within the limits specified by the standard (Vaske, Whittaker, Shelby, & Manfreda, 2002).

This report considered three sets of indicators and standards that have been used extensively in the literature:

1. Visitor satisfaction
2. Perceived conflict
3. Perceived crowding

Satisfaction Indicator and Standard

Satisfaction has been defined as the congruence between expectations and outcomes (Manning, 2011) and is one of the most commonly used indicators of visitor experience / perceived quality of service received (Vaske et al., 2002). Satisfaction from a recreation experience reflects visitor expectations and management goals. People who experience conditions / services in line with what they expected are likely to be satisfied. From a manager's perspective, providing satisfactory experiences / services to at least X percent of the visiting public reflects a standard for this indicator.

At least two methodologies for investigating satisfaction are evident in the literature. One theory has focused on a multiple satisfactions approach, which assumes that each individual brings his or her own expectations to an experience and these influence the kinds of satisfaction that he or she receives (Hendee, 1974). This framework recognizes the diversity of experiences that visitors seek, and a quality experience for a recreationist involves achieving the particular satisfactions in

which he or she is interested or expects (Manfredo, Fix, Teel, Smeltzer, & Kahn, 2004). The concern is with identifying variables that affect satisfaction and that are susceptible to management or manipulation. If such variables can be identified and monitored, the potential for changing circumstances to create better recreation opportunities is enhanced. To facilitate this applied focus, a report card was developed in the late 1970's for tracking visitor satisfaction (LaPage & Bevins, 1981). The instrument included items that could be influenced by management actions (e.g., restrooms, parking areas, trash receptacles) This applied approach was adopted for this study.

Second, researchers (e.g., Vaske, Donnelly, Heberlein, & Shelby, 1982; Vaske & Roemer, 2013) have defined satisfaction as an overall rating of a recreation experience / service as good or bad. Satisfaction is viewed as a composite of the particular expectations and needs, expressed as a single numerical rating. Defined this way, satisfaction has been operationalized with a single question, such as "Overall, how would you rate the quality of the visitor services provided to you and your group?" The percentage of individuals reporting a given level of satisfaction can be calculated for all participants in an activity and the activities can be compared directly.

There are advantages and disadvantages to both multiple-item and single-item indicators of a concept. Multiple-item indicators can contribute to a more sophisticated understanding of concepts and often have good psychometric properties (e.g., reliability, validity). Measurement reliability means that the multiple items measure the same construct (i.e., the items intercorrelate with each other). Measurement validity means that the scale measures what it was intended to measure. Unfortunately, multiple-item indicators also have disadvantages: (a) they increase respondent burden, (b) they challenge comparisons of findings among studies because different items are used, and (c) they do not necessarily yield clear management standards (Vaske, 2008).

Vaske and Roemer (2013) analyzing differences in overall satisfaction by consumptive and nonconsumptive recreationists over a 30-year period. Based on theory and previous research, two hypotheses were advanced: (a) consumptive recreationists will report significantly lower satisfaction than will nonconsumptive recreationists, and (b) this pattern will remain consistent over time. Data were obtained from published and unpublished studies in 57 consumptive (e.g., hunters) and 45 nonconsumptive (e.g., kayakers) recreation contexts. Each study used the same question measuring overall satisfaction (i.e., "overall, how would you rate your day / trip / experience"). Following previous research (Vaske et al., 1982), responses were collapsed into three categories (i.e., "poor / fair," "good / very good," "excellent / perfect"). The independent variables were activity type and year. Consistent with the hypotheses and the previous article, consumptive recreationists reported lower satisfaction than did nonconsumptive recreationists, and this pattern of findings generally remained consistent over time.

Satisfaction Standard. Based on the previous meta-analyses (Vaske & Roemer, 2013; Vaske et al., 1982), the standard for the City of Fort Collins natural areas was set at 80% or more of visitors should be satisfied with their experience or the services they received. Comparing existing satisfaction ratings against the 80% standard provides a quantitative estimate of whether any experiential changes are within the limits specified by the standard (Vaske et al., 2002).

Perceived Conflict Indicator and Standard

Conflict has been a theme in the outdoor recreation literature for decades (e.g., Lucas, 1964). Recreation conflict generally falls into two main categories (Graefe & Thapa, 2004). First, interpersonal conflict (a.k.a., goal-interference) occurs when the physical presence or behavior of an individual or group interferes with the goals of another individual or group (Jacob & Schreyer, 1980). Interpersonal conflict can occur directly via a face-to-face encounter (e.g., between a backcountry skier and a snowmobiler on a shared route), or indirectly where evidence of one group's behavior is sufficient to cause conflict (e.g., a skier smells the exhaust of a snowmobiler). Different groups may share the same goal (e.g., experiencing untracked snow), but have different means of achieving that goal (e.g., skiing vs. snowmobiling), which can influence goal-interference conflict (Graefe & Thapa, 2004).

Second, social values conflict occurs between groups who may not share similar norms or values about an activity (Vaske, Donnelly, Wittmann, & Laidlaw, 1995). Unlike interpersonal conflict, social values conflict can occur even when there is no direct contact between the groups (Carothers, Vaske, & Donnelly, 2001; Vaske, Needham, & Cline, 2007). For example, although encounters with llama packing trips may be rare, individuals may philosophically disagree about the appropriateness of using these animals in the backcountry (Blahna, Smith, & Anderson, 1995).

Interpersonal Conflict. Research on recreational conflict has traditionally focused on the asymmetrical relationships that occur when different activity groups interact (Kuss, Graefe, & Vaske, 1990). Studies, for example, have shown the presence of a one-way conflict between paddling canoeists and motorboaters (Adelman, Heberlein, & Bonnicksen, 1982). Paddling canoeists disliked motorboaters, but the people using motor-powered craft were not bothered by, and often enjoyed seeing and interacting with paddlers. This one-way type of conflict has also been shown between hikers and mountain bikers, oar-powered and motor-powered whitewater rafters, cross-country skiers and snowmobilers, backpackers and horsepackers, water skiers and anglers, and hunters and non-hunters. In general, the research has shown that for those recreationists for whom the interaction has negative consequences (e.g., disrupts the solitude of the experience, or inhibits one's ability to catch fish or hunt game), conflict increases.

Hikers and mountain bikers differ in their method of experiencing the environment, but the participants share similar characteristics. Research has profiled mountain bikers as "30 something" white males, from a range of income levels, who believe the activity is important to their identity (Chavez, 1999). Similarly, many hikers are over 30, white males, from a range of income levels and who identify with the sport (Wellner, 1997). Individuals in both activities tend to participate frequently (Ruibal, 1996) and many pursue both activities (Chavez, 1999). Such similarities suggest that conflict, to the extent it exists between hikers and mountain bikers, is likely to reflect interpersonal problems rather than differences in social values. Interpersonal conflict between hikers and mountain bikers may be related to speed, lack of courtesy, crowding, or safety concerns (Moore, 1994). Safety issues, for example, have been linked to trail design (blind corners) and the behaviors of some mountain bikers who ride too fast for existing conditions (Hoger & Chavez, 1998).

Social Values Conflict. The importance of social acceptability judgments in conflict management is relatively new to the recreation literature (Blahna et al., 1995). McShea, Wemmer, and Stuwe (1993), for example, describe the social conflicts that erupted between hunters and anti-hunters when the National Zoo's Conservation and Research Center (CRC) attempted to open the area to hunting to reduce the size of a controversial deer herd. The conflict was primarily based on differences in values held by the CRC and animal rights groups. The CRC was concerned with protecting exotic hoofed animals from disease caused by the deer, whereas the animal rights groups advocated a position favoring the rights of individual deer. These findings reflect broader societal value differences toward consumptive versus non-consumptive uses of wildlife.

Social value differences between hikers and mountain bikers may reflect anticipated threats. Existing research (Hoger & Chavez, 1998; Moore, 1994), for example, suggests that some hikers believe mountain bikers increase safety concerns (i.e., riding irresponsibly), degrade the natural resource (i.e., creating informal trails), and lower the quality of the experience (i.e., lack of user etiquette). Similar to the controversy over allowing hunting in certain locations (Vaske et al., 1995), these reactions suggest that, for at least some individuals, mountain biking is not a socially acceptable activity and should not be allowed on trails traditionally used by hikers. Such value judgments are reinforced when mountain bikers are stereotyped as "crazy kids out for an adrenaline rush" (Hoger & Chavez, 1998).

Hiking represents a traditional activity on most trails whereas mountain biking is a relatively new sport. Past research has repeatedly demonstrated that traditional users frequently question the social acceptability of any non-traditional activity in natural resource settings (Blahna et al., 1995). As the number of individuals participating in non-traditional activities like mountain biking increases (Ruibal, 1996), hikers' tolerance levels for bikers may decrease and the potential for social values conflict can increase.

Interpersonal versus Social Values Conflict. Vaske et al. (1995) examined the magnitude of interpersonal and social values conflict for two general classes of events. Hunting-associated events included seeing an animal being shot, seeing people hunting, and hearing guns being fired. Human-wildlife interaction events were represented by evaluations of people disturbing, harassing, and feeding wildlife. Comparisons were made between hunters and non-hunters and between frequent and infrequent visitors to Mt. Evans, a 14,150-foot mountain located about 70 miles west of Denver. Results indicated that interpersonal conflicts between hunters and non-hunters on Mt. Evans were minimized due to the mountain's natural visual barriers and the Colorado Division of Wildlife's regulations that prohibit hunting near the road where most non-hunters are found. To the extent that conflict existed for hunting associated events, much of the problem was associated with differences in social values held by the non-hunting public. Conflict in social values remained relatively constant across frequency of visitation; findings that supported the argument that a visitor's value orientation is independent of the number of prior visits to an area.

Carothers et al. (2001) examined social values and interpersonal conflict reported by hikers, mountain bikers, and those who participate in both activities. Across all three groups, less conflict was reported for hiking than for mountain biking.

To the extent that conflict did exist for hiking, mountain bikers and dual-sport participants were more likely than hikers to report unacceptable behaviors. For evaluations of mountain biking behavior, hikers were more likely than mountain bikers to experience conflict, whereas dual-sport participants fell in between these two extremes. All three groups reported more interpersonal than social values conflict.

Both interpersonal and social values conflict can be influenced by recreationists' lifestyle tolerance; the tendency to accept or reject lifestyles different than one's own (Jacob & Schreyer, 1980). As noted by Ivy, Stewart, and Lue (1992), tolerance is typically associated with beliefs about a particular group, rather than reactions to specific behaviors. When recreationists encounter others, a cognitive processing of information occurs. This action often results in the categorization of others according to some group membership, which helps to simplify and order environmental stimuli. Differences in lifestyles are often communicated via visual cues such as the equipment used by recreationists engaged in different activities (e.g., guns for hunting versus binoculars for wildlife viewing, Vaske et al., 1995). Recreation in-groups and out-groups represent categories an individual establishes on the basis of perceived or imagined lifestyle similarities and differences (Jacob & Schreyer, 1980). Though useful for maintaining a view of the world, it can also lead to unjustified generalizations about other groups (Ramthun, 1995). Those who demonstrate low tolerance for persons with differing lifestyles will be more likely to experience conflict.

Out-group versus in-group lifestyle tolerance differences have been noted for several recreation activities. Research (Vaske, Carothers, Donnelly, & Baird, 2000; Williams, Dossa, & Fulton, 1994), for example, has indicated that skiers and snowboarders have differing views of each other. Skiers felt threatened by the snowboarders' different approach; evaluated the language, clothes, and on-slope behavior of snowboarders as intimidating; and had the perception that snowboarders purposely created conflict situations. Snowboarders, on the other hand, perceived skiers as predictable and showed less concern for their presence on the slopes. Watson, Williams, and Daigle (1991) found that mountain bikers were more likely than hikers to perceive the two groups as similar in terms of socio-demographic characteristics, as well as their relationship to the resource (attitudes about the environment, values of the area). Hikers perceived more differences between the two groups. Other research has shown that hikers view mountain biking as intrusive and are concerned with the impact mountain biking has on the environment and safety issues related to multiple use trails (Hoger & Chavez, 1998).

Simple classifications of individuals into groups (e.g., skier vs. snowboarder, or hiker vs. biker), however, can introduce problems when attempting to understand conflict (Watson, Zaglauer, & Stewart, 1996). Many recreationists participate in multiple activities (i.e., both hiking and biking) and consequently, their tolerance for others may be altered. Analyses should distinguish these dual sport participants from individuals who pursue only one activity.

There are a variety of ways to operationalize interpersonal versus social values conflict. Vaske et al. (1995) suggests combining the frequency (observed vs. not observed) of seeing different events with corresponding perceived problem (problem vs. not a problem) variables (Figure 1). Individuals who have not observed a given event, or who have observed it (e.g., bikers riding fast) yet do not perceive it to be a problem, are considered a no conflict group (either in terms of interpersonal or social values conflicts). Those who have never seen a particular event, but believe a problem exists for that event, are expressing a conflict in social values. Conversely, those who witness a particular situation and believe that the event has caused a problem are indicating an interpersonal conflict.

Figure 1. Conflict evaluation figure

| | | Perceived Problem | |
|----------|-----|-------------------|------------------------|
| | | No | Yes |
| Observed | No | No Conflict | Social Values Conflict |
| | Yes | No Conflict | Interpersonal Conflict |

Source: Vaske et al. 1995

Conflict Standard. Unlike the other indicators and standards considered here (i.e., satisfaction, perceived crowding), standards for acceptable levels conflict are more variable. The existing research suggests that the magnitude of conflict depends on the characteristics of the:

- 1) activity (e.g., consumptive vs. non-consumptive, traditional vs. non-traditional),
- 2) visitors (e.g., tolerances for other user groups, perceived similarities between the groups),
- 3) environment (e.g., unpaved vs. paved trails that allow for faster speeds),
- 4) management (e.g., zoning to separate potentially incompatible activities).

As a starting point, the researcher recommends that no more than 25% of the respondents should report interpersonal conflict.

Crowding Indicator and Standard

Researchers have recognized the difference between density and crowding, but even scientists sometimes use the word “crowding” inappropriately when referring to high density (Shelby & Heberlein, 1986). Density is a descriptive term that refers to the number of people per unit area. It is measured by counting the number of people and measuring the space they occupy, and it can be determined objectively. Crowding, on the other hand, is a negative evaluation of density; it involves a value judgment that the specified number is too many. The term *perceived crowding* is often used to emphasize the subjective or evaluative nature of the concept.

Heberlein and Vaske (1977) developed a relatively simple measure of perceived crowding that asks people to indicate how crowded the area was at the time of their visit. Responses are given on the scale below:

| | | | | | | | | |
|------------|---|----------|---|------------|---|-----------|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Not at all | | Slightly | | Moderately | | Extremely | | |
| Crowded | | Crowded | | Crowded | | Crowded | | |

Figure 2. Example of crowding response scale

In this item, two of the nine scale points label the situation as uncrowded, and the remaining seven points label it as crowded to some degree. The rationale is that people may be reluctant to say an area was crowded because crowding is an undesirable characteristic in a recreation setting. An item that asked “Did you feel crowded?” might lead most people to say “No.” The scale is sensitive enough to pick up even slight degrees of perceived crowding, just as measures of undesirable chemicals (e.g., pollutants or carcinogens) are sensitive to even low levels of these substances.

Crowding Standard. Shelby, Vaske, and Heberlein (1989) developed crowding standards based on this indicator. Their comparative analysis of 59 different settings and activities suggested five distinct categories of standards (suppressed crowding, low normal, high normal, over capacity, and greatly over capacity) (Table 1). When $\leq 35\%$ of the visitors feel crowded, density levels in the area were not a problem. For locations where between 50 and 60% of visitors felt crowded, the setting was approaching its carrying capacity, and visitors started to experience access and displacement problems. Locations and activities where over 65% of the visitors felt crowded were considered over carrying capacity.

A subsequent meta-analysis (Vaske & Shelby, 2008) examined crowding ratings for 615 different settings and activities. These studies were conducted across the United States, Canada, New Zealand, Ecuador, Sweden, and Taiwan. The activities included hunting of many types, fishing of many types, rafting, kayaking, canoeing, floating, boating, rock climbing, mountain climbing, backpacking, day hiking, biking, sailing, photography, and driving for pleasure. The areas studied show considerable diversity, with some showing extremely high density and use impact problems, others showing low densities and no problems, and still others actively utilizing management strategies to control densities and use impacts. In total, 85,451 individuals have been asked the crowding question.

Both meta-analyses (Shelby et al., 1989; Vaske & Shelby, 2008) supported the five distinct categories of standards based on the 9-point perceived crowding scale. The five categories were established based on the percent of visitors reporting any level of crowding (scale points 3 through 9).

For all 615 evaluation contexts, 40% showed suppressed crowding, 18% low normal crowding, 17% high normal crowding, 16% over capacity, and 9% greatly over capacity. In the United States, 40% of the 522 evaluation contexts showed suppressed crowding, whereas 16% were over capacity and 9% were greatly over capacity.

Table 1. Carrying capacity standards based on levels of perceived crowding ¹

| Percent feeling crowded | Capacity judgment | Comment | Total # of contexts (n = 615) | Percent of contexts |
|-------------------------|-----------------------|--|-------------------------------|---------------------|
| 0-35% | Suppressed crowding | Crowding is likely limited by management, situational factors, or natural factors may offer unique low-density experiences. | 245 | 40% |
| 36-50% | Low normal | Access, displacement, or crowding problems are not likely to exist at this time. Similar to the above category, may offer unique low-density experiences. | 111 | 18% |
| 51-65% | High normal | These locations or activities probably have not exceeded carrying capacity but may be tending in that direction. Should be studied if increased use is expected, allowing management to anticipate problems. | 107 | 17% |
| 66-80% | Over capacity | These locations or activities are generally known to have overuse problems, and they are likely to be operating at more than their capacity. Studies and management necessary to preserve experiences. | 99 | 16% |
| 81-100% | Greatly over capacity | It is generally necessary to manage for high-density recreation. A crowding problem has typically been identified. | 53 | 9% |

1. Source: Vaske and Shelby (2008)

Methods

The City of Fort Collins conducted visitor surveys ($n = 584$) at Soapstone Prairie Natural Area during 2017 and 2018. Respondents were randomly selected throughout the year on both weekdays and weekends. Interviews were conducted in three shifts (i.e., 8 am to 11 am, 11 am to 2 pm, and 2 pm to 5 pm). Table 2 summarizes this data collection effort.

This report compared respondents engaged in three primary activities: hiking ($n = 155$), mountain biking ($n = 199$) and wildlife viewing ($n = 203$).

Table 2. Visitor survey data collection effort at Soapstone Prairie Natural Area

| | Hiking ($n = 155$) | Mountain Biking ($n = 199$) | Wildlife Viewing ($n = 203$) |
|---------------------|-------------------------|-------------------------------------|--------------------------------------|
| Year | | | |
| 2017 | 65 | 84 | 74 |
| 2018 | 35 | 16 | 26 |
| Month | | | |
| January to March | 0 | 0 | 1 |
| April to June | 35 | 21 | 28 |
| July to September | 53 | 75 | 67 |
| October to December | 12 | 5 | 4 |
| Day of Week | | | |
| Weekday | 23 | 23 | 20 |
| Weekend | 77 | 77 | 80 |
| Shift | | | |
| 8:00 – 11:00 | 40 | 42 | 47 |
| 11:00 – 2:00 | 32 | 41 | 34 |
| 2:00 – 5:00 | 28 | 17 | 20 |

Data Analysis

In this report, two types of statistics are presented: (a) Chi-square (χ^2) and (b) F -values.

The choice of statistic depends on how the dependent variable was coded. For example:

if the dependent variable was dichotomous (e.g., male vs. female) or categorical (level of education), χ^2 was used.

if the dependent variable was continuous (e.g., number of people in a group), F was used.

The independent variable was always categorical (e.g., hiker, mountain bikers, wildlife viewer).

If the p -value for a given statistic is $\leq .05$, the groups being compared differ statistically.

The χ^2 and F -values highlight when differences exist, but do not indicate the strength of the relationship.

The latter is conveyed via two effect size measures: Cramer's V (or simply V) for χ^2 and (b)eta (η) for F -values.

The cutpoints for these two effect sizes are:

for V : .1 = a minimal relationship, .3 = a typical relationship, and .5 = a substantial relationship

for η : .1 = a minimal relationship, .243 = a typical relationship, and .371 = a substantial relationship.

Results

Demographics

Over three-quarters (79%) of the mountain bikers were male, compared to 52% of the hikers and 46% of the wildlife viewers. This difference was statistically significant (Table 3). The participants in the three activities did not differ in their average ages. The mean age ranged from 44.24 (mountain bikers) to 51.59 (wildlife viewers). Nearly all respondents were not Hispanic or Latino (97% +) and the predominant race was white (90% +). There were some statistical differences among the activity participants in terms of race, but this can be attributed to the large sample size.

Respondents in all three activities were highly educated. For example, over three-quarters (77%) of the hikers had completed a bachelor's degree (42%) or masters / Ph.D. (35%). Comparable numbers for mountain bikers and wildlife viewers were 85% and 80%, respectively. Thirty-seven percent of the hikers reported an income of \$100,000 or more. The mountain bikers (43%) and wildlife viewers (39%) reported similar income levels.

Table 3. Demographic profile of visitors to Soapstone Prairie Natural Area

| | Primary Activity | | | Statistic χ^2 or <i>F</i> - value | <i>p</i> -value | Effect size <i>V</i> or η |
|----------------------------|------------------|--------------------|---------------------|--|-----------------|--------------------------------------|
| | Hiking | Mountain Biking | Wildlife Viewing | | | |
| Gender | | | | 53.48 | < .001 | .304 |
| Male | 52 | 79 | 46 | | | |
| Female | 48 | 21 | 54 | | | |
| Age | | | | 54.86 | < .001 | .218 |
| < 20 | 1 | 1 | 1 | | | |
| 21 to 25 | 5 | 8 | 7 | | | |
| 26 to 35 | 19 | 19 | 12 | | | |
| 36 to 45 | 17 | 29 | 16 | | | |
| 46 to 55 | 18 | 27 | 15 | | | |
| 56 to 65 | 29 | 15 | 33 | | | |
| 66 + | 12 | 4 | 16 | | | |
| Mean age | 49.28 | 44.24 | 51.59 | 13.42 | < .001 | .207 |
| Ethnicity | | | | 5.03 | .081 | .097 |
| Hispanic or Latino | 1 | 1 | 3 | | | |
| Not Hispanic or Latino | 99 | 99 | 97 | | | |
| Race ² | | | | | | |
| White | 90 | 98 | 94 | 8.65 | .013 | .121 |
| Black | 1 | 1 | 0 | 2.87 | .239 | .059 |
| Asian | 3 | 0 | 1 | 6.69 | .035 | .099 |
| American Indian | 0 | 1 | 1 | 2.29 | .319 | .054 |
| Native Hawaiian | 1 | 1 | 1 | 0.04 | .978 | .009 |
| Other | 3 | 1 | 1 | 2.99 | .224 | .076 |
| Highest Level of Education | | | | 15.12 | .057 | .116 |
| Some high school or less | 1 | 0 | 1 | | | |
| High school | 15 | 7 | 10 | | | |
| Associate's degree | 7 | 9 | 10 | | | |
| Bachelor's degree | 42 | 51 | 36 | | | |
| Masters / Ph.D. | 35 | 34 | 44 | | | |
| Household Income | | | | 15.87 | .321 | .131 |
| Less than \$24,999 | 9 | 6 | 4 | | | |
| \$25,000 – \$34,999 | 7 | 3 | 6 | | | |
| \$35,000 – \$49,999 | 9 | 8 | 13 | | | |
| \$50,000 – \$74,999 | 22 | 20 | 18 | | | |
| \$75,000 – \$99,999 | 17 | 20 | 20 | | | |
| \$100,000 – \$149,999 | 24 | 28 | 22 | | | |
| \$150,000 – \$199,999 | 8 | 7 | 13 | | | |
| \$200,000+ | 5 | 8 | 4 | | | |

1 Cell entries are either percentages or means.

2 Cells entries are the percentage of "yes" responses.

Approximately 90% of the respondents were residents of Larimer County. Hikers had lived in the county an average of 17.91 years, mountain bikers for 14.52 years, and wildlife viewers for 15.31 years on average (Table 4).

Table 4. Residence of visitors to Soapstone Prairie Natural Area

| | Primary Activity | | | Statistic χ^2 or F value | <i>p</i> -value | Effect size V or η |
|----------------------------------|------------------|-------------------------|--------------------------|-------------------------------------|-----------------|-------------------------------|
| | Hiking % | Mountain Biking % | Wildlife Viewing % | | | |
| Resident of Larimer County | | | | 0.67 | .713 | .038 |
| Yes | 93 | 90 | 91 | | | |
| No | 7 | 10 | 9 | | | |
| Years lived in Larimer County | | | | 24.52 | .017 | .169 |
| 1 year or less | 11 | 9 | 12 | | | |
| 2 – 3 | 15 | 8 | 8 | | | |
| 4 – 5 | 6 | 8 | 14 | | | |
| 6 – 10 | 9 | 20 | 17 | | | |
| 11 – 20 | 17 | 25 | 19 | | | |
| 21 – 30 | 25 | 21 | 15 | | | |
| 31+ | 21 | 8 | 16 | | | |
| Range | 1 to 59 | 1 to 47 | 1 to 52 | | | |
| Mean | 17.91 | 14.52 | 15.31 | 2.41 | .090 | .107 |

Over half of the participants in all three activities were from Fort Collins: hikers (54%), mountain bikers (67%), and wildlife viewers (56%) (Table 5).

Table 5. Top five specific primary residences of visitors to Soapstone Prairie Natural Area

| | Primary Activity | | |
|--------------|------------------|-------------------------|--------------------------|
| | Hiking % | Mountain Biking % | Wildlife Viewing % |
| Fort Collins | 54 | 67 | 56 |
| Wellington | 8 | 4 | 5 |
| Loveland | 6 | 3 | 8 |
| Greeley | 5 | 4 | 3 |
| Cheyenne | 3 | 5 | 1 |

Visitation

In the past 12 months, hikers visited Soapstone an average of 1.51 times; bikers visited an average 3.43 times, and wildlife viewers visited 1.71 times on average (Table 6).

Table 6. Number of visits to Soapstone Prairie Natural Area in the past 12 months

| | Primary Activity | | | Statistic χ^2 or F value | p -value | Effect Size V or η |
|-----------------|------------------|-------------------------|--------------------------|---------------------------------------|------------|---------------------------------|
| | Hiking % | Mountain Biking % | Wildlife Viewing % | | | |
| Visits | | | | 79.87 | < .001 | .187 |
| 0 (first visit) | 41 | 24 | 32 | | | |
| 1 – 2 | 32 | 29 | 26 | | | |
| 3 – 5 | 14 | 26 | 16 | | | |
| 6 – 10 | 2 | 12 | 11 | | | |
| 11 – 20 | 2 | 5 | 11 | | | |
| 21 – 50 | 0 | 1 | 5 | | | |
| More than 50 | 9 | 4 | 0 | | | |
| Range | 0 to 20 | 0 to 25 | 0 to 30 | | | |
| Mean | 1.51 | 3.43 | 1.71 | 14.09 | < .001 | .227 |

There was no statistical difference between the number of visits by residents ($M = 2.76$) and non-residents ($M = 2.00$) (Table 7).

Table 7. Number of visits to Soapstone Prairie Natural Area

| | Non-Resident | Resident | Test statistic χ^2 or t -value | p -value | Effect Size V or η |
|-----------------|--------------|----------|--|------------|------------------------------|
| | % | % | | | |
| Visits | | | 6.09 | .413 | .104 |
| 0 (first visit) | 43 | 33 | | | |
| 1 – 2 | 29 | 30 | | | |
| 3 – 5 | 12 | 19 | | | |
| 6 – 10 | 2 | 8 | | | |
| 11 – 20 | 5 | 4 | | | |
| 21 – 50 | 0 | 1 | | | |
| More than 50 | 10 | 5 | | | |
| Range | 0 to 20 | 0 to 30 | | | |
| Mean | 2.00 | 2.76 | 1.02 | .308 | .048 |

As might be expected, over three-quarters of the visitation occurred on weekends for hikers (77%), mountain bikers (77%), and wildlife viewers (80%) (Table 8).

Table 8. Primary activities on weekdays and weekends

| | Primary Activity | | |
|----------|------------------|-------------------------|--------------------------|
| | Hiking % | Mountain Biking % | Wildlife Viewing % |
| Weekdays | 23 | 23 | 20 |
| Weekend | 77 | 77 | 80 |

$\chi^2 = 0.65, p = .724$. Cramer's $V = .034$.

Group Characteristics

Nearly two-thirds of mountain bikers (61%) visited with a group, compared to about three-quarters of the hikers (74%) and wildlife viewers (75%) (Table 9). On average, people in all three activities visited in groups of two adults: hikers ($M = 2.06$), mountain bikers ($M = 1.79$), and wildlife viewers ($M = 2.16$). Three-quarters or more did not visit with children: hikers (77%), mountain bikers (92%), and wildlife viewers (82%).

Table 9. Group characteristics of visitors to Soapstone Prairie Natural Area

| | Primary Activity | | | Statistic χ^2 or F value | p -value | Effect size V or η |
|-----------------------------|------------------|------------------------|--------------------------|---------------------------------------|------------|---------------------------------|
| | Hiking % | Mountain Biker % | Wildlife Viewing % | | | |
| I visited Soapstone | | | | 10.67 | .005 | .139 |
| Alone | 26 | 39 | 25 | | | |
| With a group | 74 | 61 | 75 | | | |
| Number of people in group | | | | 24.28 | .002 | .143 |
| 1 | 27 | 39 | 25 | | | |
| 2 | 41 | 43 | 39 | | | |
| 3 | 11 | 8 | 15 | | | |
| 4 – 5 | 16 | 9 | 16 | | | |
| 6+ | 5 | 1 | 5 | | | |
| Range | 1 to 11 | 1 to 8 | 1 to 10 | | | |
| Mean | 2.54 | 1.94 | 2.51 | 10.18 | < .001 | .188 |
| Number of adults in group | | | | 22.16 | .005 | .134 |
| 1 | 29 | 43 | 27 | | | |
| 2 | 54 | 43 | 50 | | | |
| 3 | 10 | 7 | 12 | | | |
| 4 – 5 | 6 | 7 | 9 | | | |
| 6+ | 2 | 0 | 2 | | | |
| Range | 1 to 11 | 1 to 5 | 1 to 10 | | | |
| Mean | 2.06 | 1.79 | 2.16 | 7.01 | .004 | .141 |
| Number of children in group | | | | 18.40 | .005 | .124 |
| 0 | 77 | 92 | 82 | | | |
| 1 | 7 | 4 | 7 | | | |
| 2 | 10 | 3 | 7 | | | |
| 3+ | 5 | 1 | 4 | | | |
| Range | 1 to 6 | 1 to 6 | 1 to 4 | | | |
| Mean | .48 | .15 | .36 | 7.09 | .001 | .158 |

Visited Other Natural Areas

In the past 12 months, over 40% of the hikers had visited Coyote Ridge (47%) and Bobcat Ridge (42%). Sixty percent of the mountain bikers had also visited Coyote Ridge and 53% had visited Pineridge. Among the wildlife viewers, the most popular natural areas were Bobcat Ridge (46%) and Fossil Creek (40%) (Table 10). Of the 11 natural areas listed in the survey, participants in the three activities only differed statistically in their visitation rates at four locations (i.e., Coyote Ridge, Maxwell, Pineridge, Gateway).

Table 10. Visited other natural areas over the past 12 months.

| | Primary Activity | | | Chi-square | <i>p</i> -value | Cramer's <i>V</i> |
|---------------------|------------------|------------------------|--------------------------|------------|-----------------|----------------------|
| | Hiking % | Mountain Biker % | Wildlife Viewing % | | | |
| Coyote Ridge | 47 | 60 | 39 | 17.09 | < .001 | .175 |
| Fossil Creek | 36 | 31 | 40 | 3.80 | .149 | .082 |
| Maxwell | 20 | 45 | 22 | 33.35 | < .001 | .247 |
| Pineridge | 30 | 53 | 34 | 23.88 | < .001 | .208 |
| Bobcat Ridge | 42 | 45 | 46 | 0.56 | .758 | .032 |
| McMurry | 13 | 15 | 15 | 0.42 | .812 | .027 |
| Gateway | 17 | 12 | 24 | 9.43 | .009 | .130 |
| Salyer | 12 | 8 | 13 | 3.04 | .219 | .073 |
| North Shields Ponds | 23 | 22 | 30 | 4.05 | .132 | .086 |
| Arapaho Bend | 19 | 16 | 22 | 2.86 | .237 | .071 |
| Ross | 3 | 3 | 6 | 3.27 | .195 | .078 |
| Other location | 11 | 7 | 9 | 2.31 | .314 | .064 |

1. Cell entries are the percentages of respondents that visited other locations.

Relatively few respondents wrote in other natural areas (Reservoir Ridge $n = 12$; Horsetooth Reservoir $n = 9$) (Table 11).

Table 11. Other natural areas respondents' visited

| Location | Number of Responses |
|-----------------------|---------------------|
| Reservoir Ridge | 12 |
| Horsetooth Reservoir | 9 |
| Red Mountain | 5 |
| RBP | 3 |
| Cathy Fromme | 3 |
| Riverbend | 2 |
| Red Fox | 2 |
| Devil's Backbone | 2 |
| Blue Sky | 2 |
| Running Deer | 2 |
| Red Tail Grove | 1 |
| Fossil Creek Wetlands | 1 |
| Cottonwood Hallow | 1 |
| CFP | 1 |
| Lory State Park | 1 |
| Cattail Chorus | 1 |
| Swift Ponds | 1 |

Between 79% (hikers) and 90% (mountain bikers) visited Soapstone because it was less crowded (Table 12).

Table 12. Visit Soapstone Prairie Natural Area because less crowded

| Do you visit Soapstone natural area because it is less crowded? | Primary Activity | | |
|---|------------------|------------------------|--------------------------|
| | Hiking % | Mountain Biker % | Wildlife Viewing % |
| Yes | 79 | 90 | 84 |
| Not sure | 15 | 7 | 10 |
| No | 6 | 3 | 6 |

$\chi^2 = 9.80, p < .044$, Cramer's $V = .094$.

Over 90% of all three activity participants did not avoid particular natural areas: hikers (94%), mountain bikers (92%), and wildlife viewers (97%) (Table 13).

Table 13. Natural areas respondents no longer visit

| Do you avoid particular natural areas? | Primary Activity | | |
|--|------------------|------------------------|--------------------------|
| | Hiking % | Mountain Biker % | Wildlife Viewing % |
| No | 94 | 92 | 97 |
| Yes | 6 | 8 | 3 |

$\chi^2 = 5.84, p = .054$. Cramer's $V = .101$.

Of those places where respondents no longer visit Horsetooth Mountain was mentioned by five people; Blue Sky and Gustav Swanson was listed by four people each (Table 14).

Table 14. Specific natural areas respondents no longer visit

| Natural Area | Number of Responses |
|---------------------|---------------------|
| Horsetooth Mountain | 5 |
| Blue Sky | 4 |
| Gustav Swanson | 4 |
| Coyote Ridge | 3 |
| Maxwell | 3 |
| Bobcat Ridge | 2 |
| Reservoir Ridge | 2 |
| Buckingham Park | 1 |
| Poudre Trail | 1 |
| Salyer | 1 |

Visitor Satisfaction

Over 90% of respondents in all three activities rated all facilities (e.g., restrooms, parking lots, trails) at Soapstone as “good” or “very good” (Table 15).

Table 15. Perceived quality of facilities at Soapstone Prairie Natural Area

| | Primary Activity | | | Chi-square | <i>p</i> -value | Cramer's <i>V</i> |
|-------------------|------------------|------------------------|--------------------------|------------|-----------------|----------------------|
| | Hiking % | Mountain Biker % | Wildlife Viewing % | | | |
| Restrooms | 95 | 99 | 96 | 4.35 | .114 | .092 |
| Parking areas | 97 | 97 | 98 | 0.59 | .744 | .032 |
| Picnic areas | 100 | 98 | 99 | 1.73 | .422 | .074 |
| Trash receptacles | 99 | 100 | 95 | 7.05 | .029 | .144 |
| Kiosk information | 98 | 97 | 97 | 0.36 | .834 | .028 |
| Trails | 97 | 96 | 98 | 1.71 | .426 | .054 |

1. Cell entries are percentages for “good” and “very good” responses

In an open-ended question asking individuals to explain their perceived quality ratings, 146 said “well maintained and clean facilities.” Another 67 people commented on the well-maintained and paved trails. Fifty respondents thought Soapstone was a “special place” (Table 16).

Table 16. Respondents' reasons for facility ratings at Soapstone Natural Area

| Category | Example responses | Number of Responses |
|-----------------|---|------------------------|
| Well maintained | Well maintained facilities, preserved nature, well groomed, clean | 146 |
| Trails | Trails are well taken care of, well marked, paved paths are great, excellent system | 67 |
| Special place | We love soapstone, totally fantastic, top notch park, wonderful place, awesome | 50 |
| Signage | Positive - Signs are informative, well-marked, very helpful, Good maps | 29 |
| Mountain biking | I bike a lot of trails, this is among the best, great trails | 10 |
| Friendly staff | Volunteers were terrific, wonderful people | 7 |
| Uncrowded | Uncrowded, lack of people, few folks | 7 |
| Hiking | Very good hiking trails, trails are narrow, favorite place to hike | 6 |
| Restrooms | Positive - Clean restrooms | 6 |
| Parking | Negative – big hole in the parking, no signage, lot seems small, need more parking | 5 |
| Restrooms | Negative - the door to the mens' restroom wouldn't latch, no hand sanitizer | 5 |
| Parking | Positive - Parking is good but limited, lots of parking spacing, easy to find | 3 |
| Wildlife | Birds, bison | 3 |
| Access | Easy to access. | 2 |
| Signage | Negative - Would be good to get mile markers on trail postings, need maps | 2 |
| Vegetation | Excellent trail-beautiful views, wildflowers! | 1 |

Overall, 85% + rated the perceived quality of their experience as “excellent:” hikers (90%), mountain bikers (85%), and wildlife viewers (89%) (Table 17).

Table 17. Overall perceived quality of Soapstone Prairie Natural Area

| | Hiking % | Mountain Biker % | Wildlife Viewing % |
|-------------|-------------|------------------------|--------------------------|
| 1 Poor | 0 | 0 | 0 |
| 2 | 0 | 0 | 0 |
| 3 Neutral | 1 | 1 | 0 |
| 4 | 9 | 14 | 11 |
| 5 Excellent | 90 | 85 | 89 |

$\chi^2 = 4.88, p = .299, \text{Cramer's } V = .060.$

Respondents' reasons for their overall evaluations included scenic beauty ($n = 89$), special place ($n = 76$), uncrowded ($n = 48$), and well maintained ($n = 37$) (Table 18).

Table 18. Respondents' reasons for overall perceived quality ratings

| Category | Example responses | Number of Responses |
|---------------------|--|---------------------|
| Scenic | Scenic, beautiful place, great views, majestic beauty, awesome, unspoiled | 89 |
| Special place | Incredible area, amazing, unique, favorite place, special place, hidden gem | 76 |
| Uncrowded | Not crowded, not too many people, few people, not as busy as other places | 48 |
| Well maintained | Well-maintained, taken care of, preserved, very clean, well set up | 37 |
| Wildlife | Wildlife viewing in general, awesome bison, beautiful birds, ferrets, antelope | 31 |
| Quiet | Quiet, secluded, natural, remote | 23 |
| Trails | Positive - Not too steep, well-kept, nice, great design, surface good | 22 |
| Peaceful | Peaceful, well maintained, great signage, pristine, not too strenuous | 5 |
| Vegetation | Good variety, nice diversity, good habitat, beautiful wildflowers | 5 |
| Access | Access to a great natural area, wild but accessible, easy to access | 4 |
| History | Created good historical conversation for our family, interesting history | 3 |
| Signage | Great signage and maps, good trail markings, nicely annotated signs | 3 |
| No buildings | No buildings, superb facilities | 2 |
| Friendly staff | Staff is always friendly. | 1 |
| Trails | Negative Trails - Markers are confusing | 1 |
| Hiking | Steady but not too steep gradient for running | 1 |
| Hiking | It's wonderful, peaceful, easy hiking | 1 |
| Hiking | Nice to have one trail just for walking | 1 |
| Hiking | Hiking for 70 years, on hundreds of trails | 1 |
| Hiking | I had a nice hike | 1 |
| Hiking | Great workout | 1 |
| Hiking | Easy walk with our 4 year old | 1 |
| Hiking | Good hiking experience - limited infrastructure enhanced natural experience | 1 |
| Hiking & Mtn biking | Hiking and mountain biking have paved trail too | 1 |
| Mountain biking | Beautiful place to ride | 1 |
| Mountain biking | Not much technical good for beginners | 1 |
| Mountain biking | For my type of MB riding, trails are not my favorite; but I like coming here | 1 |

Perceived Conflict

Nearly all (98 – 100%) respondents “never” *observed* hikers, mountain bikers or equestrian riders behaving unsafely or discourteously (Table 19).

Table 19. Unsafe and discourteous behaviors witnessed at Soapstone Prairie Natural Area on the day of the interview.

| Observed: | Primary Activity | | | Chi-square | <i>p</i> -value | Cramer's <i>V</i> |
|--|------------------|------------------|--------------------|------------|-----------------|-------------------|
| | Hiking % | Mountain Biker % | Wildlife Viewing % | | | |
| Saw hikers behaving unsafely | 98 | 99 | 98 | 0.83 | .660 | .038 |
| Saw mountain bikers behaving unsafely | 98 | 98 | 99 | 0.55 | .760 | .031 |
| Saw equestrian riders behaving unsafely | 99 | 99 | 99 | 1.16 | .559 | .043 |
| Witnessed hikers being discourteous | 100 | 100 | 99 | 2.39 | .318 | .054 |
| Witnessed mountain bikers being discourteous | 99 | 98 | 98 | 2.07 | .355 | .059 |
| Witnessed equestrian riders being discourteous | 100 | 99 | 99 | 3.51 | .173 | .064 |

1. Percent of respondents who “never” observed the behavior

Nearly as many (82 – 89%) “never” *perceived a problem* with hikers, mountain bikers or equestrian riders behaving unsafely or discourteously (Table 20).

Table 20. Perceived problems with other visitors at Soapstone Prairie Natural Area on the day of the interview

| | Primary Activity | | | Chi-square | <i>p</i> -value | Cramer's <i>V</i> |
|--------------------------------------|------------------|-------------------|--------------------|------------|-----------------|-------------------|
| | Hiking % | Mountain Biking % | Wildlife Viewing % | | | |
| Hikers hiking unsafely | 87 | 89 | 89 | 0.51 | .775 | .031 |
| Mountain bikers riding unsafely | 85 | 82 | 85 | 0.62 | .733 | .034 |
| Equestrian riders riding unsafely | 87 | 88 | 87 | 0.10 | .950 | .014 |
| Hikers being discourteous | 87 | 89 | 87 | 0.59 | .743 | .033 |
| Mountain bikers being discourteous | 86 | 86 | 85 | 0.31 | .856 | .024 |
| Equestrian riders being discourteous | 88 | 88 | 87 | 0.21 | .900 | .019 |

1. Percent of respondents who “never” experienced the problem behavior

There are a variety of ways to operationalize interpersonal versus social values conflict. One approach suggests combining the frequency (observed vs. not observed) of seeing different events with corresponding perceived problem (problem vs. not a problem) variables (Figure 1). Individuals who have not observed a given event, or who have observed it yet do not perceive it to be a problem, are considered a no conflict group (either in terms of interpersonal or social values conflicts). Those who have never seen a particular event, but believe a problem exists for that event, are expressing a conflict in social values. Conversely, those who witness a particular situation and believe that the event has caused a problem are indicating an interpersonal conflict.

Combining the observed behaviors in Table 19 with the corresponding perceived problem behaviors in Table 20 resulted in the distributions shown in Table 21. Across all three activities, between 82% and 90% of respondents reported no conflict. Between 10% and 16% experienced social values conflict. Two percent or less noted interpersonal conflict. These percentages are well within the limits of the recommended standard of quality that no more than 25% of the respondents should report interpersonal conflict.

Table 21. Perceived conflict at Soapstone Prairie Natural Area

| | Primary Activity | | | Chi-square | <i>p</i> -value | Cramer's <i>V</i> |
|-----------------------------------|------------------|------------------|--------------------|------------|-----------------|-------------------|
| | Hiking % | Mountain Biker % | Wildlife Viewing % | | | |
| Hikers hiking unsafely | | | | 1.06 | .901 | .031 |
| No conflict | 87 | 90 | 88 | | | |
| Interpersonal conflict | 1 | 0 | 1 | | | |
| Social values conflict | 12 | 10 | 10 | | | |
| Mtn. bikers riding unsafely | | | | 5.94 | .204 | .061 |
| No conflict | 85 | 82 | 84 | | | |
| Interpersonal conflict | 1 | 2 | 0 | | | |
| Social values conflict | 14 | 16 | 16 | | | |
| Equestrian riders riding unsafely | | | | 2.03 | .730 | .036 |
| No conflict | 87 | 88 | 87 | | | |
| Interpersonal conflict | 1 | 0 | 0 | | | |
| Social values conflict | 12 | 12 | 13 | | | |
| Hikers being discourteous | | | | 2.52 | .641 | .045 |
| No conflict | 87 | 89 | 86 | | | |
| Interpersonal conflict | 0 | 0 | 1 | | | |
| Social values conflict | 13 | 11 | 13 | | | |
| Mtn. bikers being discourteous | | | | 4.42 | .351 | .058 |
| No conflict | 86 | 86 | 84 | | | |
| Interpersonal conflict | 0 | 2 | 1 | | | |
| Social values conflict | 14 | 12 | 15 | | | |
| Equestrians being discourteous | | | | 4.68 | .321 | .061 |
| No conflict | 88 | 88 | 87 | | | |
| Interpersonal conflict | 0 | 1 | 0 | | | |
| Social values conflict | 12 | 11 | 13 | | | |

Perceived Crowding

Traditional crowding models assume that as the number of encounters with other visitors increases, crowding will increase. Across all three activities, the average number of reported encounters with other visitors at the trailhead and on the trail was consistently ≤ 3.30 people (Table 22).

Table 22. Reported number of other visitors seen at Soapstone Prairie Natural Area

| | Primary Activity ¹ | | | <i>F</i> -test | <i>p</i> -value | Eta |
|------------------------------|-------------------------------|----------------|------------------|----------------|-----------------|------|
| | Hiking | Mountain Biker | Wildlife Viewing | | | |
| Number seen at the trailhead | | | | | | |
| Hikers | 3.30 | 1.97 | 3.07 | 6.60 | .001 | .153 |
| Mountain bikers | 1.75 | 1.98 | 1.00 | 6.42 | < .001 | .150 |
| Horseback riders | 0.08 | 0.19 | 0.04 | 4.67 | .010 | .017 |
| Number seen on the trail | | | | | | |
| Hikers | 2.39 | 1.63 | 2.34 | 3.81 | .023 | .117 |
| Mountain bikers | 1.15 | 2.77 | 0.99 | 30.14 | < .001 | .098 |
| Horseback riders | 0.00 | 0.22 | 0.08 | 6.83 | .001 | .024 |

1. Cell entries are means

Given the findings in Table 22, it is not surprising that 4% or fewer reported any level crowding (i.e., scale points 3 thru 9 in Figure 2) (Table 23). These findings are well within the standard of quality that no more than 35% of all respondents should feel any level of crowding.

Table 23. Perceived crowding at Soapstone Prairie Natural Area

| Did you feel crowded by: | Primary Activity | | | Chi-square | <i>p</i> -value | Cramer's <i>V</i> |
|--------------------------|------------------|------------------|--------------------|------------|-----------------|-------------------|
| | Hiking % | Mountain Biker % | Wildlife Viewing % | | | |
| Hikers | | | | | | |
| At the trailhead | 4 | 3 | 2 | 1.12 | .546 | .047 |
| On the trail | 1 | 1 | 1 | 0.73 | .693 | .036 |
| Mountain bikers | | | | | | |
| At the trailhead | 3 | 2 | 3 | 0.82 | .663 | .038 |
| On the trail | 1 | 2 | 2 | 0.34 | .841 | .026 |
| Horseback riders | | | | | | |
| At the trailhead | 1 | 1 | 1 | 0.30 | .859 | .024 |
| On the trail | 0 | 1 | 1 | 1.29 | .525 | .038 |

1. % crowded includes scale points 3 thru 9 in Figure 2

Conclusions

This report summarized the findings from a 2017-2018 survey of visitors to four City of Fort Collins Soapstone Prairie natural areas. Visitors were described in terms of their (1) demographic characteristics (e.g., sex, age, place of residence), (2) prior visitation rates and trip characteristics (e.g., trip duration, activity participation), (3) visitation to other natural areas, (4) visitor satisfaction, (5) perceived conflicts with other visitors, and (6) perceived crowding. The intent was to provide managers with baseline information against which future research results can be compared and to inform management decisions.

To facilitate understanding the data, the results were couched in terms of indicators and standards for visitor satisfaction, perceived conflict, and perceived crowding. An indicator is a specific variable that reflects the current situation. A standard of quality is the minimum acceptable condition for each indicator. Standards identify desirable conditions (e.g., no litter), and conditions that managers are trying to achieve. For example, at least X% of visitors should be satisfied with their experience at the natural area, or no more than Y% of recreationist should feel crowded. Selecting values for X and Y has always proven challenging for natural resource managers and researchers. This section (1) summarizes how the indicators and standards for the City of Fort Collins Soapstone Prairie natural area were selected and what the results revealed. (2) presents more general criteria for choosing indicators and standards, and (3) discusses sources for selecting indicator and developing standards.

City of Fort Collins Soapstone Prairie Indicators and Standards

This report was based on indicators and standards for visitor satisfaction, perceived conflict and perceived crowding. The three concepts were selected because they have received the most attention in the natural resource literature and previous research has suggested standards for their application. Meta-analyses of the satisfaction research (e.g., Vaske et al., 1982; Vaske & Roemer, 2013), for example, has consistently found that non-consumptive recreationists (e.g., hiker, mountain bikers) report higher levels of satisfaction than consumptive recreationists (e.g., hunters, anglers). This study focused on non-consumptive visitors. Based on the literature, the standard was set at 80% or more of the visitors should be satisfied with their experiences at City of Fort Collins natural areas. Results for the quality of specific facilities indicated that this standard was met or exceeded for all four natural areas across all six facilities. The standard was also achieved for the overall perceived quality of the experience. Nearly all respondents rated the perceived quality of their experience as “excellent”.

For perceived conflict, the literature suggested that the magnitude of conflict depends on the characteristics of: (1) the activity (e.g., consumptive vs. non-consumptive, traditional vs. non-traditional), (2) the visitors (e.g., tolerances for other user groups, perceived similarities between the groups), (3) the environment (e.g., unpaved vs. paved trails that allow for faster speeds), and (4) management (e.g., zoning to separate potentially incompatible activities). Given the activities and conditions at the four natural areas, the standard was set at no more than 25% of the respondents should experience interpersonal conflict. This standard was met or exceeded across all activities (hiking, mountain biking, horseback riding) and behaviors (i.e., acting unsafely or discourteous).

The perceived crowding literature (Shelby et al., 1989; Vaske & Shelby, 2008) has suggested a standard of $\leq 35\%$ of visitors should feel any level of crowding (i.e., scale points 3 thru 9 on the crowding scale, Figure 2). With 4% or fewer feeling any lever of crowding at Soapstone, the standard was clearly achieved.

Overall, the findings here suggest the standards of quality for visitor satisfaction, perceived conflict, perceived crowding were met or exceeded at the Soapstone Prairie natural area. Should the City wish to expand the research to include other indicators, the following gives some general criteria for choosing indicators and standards.

Criteria for Choosing Indicators

Before standards can be developed, appropriate impact indicators must be selected. As used in other sciences (e.g., medicine, agriculture, forestry), indicators are variables that reflect the “health” of something (Ott, 1978). Indicators identify what conditions will be monitored (e.g., a person’s blood pressure), while the standards define when those conditions are acceptable or unacceptable. For example, the American Heart Association defines high blood pressure (an

indicator) as greater than or equal to 140 mm HG systolic pressure (a standard) or greater than or equal to 90 mm Hg diastolic pressure (a standard).

Although any number of variables could be monitored, it is important to identify those indicators that are most linked to issues of concern (Graefe et al., 1990). Thus, while a physician could monitor a stroke victim's kidney functions, it is more efficient to focus on the individual's blood pressure. The same logic applies to selecting indicators for natural area recreation opportunities. A manager could count the number of vehicles at trailhead parking lots, but past research suggests that monitoring how individuals distribute themselves in time and space throughout a natural area, or how they interact with other visitors, are better indicators of recreation-opportunity differences (Kuss et al., 1990; Shelby & Heberlein, 1986).

It is also important to recognize that there is no single "best" indicator or set of indicators. The choice of indicators and standards depends on the particular impact under consideration and the specific characteristics of the site. In other words, indicators and standards should be specific to the resource and opportunities provided at the site. The key is to select those impact indicators that matter the most for a given experience. Although indicators and standards are site specific, it is possible to identify criteria for choosing indicators.

Criteria for Choosing Indicators

- Specificity and responsiveness
- Sensitivity
- Measurability
- Integration with management objectives
- Impact importance

Specificity and Responsiveness. Indicators are only useful if they refer to specific conditions created by human use. For example, an overall measure of human density in an area is too vague unless it is linked to the impact conditions associated with that level of use (e.g., encounters with others, loss of solitude-oriented wildlife-viewing opportunities). Specific indicators might focus on the cleanliness of restrooms or trash receptacles.

Indicators should reflect impact changes related to impacts caused by human activity rather than those caused by natural events. Unfortunately, disentangling human from natural impacts is complex. Wall and Wright (1977) suggest four factors that limit ecological studies and introduce difficulties in identifying human impacts: (1) there are often no baseline data for comparison to natural conditions; (2) it is difficult to disentangle the roles of humans and nature; (3) there are spatial and temporal discontinuities between cause and effect; and (4) in light of complex ecosystem interactions, it is difficult to isolate individual components. Some impacts take the form of naturally occurring processes that have been speeded up by human interference. Even without human activity, however, severe impacts can occur due to natural causes that render the impacts associated with recreational use insignificant.

Sensitivity. The indicator needs to be sensitive to changes in conditions during relatively short time periods; Merigliano (1989) suggests within one year. Such changes may be reflected in biological conditions (e.g., the amount of erosion on a given trail) or the human experience (e.g., the frequency of encounters with others). If the indicator only changes after impacts are substantial or never changes, the variable lacks the early warning signs that allow managers to be proactive.

General measures of overall visitor satisfaction, for example, is often a major management objective and has been one of the most commonly used indicators of recreation quality. If, as traditionally assumed, enjoyment from a recreation experience is inversely correlated with the number of people present, reported overall satisfaction ratings should provide the basis for setting standards. Studies in a variety of settings, however, have consistently found that recreationists are generally satisfied with their experience independent of the use intensities they experienced (Kuss et al., 1990).

A variety of explanations have been offered to account for these findings. For example, to cope with the negative consequences of increasing numbers of visitors (e.g., loss of solitude), some individuals modify their standards for what is acceptable. The end result is a "product shift" or change in the character of the experience at a given area. Other people who are more sensitive to user densities may stop visiting an area all together if adjustments, either attitudinal (product

shift) or behavioral (e.g., visiting during off peak times, visiting less frequently), fail to bring about the desired experience. With all of these explanations, the current visitors to a heavily used area may be as satisfied as visitors 5 or 10 years ago when use levels were much lower, but are receiving a different type of experience.

While overall satisfaction measures are not always sensitive to changing use conditions, other measures of recreation quality do show the requisite variation. Perceived crowding, for example, combines the descriptive information (the density or encounter level experienced by the individual) with evaluative information (the individual's negative evaluation of that density or encounter level). When people evaluate an area as crowded, they have at least implicitly compared the impact they experienced with their perception of a standard. Findings from the comparative analysis of 181 crowding studies and 615 different settings and activities indicated that crowding varied across recreational settings and activities, time or season of use, resource availability, accessibility, or convenience, and management strategies designed to limit visitor numbers (Vaske & Shelby, 2008). This variability has allowed recreation researchers and managers to use crowding as a useful indicator.

Measurability. Indicators should be easily and reliably measurable in the field. When choosing impact indicators, it is important to specify the level of detail at which selected indicators will be measured and evaluated. The scale of measurement may range from sophisticated indices using quantitative measurements to subjective visual rating schemes. The choice of an appropriate level of measurement depends on such factors as the availability of funding and personnel, number of sites that must be evaluated, and frequency of measurement and site evaluation.

To illustrate, early crowding studies employed multiple-item scales (Shelby et al. 1989). While such scales consider a concept from different points of view and provide the data necessary for estimating reliability coefficients, the mathematical calculations involved in combining survey items into a single scale score sometimes make it difficult to compare results and can render the findings less understandable to managers (Vaske & Shelby, 2008). To overcome these problems, the single item crowding indicator discussed here that asks people to indicate how crowded the area was at the time of their visit overcomes these problems.

The crowding measure alone is not a perfect substitute for information about use levels, impacts, and evaluative standards that a more complete study can provide. Nevertheless, one can easily collect data with a single crowding item, thereby providing considerable insight about a study site. The single-item crowding measure is easy to interpret and compare across studies, and has been widely used in outdoor-recreation research (Shelby et al. 1989; Vaske & Shelby, 2008). The consistency of these findings makes the crowding measure a good indicator for addressing social impacts.

Integration with Management Objectives. Indicators need to be linked to the management objectives that specify the type of experience to be provided. For example, if a management objective is to provide a low-density backcountry experience, the indicators should focus on the number of encounters between visitors, perceptions of crowding, and encounter norm tolerances. Alternatively, if a management objective involves frontcountry opportunities, the indicators might be linked to visitor safety and the cleanliness of facilities.

Useful impact indicators are those that can be treated by management prescriptions. A seemingly eloquent solution to a human-caused impact that cannot be addressed by management actions does not resolve the problem condition. The most useful indicators reflect multiple impact conditions. Because managers typically have small monitoring budgets, indicators that can be used to represent several different impacts allow managers to focus their attention and efforts while being reasonably assured that the overall quality of a given experience is maintained. Crowding or norm tolerances are examples that often reflect several other interaction-type indicators such as encounters with others.

The concept of norms provides a theoretical framework for collecting and organizing information about users' evaluations of conditions and has proven to be sensitive to changing use conditions. As defined by one research tradition, norms are standards that people use to evaluate behavior or the conditions created by behavior as acceptable or unacceptable (see Vaske & Whittaker, 2004 for a review). Norms define what behavior or conditions should be, and can apply to individuals, collective behavior, or management actions designed to constrain collective behavior. This normative approach allows researchers to define social norms, describe a range of acceptable behavior or conditions, explore agreement about the norm, and characterize the type of norm (e.g., no tolerance, single tolerance, or multiple tolerance norms; Whittaker & Shelby, 1988).

Normative concepts in natural-resource settings were initially applied to encounter impacts in backcountry settings (encounter norms measure tolerances for the number of contacts with other users). The focus on encounters in backcountry worked because encounter levels were generally low, survey respondents could count and remember them, and encounters have important effects on the quality of experiences when solitude is a feature. Most studies showed that encounter norms across these backcountry settings were stable and strongly agreed upon, usually averaging about four encounters per day (Vaske, Shelby, Graefe, & Heberlein, 1986).

More recently, norm concepts and methods have been applied to a greater diversity of impacts and settings. Research on encounter norms in higher-density frontcountry settings, for example, has demonstrated more variation in visitors' tolerances for others as well as lower levels of agreement (Donnelly et al., 2000). This led some researchers to examine norms for interaction impacts other than encounters (Vaske & Whittaker, 2004). Norms for recreationist proximity, percentage of time within sight of others, incidents of discourteous behavior, competition for specific resources, and waiting times at access areas have all been examined. These alternative interaction impacts are often more salient than encounters in higher-use settings. Taken together, this work suggests that normative data are sensitive to changing use conditions, can facilitate understanding visitors' evaluations of social and environmental conditions, and have proven helpful to managers.

Normative standards may also provide a gauge for estimating benefits to society. If, for example, a management objective is to enhance the flow of dollars into a community's economy by creating more recreation opportunities, one indicator might be the occupancy rate at local motels. The standard in this situation might be 50% occupancy.

Impact Importance. Finally, and most importantly, indicators should represent important impacts. For example, if managers, stakeholders and visitors are not concerned about a social impact or researchers are not able to show how an impact negatively influences environment, developing standards is difficult to justify. If wildlife viewers are more interested in photographing elk than the number of people standing next to them, frequency of seeing elk becomes a better indicator of quality experiences than social-interaction variables. Alternatively, if visitors consider solitude in viewing experiences as more important than number of animals seen, encounters with other visitors becomes an important quality indicator.

Characteristics of Good Standards

Specific standards are established for each impact indicator and define an acceptable level of impact for each indicator. Just as impact indicators reflect management goals and objectives, standards are quantifiable value judgments concerning what the agency is attempting to achieve. Based on previous work (Graefe et al., 1990), the following discusses several important characteristics of good standards.

- Quantifiable
- Time Bounded
- Attainable
- Output Oriented

Quantifiable. Standards restate management objectives in quantitative terms. A good standard unequivocally states the level of acceptable impact. Such statements define how much is acceptable in quantitative terms. For example, a good standard might specify that visitors should be able to watch wildlife with fewer than 10 other people present. Specifying that there should only be "a few other people present" is not a good standard because it does not define how many constitutes "a few."

Time Bounded. "Time-boundedness" complements the quantifiable component of a good standard. Quantifiable standards only state "how much" is appropriate. Time-bounded standards specify "how much, how often" or "how much by when." This is especially important for impacts that have a seasonal component. Seeing 500 elk in Rocky Mountain National Park (ROMO) is a common occurrence for a fall evening, but a rare event during the summer when the elk are at higher elevations. Such seasonal differences in viewable wildlife often correlate with fluctuations in visitor numbers. The number of day visitors to ROMO who are explicitly interested in viewing and photographing elk, for example, is substantially greater in the fall than other seasons. Time-bounded standards recognize such variation.

Attainable. Management standards need to be reasonably attainable. When standards are too easy, little is accomplished. If they are too difficult to achieve, both managers and visitors are likely to become frustrated. Good objectives and standards should “moderately challenge” the manager and staff.

For each important indicator, standards should be set at levels that reflect management’s intent for resource or experiential outcomes in the area. While standards that are difficult to attain are generally undesirable, they may still be necessary. A “no litter” standard, for example, may not be attainable, but is still correct. The cynical excuse for not setting appropriate standards is that managing for some conditions is “too hard.” On the other hand, management strategies designed to meet a standard may produce sufficient positive change to warrant the effort. Without standards, it is too easy to do nothing (management by default).

Output Oriented. Standards should be “output” rather than “input” oriented. This distinction suggests that managers should focus on the conditions to be achieved rather than the way the standard is met. For example, a standard that specifies “150 people per day in a wildlife-viewing area” is not a good standard because it refers to an action (use limits) rather than an acceptable impact. “Less than 10 encounters per day” or “no more than 35% of the visitors feeling some level of crowding” are better standards because they emphasize the acceptability of different impact conditions.

Sources for Selecting Indicators / Developing Standards

Identifying characteristics of good standards is a useful exercise, but it does not provide much information about what standards should be (see inset – Different Experiences—Different Indicators and Standards), or where they should come from. Many different management and research efforts have developed or recommended various standards, utilizing a variety of techniques or sources of information. A review of the most common sources and techniques follows.

- Laws and policy mandates
- Manager’s professional judgment
- Biological research
- Public involvement
- Visitor or population surveys

Laws and Policy Mandates. Laws and policy mandates may provide guidelines for selecting specific impact indicators and developing appropriate standards for desirable wildlife-viewing experiences. Most laws, however, are written in broad and often vague language. Directives such as “provide high-quality viewing experiences” or “minimize conflict” lack the specificity necessary to set quantitative standards.

Manager’s Professional Judgment. Managers often develop standards based on their interpretation of laws and policy mandates, their knowledge of the area, their understanding of the recreation opportunities, and their knowledge of conditions that define those opportunities. By imposing their idea of what is appropriate, or even their own personal values, in the decision-making process, managers have implicitly been setting standards for years. An argument can be made, however, for setting standards more explicitly. First, although management standards have traditionally been based solely on professional judgment and biological expertise, the increasingly political nature of all natural-resource actions implies that decisions made in isolation are likely to generate considerable public scrutiny. Second, although it has been assumed that managers understand the acceptability of different resource and experiential conditions, empirical evidence suggests considerable differences between the views of managers, visitors, and organized interest groups (Magill, 1988; Gill, 1996). By formalizing the process for developing standards and including different points of view, managers gain a greater understanding of their objectives, have more justification for their actions, and are able to be more proactive when potential problem situations arise.

Biological Research. Science-based research has been and always will be an important component in developing standards. Data help clarify what management goals are biologically possible and describe how management actions affect wildlife impacts. Biological research by itself, however, cannot predict which alternatives are more or less desirable. For example, scientists are often assumed to be the most appropriate individuals to set standards for acceptable air- and water-pollution levels. When viewed from the larger societal perspective, however, this assumption is invalid. The scientific data describe the consequences of allowing a certain number of pollutants per volume of air or water (e.g., X number of people will die at contamination level Y). Whether this risk level is considered acceptable depends on legislation or other government functions. Even at extremely low levels of water pollution, some people are likely to become ill. It is impossible to set a standard until the acceptability of various risk levels has been identified.

Public Involvement. Traditional public involvement (e.g., focus groups, public meetings) represent another important strategy for developing standards, especially for social-impact indicators and standards. Recreationists are experts in identifying the characteristics of an experience they find most important. When given the opportunity to communicate their preferences, individuals are typically willing to express their views. Small focus-group meetings with different interest groups, for example, provide a useful starting point for identifying which impacts matter more. Standards can be developed from input provided by participants at larger public meetings, but it is often difficult to focus discussion on specific issues at these meetings. Moreover, individuals who attend public hearings and voice the loudest concerns may not represent all constituents.

Although these traditional techniques for soliciting citizen participation provide useful information, managers are increasingly adopting a stakeholder approach to involving public interests. Approaches such as transactive planning and co-management bring diverse interests and stakeholders in direct communication with one another and with agency decision makers to fashion collaborative solutions to management challenges. For example, agencies now routinely form citizen task forces, roundtables, advisory councils, and stakeholder planning teams to assist agency personnel with planning tasks and decisions. When multiple stakeholders have a voice in developing standards, polarized views about acceptable conditions and experiences are likely to emerge. Under these conditions, some negotiation and compromise must occur to develop standards that will be supported by the different publics and interest groups.

Visitor or Population Surveys. As this report has tried to demonstrate, perhaps the most useful source for developing standards involves visitor or population surveys. Even the best public-involvement efforts tend to neglect the “general public” in favor of special-interest groups who voice strong opinions on a topic. When surveys adhere to scientific principles (e.g., reliability, validity, representativeness, generalizability), the approach is especially useful for developing standards for social indicators (Vaske, 2008).

First, the survey should include a range of impact conditions and gauge which of those impacts are more important. Managers may ultimately establish standards for only a few key impact indicators. However, because surveys are usually conducted before this decision is made, asking about several different types of impact (e.g., human-interaction impacts) allows some flexibility in choosing different indicators. If respondents are asked to consider the relative importance of different impacts, the survey can facilitate the indicator selection process.

Second, questions about users’ personal standards should be direct, involve quantitative response categories, and be easy to understand. As noted previously, extensive research has failed to demonstrate a consistent relationship between impact variables (e.g., encounters with others) and general evaluative measures (e.g., satisfaction). Most researchers recommend focusing on the evaluation of impacts themselves (Shelby & Heberlein, 1986). For example, surveys might ask respondents to report the number of encounters they are willing to have per day or to rate acceptable encounter levels for different experiences. An effective technique used in several studies involves parallel questions about the amount of impact individuals experienced and the amount of impact they are willing to tolerate. Statistical comparisons of such results provide data about where to set standards and allow definition of an impact problem.

Third, when asking about quantitative estimates of acceptable impact levels, respondents should be allowed to specify that “this impact does not matter to me” or that “the impact matters but I cannot give a number” (Hall, Shelby, & Rolloff, 1996; Roggenbuck, Williams, Bange, & Dean, 1991). Some wildlife viewers, especially those with little experience, may not have opinions about acceptable impact levels or may not even be aware of the impact situation (Donnelly et al., 2000).

Finally, analysis of survey data should go beyond simple frequencies or measures of central tendency. Such measures are useful starting points, but closer examination of the response distributions reported by different groups or the level of group agreement are also important for developing standards.

References

- Adelman, B. J., Heberlein, T. A., & Bonnicksen, T. M. (1982). Social psychological explanations for the persistence of a conflict between paddling canoeists and motor craft users in the Boundary Waters Canoe Area. *Leisure Sciences*, 5, 45-62.
- Blahna, J. B., Smith, K. S., & Anderson, J. A. (1995). Backcountry llama packing: Visitor perceptions of acceptability and conflict. *Leisure Sciences*, 17, 185-204.
- Bryan, H. (1977). *Conflict in the great outdoors: Toward understanding and managing for diverse user preferences*. (Sociological Studies No. 4). Tuscaloosa, AL: University of Alabama, Bureau of Public Administration.
- Carothers, P., Vaske, J. J., & Donnelly, M. P. (2001). Social values versus interpersonal conflict among hikers and mountain bikers. *Leisure Sciences*, 23, 47-61.
- Chavez, D. J. (1999). Mountain biking - A rapidly growing sport. In K. Cordell, (Ed.), *Outdoor recreation in American life: A national assessment of demand and supply trends*. (pp. 245-246. Champaign, Illinois: Sagamore Publishing, Inc.
- Decker, D. J., Brown, T. L., & Siemer, W. F. (2001). *Human dimensions of wildlife management in North America*. Bethesda, MD: The Wildlife Society.
- Donnelly, M. P., Vaske, J. J., DeRuiter, D. S., & King, T. B. (1996). Person-occasion segmentation of state park visitors. *Journal of Park and Recreation Administration*, 14(2), 96-106.
- Donnelly, M. P., Vaske, J. J., Whittaker, D., & Shelby, B (2000). Toward an understanding of norm prevalence: A comparative-analysis. *Environmental Management*, 25, 403-14.
- Gill, R. B. (1996). The wildlife professional subculture: The case of the crazy aunt. *Human Dimensions of Wildlife*, 1, 60-69.
- Graefe, A. R. & Thapa, B. (2004). Conflict in natural resource-based recreation. (pp. 209-224). In M. J. Manfredo, J. J. Vaske, B. L. Bruyere, D. R. Field, & P. Brown (Eds.), *Society and natural resources: A summary of knowledge*. Jefferson, MO: Modern Litho.
- Graefe, A. R., Kuss, F. R., & Vaske, J. J. (1990). *Visitor Impact Management: The Planning Framework*. Washington, DC: National Parks and Conservation Association.
- Hall, T., Shelby, B, & Rolloff, D. (1996). Effect of varied question format on boaters' norms. *Leisure Sciences*, 18, 193-204
- Heberlein, T. A., & Vaske, J. J. (1977). *Crowding and Visitor Conflict on the Bois Brule River*. (Technical Report WIS WRC 77-04). Madison, WI: University of Wisconsin, Water Resources Center.
- Hendee, J. C. (1974). A multiple satisfaction approach to game management. *Wildlife Society Bulletin*, 2(3), 104-113.
- Hoger, J. L., & Chavez, D. J. (1998). Conflict and management tactics on the trail. *Parks and Recreation*, 33, 41-56.
- Ivy, M. I., Stewart, W. P., & Lue, C. (1992). Exploring the role of tolerance in recreation conflict. *Journal of Leisure Research*, 24, 348-360.
- Jacob, G., & Schreyer, R. (1980). Conflict in outdoor recreation: A theoretical perspective. *Journal of Leisure Research*, 12, 368-380.
- Kuss, F. R., Graefe, A. R., & Vaske, J. J. (1990). *Recreation Impacts and Carrying Capacity: A Review and Synthesis of Ecological and Social Research*. Washington, DC: National Parks and Conservation Association.
- LaPage, W. F., & Bevins, M. I. (1981). *Satisfaction monitoring for quality control in campground management*. USDA Forest Service Research Paper NE-484, Broomall, PA: Northeastern Forest Experiment Station.

- Lucas, R. C. (1964). Wilderness perception and use: The example of the Boundary Waters Canoe Area. *Natural Resources Journal*, 3, 394-411.
- Magill, A. (1988). Natural resource professionals: The reluctant public servants. *The Environmental Professional*, 10, 295-303.
- Manfredo, M. J., Fix, P. J., Teel, T. L., Smeltzer, J., & Kahn, R. (2004). Assessing demand for big-game hunting opportunities: Applying the multiple satisfaction concept. *Wildlife Society Bulletin*, 32(4), 1147-1155.
- Manning, R. E. (2011). Indicators and standards in parks and outdoor recreation. In M. Budruk & R. Phillips (Eds.), *Quality-of-life community indicators for parks, recreation, and tourism management* (pp. 11-22). The Netherlands: Springer.
- Merigiano, L. (1989). Indicators to monitor the wilderness recreation experience. In D. Lime (Ed.), *Proceedings: Managing America's enduring wilderness resources symposium* (pp. 205-209). Minneapolis, MN: U.S. Department of Agriculture, Forest Service.
- McShea, W. J., Wemmer, C., & Stuwe, M. (1993). Conflict of interests: A public hunt at National Zoo's Conservation and Recreation Center. *Wildlife Society Bulletin*, 21, 492-497.
- Moore, R. L. (1994). *Conflicts on multiple-use trails: Synthesis of the literature and state of the practice*. The Federal Highway Administration and the National Recreational Trails Advisory Committee, Federal Highway Administration, U.S. Department of Transportation.
- National Park Service. (1997). *VERP: The Visitor Experience and Resource Protection (VERP) Framework: A handbook for planners and managers*. Lakewood, CO: U.S. Department of the Interior, National Park Service, Denver Service Center.
- Ott, W. R. (1978). *Environmental Indices: Theory and Practice*. Ann Arbor, MI: Ann Arbor Science Publications, Inc.
- Ramthun, R. (1995). Factors in user group conflict between hikers and mountain bikers. *Leisure Sciences*, 17, 159-169.
- Roggenbuck, J. W., Williams, D. R., Bange, S. P., & Dean, D. J. (1991). River float trip encounter norms: Questioning the use of the social norms concept. *Journal of Leisure Research*, 23, 133-53.
- Ruibal, S. (1996). Off-road now means 2 wheels. *USA Today*, pp. B1, B2.
- Shelby, B., & Heberlein, T. A. (1986). *Carrying capacity in recreation settings*. Corvallis, OR: Oregon State University Press.
- Shelby, B., Vaske, J. J., & Heberlein, T. A. (1989). Comparative analysis of crowding in multiple locations: Results from fifteen years of research. *Leisure Sciences*, 11, 269-291.
- Stankey, G. H., Cole, D. N., Lucas, R. C., Petersen, M. E., Frissell, S. S. (1985). *The Limits of Acceptable Change (LAC) System for Wilderness Planning* (Report INT-176). Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station.
- Vaske, J. J. (2008). *Survey research and analysis: Application in parks, recreation, and human dimensions*. State College, PA: Venture Publishing, Inc.
- Vaske, J. J., & Roemer, J. M. (2013). Differences in reported satisfaction ratings by consumptive and nonconsumptive recreationists: A comparative analysis of three decades of research. *Human Dimensions of Wildlife*, 18(3), 1-22.
- Vaske, J. J., & Shelby, L. B. (2008). Crowding as a descriptive indicator and an evaluative standard: Results from 30 years of research. *Leisure Sciences*, 30(2), 111-126.
- Vaske, J. J., & Whittaker, D. (2004). Normative approaches to natural resources. (pp. 283 - 294). In M. J. Manfredo, J. J. Vaske, B. L. Bruyere, D. R. Field, & P. Brown (Eds.), *Society and natural resources: A summary of knowledge*. Jefferson, MO: Modern Litho.
- Vaske, J. J., Donnelly, M. P., & Williamson, B. N. (1991). Monitoring for quality control in state park management. *Journal of Park and Recreation Administration*, 9(2), 59-72.

- Vaske, J. J., Needham, M. D., & Cline, R. C. (2007). Clarifying interpersonal versus social values conflict among recreationists. *Journal of Leisure Research*, 39(1), 182-195.
- Vaske, J. J., Beaman, J., Stanley R., & Grenier, M. (1996). Importance performance and segmentation: Where do we go from here? *Journal of Travel and Tourism Marketing*, 5(3), 225-240.
- Vaske, J. J., Carothers, P., Donnelly, M. P., & Baird, B. (2000). Recreation conflict among skiers and snowboarders. *Leisure Sciences*, 22, 297-313.
- Vaske, J. J., Donnelly, M. P., Heberlein, T. A., & Shelby, B. (1982). Differences in reported satisfaction ratings by consumptive and nonconsumptive recreationists. *Journal of Leisure Research*, 14(3), 195-206.
- Vaske, J. J., Donnelly, M. P., Wittmann, K., & Laidlaw, S. (1995). Interpersonal versus social-values conflict. *Leisure Sciences*, 17(3), 205-222.
- Vaske, J. J., Shelby, B., Graefe, A. R., & Heberlein, T. A. (1986). Backcountry encounter norms: Theory, method, and empirical evidence. *Journal of Leisure Research*, 18, 137-153.
- Vaske, J. J., Whittaker, D., Shelby, B., & Manfredi, M. J. (2002). Indicators and standards: Developing definitions of quality. In M. J. Manfredi (Ed.), *Wildlife viewing in North America: A management planning handbook* (pp. 143-171). Corvallis, OR: Oregon State University Press.
- Wall, G., & Wright, C. (1977). *The Environmental Impact of Outdoor Recreation*. (Publication Series No. 11). Waterloo, Ontario: University of Waterloo, Department of Geography.
- Watson, A. E., Williams, D. R., & Daigle, J. J. (1991). Sources of conflict between hikers and mountain bike riders in the Rattlesnake NRA. *Journal of Park and Recreation Administration*, 9, 59-71.
- Watson, A., Zaglauer, H., & Stewart, S. (1996). Activity orientation as a discriminant variable in recreation conflict research. In *Proceedings of the 1995 Northeastern Recreation Research Symposium*. (Gen. Tech. Rep. NE-218, pp. 103-108). Saratoga Springs, NY: U. S. Department of Agriculture, Forest Service, Northeastern Forest Experiment Station.
- Wellner, A. S. (1997). *Americans at play: Demographics of outdoor recreation and travel*. New York: New Strategist Publications.
- Whittaker, D., & Shelby, B. (1988). Types of norms for recreation impacts: Extending the social norms concept. *Journal of Leisure Research*, 20, 261-73.
- Williams, P. W., Dossa, K. B., & Fulton, A. (1994). Tension on the slopes: managing conflict between skiers and snowboarders. *Journal of Applied Recreation Research*, 19, 191-213.

Appendix A

Table A1. Ranking of perceived crowding for Colorado resources and evaluation contexts

| Study site | Date | Evaluation context | | Crowding Scale 3-9 % |
|---|-------------|--------------------------------|-------------------------------------|----------------------|
| | | Evaluation by: | Evaluation for: | |
| Mesa Verde National Park | 2001 | Visitors at Cliff Palace | Other visitors | 76 |
| Rocky Mountain National Park | 2001 | Tourists | Visitors at Alpine Visitor Center | 74 |
| Mt Evans | 1994 | Deer Hunter | Other Deer Hunters | 72 |
| Mt Evans | 1994 | Tourists | Regional Survey | 70 |
| Rocky Mountain National Park | 2001 | Hikers | Longs Peak Hikers on the Trail | 69 |
| Rocky Mountain National Park | 2001 | Hikers | Longs Peak Hikers at the Summit | 69 |
| Rocky Mountain National Park | 2001 | Tourists | Trails near Bear Lake | 68 |
| Mesa Verde National Park | 2001 | Visitors at Museum | Other visitors - overall | 67 |
| Mesa Verde National Park | 2001 | Visitors at Spruce Tree House | Visitors at Spruce Tree House | 67 |
| Mesa Verde National Park | 2001 | Visitors at Museum | Other visitors at Museum | 66 |
| Rocky Mountain National Park | 2001 | Tourists | Bear Lake by Kiosk | 66 |
| Rocky Mountain National Park | 2001 | Tourists | Trail around Bear Lake | 65 |
| Mesa Verde National Park | 2001 | Visitors at Spruce Tree House | Other visitors - overall | 64 |
| Mesa Verde National Park | 2001 | Visitors at Step House | Other visitors - overall | 63 |
| Mt Evans | 1994 | Tourists | Other Tourist | 61 |
| Mesa Verde National Park | 2001 | Visitors at Cliff Palace | Other visitors - overall | 60 |
| City of Fort Collins – Maxwell | 2018 | Mountain bikers | Hikers on trail | 58 |
| Vail Pass White River NF | 2003 | Nonmotorized Users | snowmobilers at trailhead | 57 |
| Vail Pass White River NF | 2003 | Nonmotorized Users | snowmobilers on trail | 57 |
| Rocky Mountain National Park | 2001 | Tourists | Bear Lake Glacier Basin Shuttle Lot | 55 |
| City of Fort Collins – Maxwell | 2018 | Mountain bikers | Mountain bikers on trail | 49 |
| Mesa Verde National Park | 2001 | Visitors at Sun Point Overlook | Other visitors | 48 |
| Appalachian National Scenic Trail | 1999 | Non-Thru hiker | Other hikers | 47 |
| Gunnison Gorge Natl Conserv Area | 2002 | Gunnison Gorge Wilderness | All users | 47 |
| Gunnison Gorge Natl Conserv Area | 2002 | Gunnison River non-wilderness | All users | 42 |
| City of Fort Collins – Reservoir Ridge | 2018 | Mountain bikers | Hikers on trail | 41 |
| Cache la Poudre River | 1993 | Anglers | Other anglers | 40 |
| Colorado Reservoirs | 1998 | Anglers | Other anglers | 39 |
| Gunnison Gorge Natl Conserv. Area | 2002 | Flat Top & Peach Valley - OHVs | All users | 39 |
| Rocky Mountain National Park | 2001 | Hikers | Longs Peak hikers at trailhead | 37 |
| City of Fort Collins – Maxwell | 2018 | Mountain bikers | Hikers at trailhead | 37 |
| Colorado Reservoirs | 1998 | Anglers | South Catamount Reservoir anglers | 35 |

| Study site | Date | Evaluation context | | Crowding Scale 3-9 % |
|---|-------------|--------------------------------|-------------------------------------|----------------------|
| | | Evaluation by: | Evaluation for: | |
| Wolf Creek Pass | 2003 | Nonmotorized Users | Snowmobilers at trailhead | 35 |
| Cache la Poudre River | 1993 | Anglers | Evaluations of rafters | 34 |
| City of Fort Collins – Coyote Ridge | 2018 | Mountain bikers | Hikers on trail | 33 |
| Cache la Poudre River | 1993 | Kayakers | Rafters at the put-in | 31 |
| Vail Pass - White River NF | 2003 | Motorized Users | skiers/snowboarders at trailhead | 31 |
| Jefferson County | 1996 | Hikers | Bikers | 30 |
| Vail Pass - White River NF | 2003 | Motorized users | snowmobilers at trailhead | 30 |
| Horsetooth Mountain Open Space | 2018 | Visitors | Hikers on trail | 30 |
| City of Fort Collins – Maxwell | 2018 | Hikers | Mountain bikers on trail | 30 |
| City of Fort Collins – Pineridge | 2018 | Mountain bikers | Mountain bikers on trail | 30 |
| Cache la Poudre River | 1993 | Anglers | Kayakers | 29 |
| Vail Pass White River NF | 2003 | Nonmotorized Users | skiers/snowboarders at trailhead | 29 |
| Wolf Creek Pass | 2003 | Nonmotorized Users | snowmobilers on trail | 29 |
| Vail Pass White River NF | 2003 | Nonmotorized Users | skiers/snowboarders on trail | 28 |
| Wolf Creek Pass | 2003 | Nonmotorized Users | skiers/snowboarders on trailhead | 27 |
| City of Fort Collins – Coyote Ridge | 2018 | Mountain bikers | Mountain bikers on trail | 26 |
| City of Fort Collins – Maxwell | 2018 | Hikers | Hikers on trail | 25 |
| City of Fort Collins – Pineridge | 2018 | Hikers | Mountain bikers on trail | 25 |
| City of Fort Collins – Pineridge | 2018 | Mountain bikers | Hikers on trail | 25 |
| Horsetooth Mountain Open Space | 2018 | Visitors | Hikers at trailhead | 24 |
| City of Fort Collins – Maxwell | 2018 | Mountain bikers | Mountain bikers at trailhead | 23 |
| City of Fort Collins – Pineridge | 2018 | Mountain bikers | Mountain bikers at trailhead | 23 |
| Cache la Poudre River | 1993 | Rafters | Other rafters at the put-in | 22 |
| Jefferson County | 1996 | Bikers and hikers (Dual sport) | Bikers | 22 |
| Cache la Poudre River | 1993 | Kayakers | Rafters at the take-out | 21 |
| City of Fort Collins – Coyote Ridge | 2018 | Mountain bikers | Hikers at trailhead | 21 |
| City of Fort Collins – Coyote Ridge | 2018 | Hikers | Mountain bikers on trail | 20 |
| Jefferson County | 1996 | bikers | Other bikers | 19 |
| City of Fort Collins – Reservoir Ridge | 2018 | Hikers | Mountain bikers on trail | 19 |
| Colorado Reservoirs | 1998 | Anglers | Crystall Reservoir anglers | 18 |
| Vail Pass White River NF | 2003 | Motorized Users | skiers/snowboarders on trail | 18 |
| City of Fort Collins – Maxwell | 2018 | Hikers | Hikers at trailhead | 18 |
| City of Fort Collins – Reservoir Ridge | 2018 | Hikers | Hikers on trail | 18 |

| Study site | Date | Evaluation context | | Crowding Scale 3-9 % |
|---|-------------|--------------------------------|-------------------------------------|----------------------------|
| | | Evaluation by: | Evaluation for: | |
| City of Fort Collins – Coyote Ridge | 2018 | Hikers | Hikers on trail | 16 |
| City of Fort Collins – Pineridge | 2018 | Hikers | Hikers on trail | 14 |
| City of Fort Collins – Coyote Ridge | 2018 | Mountain bikers | Mountain bikers at trailhead | 14 |
| City of Fort Collins – Pineridge | 2018 | Mountain bikers | Hikers at trailhead | 14 |
| Cache la Poudre River | 1993 | Rafters | Other rafters on river | 13 |
| Cache la Poudre River | 1993 | Rafters | Other rafters at the take-out | 13 |
| Mesa Verde National Park | 2001 | Visitors at Step House | Other visitors - at Step House | 13 |
| Vail Pass White River NF | 2003 | Motorized Users | snowmobilers on trail | 13 |
| Wolf Creek Pass | 2003 | Motorized Users | snowmobilers at trailhead | 13 |
| City of Fort Collins – Reservoir Ridge | 2018 | Mountain bikers | Hikers at trailhead | 13 |
| Jefferson County | 1996 | Bikers | Hikers | 12 |
| Jefferson County | 1996 | Hikers & bikers (Dual-sport) | Hikers | 12 |
| Wolf Creek Pass | 2003 | Nonmotorized Users | skiers/snowboarders on trail | 12 |
| Wolf Creek Pass | 2003 | Motorized Users | skiers/snowboarders on trail | 12 |
| City of Fort Collins – Reservoir Ridge | 2018 | Mountain bikers | Mountain bikers on trail | 12 |
| Mesa Verde National Park | 2001 | Visitors at Sun Point Overlook | Visitors at Sun Point Overlook | 11 |
| Horsetooth Mountain Open Space | 2018 | Visitors | Mountain bikers on trail | 11 |
| City of Fort Collins – Reservoir Ridge | 2018 | Hikers | Hikers at trailhead | 11 |
| City of Fort Collins – Maxwell | 2018 | Hikers | Mountain bikers at trailhead | 10 |
| Cache la Poudre River | 1993 | Kayakers | Other kayakers at the take-out | 9 |
| Jefferson County | 1996 | Hikers | Other Hikers | 9 |
| Wolf Creek Pass | 2003 | Motorized Users | Snowmobilers on trail | 9 |
| City of Fort Collins – Coyote Ridge | 2018 | Hikers | Hikers at trailhead | 9 |
| City of Fort Collins – Reservoir Ridge | 2018 | Hikers | Mountain bikers at trailhead | 9 |
| Wolf Creek Pass | 2003 | Motorized Users | Skiers/snowboarders at trailhead | 8 |
| Cache la Poudre River | 1993 | Kayakers | Kayakers at the put-in | 7 |
| Horsetooth Mountain Open Space | 2018 | Visitors | Mountain bikers at trailhead | 7 |
| Cache la Poudre River | 1993 | Rafters | Kayakers on river | 7 |
| City of Fort Collins – Coyote Ridge | 2018 | Hikers | Mountain bikers at trailhead | 7 |
| Cache la Poudre River | 1993 | Rafters | Kayakers at the put-in | 6 |
| Cache la Poudre River | 1993 | Rafters | Kayakers at the take-out | 4 |
| Red Mountain Open Space | 2018 | Visitors | Hikers at trailhead | 4 |
| Red Mountain Open Space | 2018 | Visitors | Hikers on trail | 4 |

Evaluation context

| Study site | Date | Evaluation context | | Crowding Scale 3-9 % |
|---|-------------|---------------------------|--------------------------------------|----------------------------|
| | | Evaluation by: | Evaluation for: | |
| City of Fort Collins – Pineridge | 2018 | Hikers | Mountain bikers at trailhead | 4 |
| City of Fort Collins | 2018 | Soapstone visitors | Hikers at trailhead | 3 |
| Red Mountain Open Space | 2018 | Visitors | Mountain bikers on trail | 2 |
| City of Fort Collins | 2018 | Soapstone visitors | Mountain bikers at trailhead | 2 |
| City of Fort Collins | 2018 | Soapstone visitors | Mountain bikers on trail | 2 |
| City of Fort Collins – Pineridge | 2018 | Hikers | Hikers at trailhead | 2 |
| Red Mountain Open Space | 2018 | Visitors | Mountain bikers at trailhead | 1 |
| City of Fort Collins | 2018 | Soapstone visitors | Hikers on trail | 1 |
| City of Fort Collins | 2018 | Soapstone visitors | Horseback riders at trailhead | 1 |
| City of Fort Collins | 2018 | Soapstone visitors | Horseback riders on trail | 1 |
| City of Fort Collins – Reservoir Ridge | 2018 | Mountain bikers | Mountain bikers at trailhead | 0 |

Appendix B
Additional Comments

Table B1. Additional comments

| Category | Example responses | Number of Responses |
|----------------|--|---------------------|
| Love Soapstone | Love this place, wonderful place, hidden gem | 69 |
| Thanks | Great! Thanks! Thank you, volunteers! | 27 |
| Trails | need more maps at trail intersections, great trails | 8 |
| Wildlife | We were hoping to see the bison, pronghorn, antelope, birds | 6 |
| Signage | Needs better signage for north parking lot, more signs marking trails, signage confusing | 4 |
| Friendly staff | Very friendly volunteer, friendly & knowledgeable | 3 |
| Helpful staff | Volunteer nice and helpful, awesome volunteers | 3 |
| Scenic | Nice area good views very nice to have drinks at the end, beautiful area | 2 |
| Solitude | Solitude is greatest asset at soapstone, not crowded | 2 |
| Dogs | Allow dogs on leashes! | 1 |
| Hiking | Good hiking | 1 |
| Management | Please provide a backcountry access permit system | 1 |
| Mtn. biking | More bike trails please | 1 |
| Peaceful | Very peaceful will be back | 1 |
| Restroom | I would like to see a sanitizer dispenser in bathroom! | 1 |