Visitor Tolerances and Standards for Off Leash Dogs at Boulder Open Space and Mountain Parks

Sponsored by the City of Boulder Open Space and Mountain Parks and conducted by

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Executive Summary

- This study evaluated visitors' normative tolerances for 11 off leash dog behaviors identified and collectively agreed upon by the City of Boulder Open Space and Mountain Parks (OSMP) and citizen interest groups as potentially causing conflict.

- Data for this project were obtained from on-site surveys (n = 951) conducted at 16 OSMP locations during the summer of 2006. Sampling occurred at trailheads that provide access to trails allowing dogs to be managed under voice and site control.

- Questions related to normative tolerances examined 5 *direct* (e.g., dogs jumping on visitors) and 6 *indirect* (e.g., dogs causing wildlife to flee) human-dog interactions. The direct behaviors were situations where dogs interacted with visitors other than their guardians. In the indirect behaviors, the dog interacted with the guardian, wildlife, other dogs, or the guardian failed to pick up after their dogs.

- *Summary of Key Findings*

  1. Nine of the 11 indicators reflected "no tolerance" norms. The average acceptability ratings for these behaviors were negative irrespective of the number of times the behaviors were observed. Thus, *the visitors' reported standard for each of these nine behaviors was 0.*
  2. For "dogs play chasing" and "dogs off trail," a single tolerance norm was observed with acceptability ratings only slightly above neutral (i.e., the average acceptability ratings were +0.48 for "dogs off trail" and +0.51 for "dogs play chasing with another dog"). *Given that the averages were less than 1, the visitors' standard for these two behaviors was in essence 0.*
  3. Although statistical differences between some sub-groups (e.g., guardians vs. non-guardians, frequency of walking dogs at OSMP) were identified in our analyses, the magnitude of these differences was minimal. The "no tolerance" standards for the entire sample are thus applicable to all stakeholders.
  4. These standards were exceeded 13% of the time or more. The most serious violation of a standard occurred for "owners not picking up after their dogs," which was exceeded 50% of the time. The standard for "dogs approaching uninvited" was exceeded 35% of the time.

- *Recommendations*

  1. Given the visitors' "no tolerance" standards, a management standard of "no more than 0% of the visitors should have their norms exceeded" for any of these human-dog interaction variables could be recommended. A good standard, however, should be attainable, and a standard of 0% is unrealistic short of eliminating all off leash dogs at OSMP.
  2. We recommend a standard of "no more than 10% of visitors should have their norms exceeded." This recommendation is consistent with the standards currently in the OSMP Visitor Master Plan.
  3. Although the proposed standard of 10% is never met under current conditions, OSMP's Voice and Sight Tag (VST) Program had just been implemented at the time our data were collected. The VST program should be monitored to evaluate its effectiveness in reducing dog-related conflict.

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Introduction

Most natural resource planning frameworks (e.g., Limits of Acceptable Change, Visitor Impact Management, Visitor Experience and Resource Protection) argue that resource management decisions require both descriptive and evaluative information (Graefe, Kuss, & Vaske, 1990; Shelby & Heberlein, 1986; Stankey, Cole, Lucas, Petersen, & Frissell, 1985). Descriptive information is needed to demonstrate how different management actions produce different ecological and social impacts. Evaluative information is necessary to identify management goals and objectives, and to develop specific standards that define high quality. Although management decisions require both kinds of information, the evaluative component is generally the most difficult and controversial part of the decision-making process (Vaske, Shelby, Graefe, & Heberlein, 1986).

The City of Boulder Open Space and Mountain Parks (OSMP) Visitor Master Plan establishes procedures for collecting descriptive information and sets standards for several key services that enhance visitor experiences and protect the natural areas. Success in providing these community services is defined as making meaningful progress toward a sustainable and high quality visitor experience.

The Visitor Master Plan describes seven community initiatives that deliver services to OSMP visitors and the community through a package of strategies. Performance measures enable OSMP to assess progress toward implementing those strategies and meeting the Visitor Master Plan goals and objectives. The Visitor Master Plan initiatives are:

1. Education and outreach
2. Safety and enforcement
3. Recreational opportunities
4. Trails and facilities
5. Resource protection
6. User conflict reduction
7. Public involvement

This report primarily focuses on the user conflict reduction initiative. One specific type of potential conflict involves the presence of dogs in the City of Boulder Open Space and Mountain Parks and the impact of dog behaviors on the visiting public. Dog guardians, for example, that allow their dogs to be off leash may not be in control of their animals and may be less likely to clean up after their pets. Visitors who are intolerant of the presence and / or behavior of pets in natural areas are likely to evaluate these situations as unacceptable.

In response to this situation, OSMP has initiated a Voice and Sight Dog Tag Program (VST). Under the VST program, visitors wishing to have their dogs off leash and under voice and sight control are required to have a tag visibly displayed on their dogs. To obtain a tag, a visitor must view a video describing the requirements of voice and sight control and complete a registration form. Visitors not registered in the program or who do not have a tag on their dog must keep their dog on leash while visiting OSMP and other City of Boulder properties where voice and sight control applies.

Study Objectives

During the summer of 2006, OSMP conducted an observational study to evaluate visitors' compliance with observable aspects of existing dog regulations, including the voice and sight ordinance. The study described in this document complements the OSMP observational investigation by evaluating visitor tolerances for the impacts of dogs in Open Space and Mountain Parks. Our overall study objective was to evaluate visitor tolerances for 11 behaviors identified by OSMP and citizen interest groups as causing potential conflict. More specifically, we addressed the following issues:

1. Visitors' reported frequency of observing 11 dog / guardian behaviors (e.g., dogs approaching visitors uninvited, guardians not picking up after their pets).
2. Visitors' normative acceptability ratings and tolerances for these dog / guardian behaviors.
3. The extent to which visitors perceive the presence and / or behavior of dogs to be a problem at locations managed by OSMP.
4. Visitor beliefs about off leash dogs at OSMP.

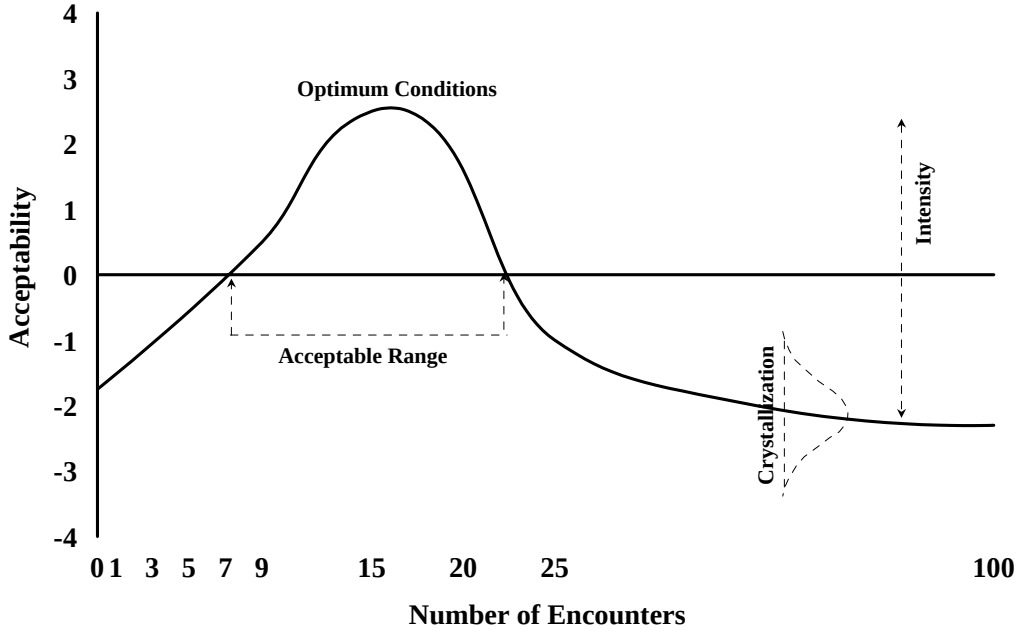
Theoretical and Methodological Contexts

Structural Characteristics of Norms

Given the need for evaluative information, a normative model has been developed as a useful way to conceptualize, collect, and organize evaluative judgments in resource management. Norms can refer to what most people are doing (a descriptive norm) or to what people *should* or *ought to* do (an injunctive norm) in a given situation (Cialdini, Kallgren, & Reno, 1991). 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 Shelby et al. 1996; Vaske et al. 1986 for reviews). Norms thus define what behavior or conditions should be, and can apply to individuals, collective behavior, or management actions designed to constrain collective behavior.

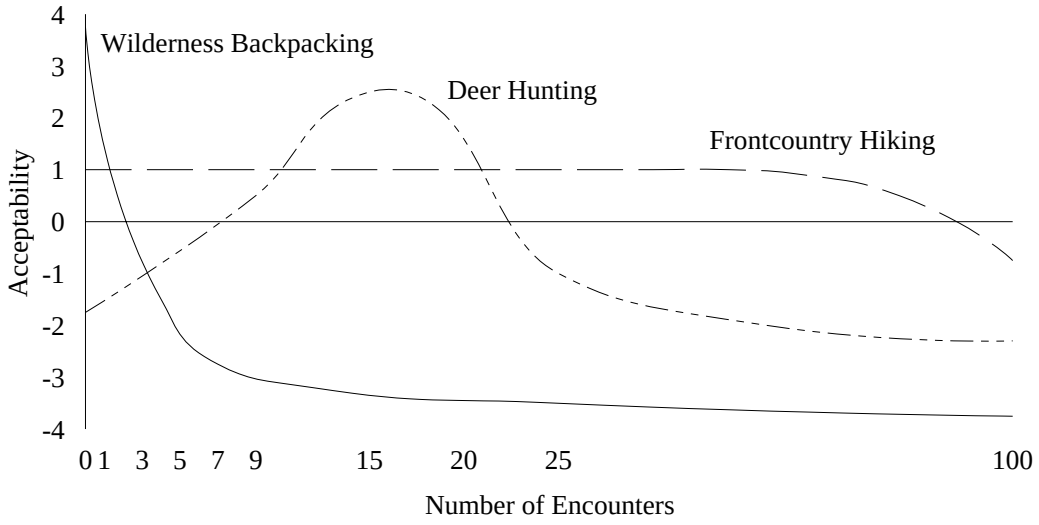
The traditional norm model focuses on the characteristics of social norms using a graphic device that Jackson (1965) initially described as the return potential model (now more generally known as impact acceptability curves). Impacts are displayed on a horizontal axis while evaluation (e.g., acceptability) is displayed on the vertical axis (Figure 1). The curves describe social norms as averages of personal norms.

Figure 1. The structural characteristics of norms



The curve can be analyzed for various structural characteristics. The high point of the curve shows the *optimum* or best situation. The range of impacts where evaluations are above the neutral line defines the *range of tolerable conditions*. The height of the curve (both above and below the neutral line) describes the *intensity* of the norm (one measure of strength), while variation among evaluations at each impact level shows the amount of agreement or *crystallization* (a second measure of strength). Evaluative standards for backpacking in a wilderness setting (Figure 2), for example, often have an optimum of zero encounters, a low range of tolerable contacts, high intensity, and high crystallization. Norms for hiking in a developed recreation area tend to show a greater tolerable range, lower intensity, and less agreement (Shelby et al., 1996). For deer hunting, too few and too many people can be evaluated negatively; hunters want enough people to move deer, but not so many that crowding or competition problems appear.

Figure 2. Hypothetical norm curves for three activities



Jackson's model has been extensively applied to natural resource applications; often with respect to encounter norms that describe how many people are too many in a recreation setting (see Donnelly, Vaske, Whittaker, & Shelby, 2000; Manning, Lawson, Newman, Laven, & Valliere, 2002; Shelby et al., 1996; Vaske & Donnelly, 2002, for reviews). Other applications have extended the structural approach to other impact issues such as campsite or attraction site sharing (Heberlein & Dunwiddie, 1979; Shelby, 1981); the number of people in sight at attraction areas (Manning, Lime, Freimund, & Pitt, 1996); fishing competition (Martinson & Shelby, 1992; Whittaker & Shelby, 1993); discourteous behavior incidents (Whittaker & Shelby, 1988; 1993; Whittaker, Vaske, & Williams, 2000); capacities on wildlife viewing platforms (Whittaker, 1997); or other resource issues such as instream flow requirements for different river recreation activities (Whittaker & Shelby, 2002); the amount of bare ground and size of fire rings in campgrounds (Shelby, Vaske, & Harris, 1988); and the acceptability of wildlife management practices (Wittmann, Vaske, Manfredo, & Zinn, 1998; Zinn, Manfredo, Vaske, & Wittmann, 1998) and wildfire policies (Kneeshaw, Vaske, Bright, & Absher, 2004). In all of these applications, researchers have explored either acceptable behaviors or acceptable conditions caused by behavior (Vaske, Donnelly, & Whittaker, 2000).

For many of the behaviors / conditions examined in past research, “less” impact is often deemed more acceptable than “more.” Encountering no other visitors in a wilderness (or at a campsite or attraction site), for example, is consistently evaluated more positively than seeing many visitors. Other research (e.g., Whittaker & Shelby, 1988), however, suggests that “no tolerance” norms may exist when visitors agree that any level of impact is unacceptable. A “single tolerance” norm exists when visitors show similar agreement at impact levels greater than zero.

Overall, the normative approach is powerful because it facilitates the development of standards for acceptable social and physical conditions that are central to visitor impact management frameworks such as Limits of Acceptable Change, Visitor Impact Management, or Visitor Experience and Resource Protection (Shelby & Vaske, 1991). In addition, the visual representation has proven useful to the process of communicating normative concepts to resource managers. Crystallization or level of agreement about the norm, however, is typically not visually displayed on a norm curve. Understanding the amount of agreement regarding a given issue allows decision makers to avoid or at least plan in advance for potential conflicts between users. When agreement among respondents is high, confidence in a management action increases. In cases with low levels of agreement, caution should be exercised when adopting a given decision.

The potential for conflict index (PCI) developed by Manfredo, Vaske, and Teel (2003) advances the graphic representation of social norms by visually displaying information about their central tendency and dispersion (Vaske, Needham, Newman, Manfredo, & Petchenik, 2006).

Potential for Conflict Index (PCI)

If the goal of human dimensions research is to inform management decisions, researchers working in this arena must improve their ability to effectively communicate. Basic summary statistics describe variables in terms of central tendency (mean, mode, median), dispersion (e.g., standard deviation, variance, range), and form (e.g., skewness, kurtosis) (Loether & McTavish, 1976). Although these statistics can efficiently convey meaning, an accurate understanding of a variable’s distribution requires consideration of all three indicators simultaneously.

Crystallization in the structural norm approach has commonly been defined as the standard deviation (Shelby et al., 1996), but norm agreement can be conveyed in other ways. The potential for conflict index (PCI), for example, describes the ratio of scoring on either side of a rating scale’s center point and displays this ratio as bubble graphs. A standard deviation is centered on the mean while the PCI is centered on the neutral point. Although both statistics can communicate agreement, the PCI bubble graphs have a more intuitive appeal.

Surveys using the structural norm approach commonly measure variables using response scales with an equal number of response options surrounding a neutral center point. Numerical ratings are assigned in ordinal fashion with the neutral point being 0 (e.g. -2, -1, 0, 1, 2, where -2 = highly unacceptable, 0 = neutral, and 2 = highly acceptable.). The potential for conflict index (PCI) requires this common form of measurement. The greatest possibility for conflict (PCI = 1) occurs when there is a bimodal distribution between the two extreme values of the response scale (e.g., 50% strongly support, 50% strongly oppose, 0% neutral). A distribution with 100% at any one point yields a PCI of 0 (i.e., no conflict).

PCI results can be displayed as bubble graphs to visually and simultaneously describe a variable’s form, dispersion, and central tendency. The size of the bubble depicts the PCI and indicates degree of dispersion (e.g., extent of potential conflict regarding the acceptability of a behavior). A small bubble suggests little potential conflict; a larger bubble suggests more

potential conflict. The center of the bubble, which is plotted on the Y-axis, indicates the mean response (central tendency) to the measured variable. With the neutral point of the response scale highlighted on the Y-axis, it is apparent that respondents' average evaluations are situated above or below the neutral point (i.e., the action, on average, is acceptable or unacceptable). Information about a distribution's skewness is reflected by the position of the bubble relative to the neutral point (i.e., bubbles at the top or bottom of the graph suggest high degrees of skewness). In this study we combine the PCI and the structural norm methodologies to analyze normative tolerances for dog associated behaviors at the City of Boulder Open Space and Mountain Parks.

Methods

Sampling Design

Data for this project were obtained from on-site surveys (n = 951) conducted at 16 locations managed by the City of Boulder Open Space and Mountain Parks during the summer of 2006 (Table 1). Representatives from OSMP distributed the self-administered surveys. Surveys were randomly distributed during July (43%), August (49%) and early September (8%). Both weekdays (47%) and weekends (53%) were included in the sample. Surveys were administered in the morning (44%), midday (32%) and evening (24%). Sampling occurred at trailheads that provide access to trails allowing dogs to be managed under voice and site control.

Table 1. Survey locations

Survey locations	Number	Percent
East Boulder – Gunbarrel	53	6
East Boulder – Teller Farm	21	2
Dry Creek	79	8
Bobolink	72	8
South Boulder Creek at EBCC	31	3
Marshall Mesa	66	7
Greenbelt Plateau	12	1
Doudy Draw	18	2
South Mesa	107	11
Shanahan Ridge	52	5
Chautauqua	216	23
Sanitas	64	7
Foothills	15	2
Sage	44	5
Eagle	53	6
Gregory Canyon	48	5
Total	951	100

Variables Measured

The one-page survey included general questions related to: (a) frequency of visitation, (b) dog ownership, (c) activities participated in on the day the individual was interviewed, (d) demographics (sex, age, education, place of residence), and (e) beliefs about off leash dogs at OSMP. The actual survey wording and basic descriptive findings are presented in Appendix A.

Questions related to normative tolerances examined 11 specific behaviors that could potentially create conflict for OSMP visitors. This list of behaviors was developed collectively from input

provided by OSMP and interested citizen groups. For presentation purposes these items were arranged into *direct* and *indirect* human-dog interactions. The direct behaviors involved situations where dogs interacted with visitors other than their guardians. In the indirect behaviors, the dog interacted with the guardian, wildlife or other dogs, or the guardian failed to pick up after their dogs.

The direct behaviors included:

- Dogs jumping on a visitor
- Dogs pawing a visitor
- Dogs licking a visitor
- Dogs sniffing a visitor
- Dogs approaching uninvited

The indirect behaviors included:

- Owners not picking up after their dogs
- Dogs causing wildlife to flee
- Dogs flushing birds
- Owners repeatedly calling their dogs
- Dogs off trail
- Dogs "play" chasing another dog

For each of these 11 behaviors, respondents indicated: (a) the frequency of observing the specific behavior for off leash dogs, (b) their acceptability ratings of the behavior, and (c) their maximum tolerances for the behavior on a typical OSMP visit. Response categories for the frequency of observing the behavior ranged from 0 to 6 or more times. Acceptability ratings were coded on 5-point scales ranging from -2 (very unacceptable) to +2 (very acceptable) with 0 as the mid-point of the scale. The maximum number of times that a respondent would find the observed behavior acceptable on a typical visit to OSMP ranged from 0 to 6+ times.

Results

Descriptive Findings

Fifty-six percent of the sample was female and 44% male (Table 2). Half of the respondents were between the ages of 31 to 50, with another quarter over 50. The average age was 42 years old. A third of the sample held a bachelors degree and 53% had attended some graduate school or held masters or doctoral / professional degrees. Nearly half of the sample (48%) lived within the city limits of Boulder (Table 3).

A quarter of the sample had visited OSMP locations two years or less; over a third (38%) had been visiting more than 10 years (Table 4). The average number of years visiting OSMP locations was 11. Forty-one individuals (4%) had been visiting for more than 30 years.

About a quarter (26%) of the individuals in the sample had made between 1 and 10 visits to OSMP locations within the past 12 months. On the other extreme, 38% had made more than 90 visits during the previous year. The average number of visits per year was 92 and ranged from 1 to 365 visits.

A third of the respondents had made between 1 and 3 visits during the past month (Table 4). Another third had visited 4 to 10 times, and a third had made more than 10 visits in the last month. The average number of visits per month was 10 and the range was from 1 visit to more than 31 visits.

Table 2. Demographic profile

	Respondents	
	Number	Percent
Sex		
Male	386	44
Female	492	56
Age		
< 20	32	4
21 to 30	155	18
31 to 40	206	24
41 to 50	228	27
51 to 60	170	20
61 to 70	56	6
> 70	14	1
Mean age	42.24	
Education		
High school or less	41	5
Some college	71	8
College graduate	307	35
Some graduate school	95	11
Masters degree	245	28
Doctoral or professional degree	119	14

Table 3. Place of residence

	Respondents	
	Number	Percent
Boulder (within city limits)	419	48
Louisville	51	6
Lafayette	44	5
Superior	23	3
Longmont	21	2
Unincorporated Boulder County	122	14
Other city in Boulder County	10	1
Metro Denver	94	11
Other area in Colorado	31	3
Out of state	63	7
Out of country	5	1

Table 4. Frequency of visitation

	Respondents					
	Number	Percent	Mean	Standard Deviation	Minimum	Maximum
Number of years visiting OSMP			10.94	10.48	0	61
1st year	84	9				
1 to 2 years	146	16				
3 to 5 years	147	16				
6 to 10 years	190	21				
11 to 20 years	216	24				
21 to 30 years	96	10				
More than 30 years	41	4				
Number of visits during past 12 months			92.56	107.62	1	365
1 to 10 visits	246	26				
11 to 30 visits	179	19				
31 to 90 visits	158	17				
91 to 180 visits	172	18				
181 to 365 visits	194	20				
Number of times visited OSMP during past month			10.34	10.36	1	60
1 visit	171	18				
2 to 3 visits	139	15				
4 to 5 visits	126	13				
6 to 10 visits	188	20				
11 to 20 visits	188	20				
21 to 31 visits	109	12				
More than 31 visits	18	2				

Over half (54%) of the respondents considered themselves to be dog guardians (Table 5). Of these individuals, 71% owned one dog and another quarter owned two dogs. Over half (56%) walk their dogs two or more times per week at OSMP areas. The average number of dogs per dog walker was 1.35.

Fifty-six percent were not visiting OSMP with a dog on the day they completed the survey; about a third were visiting with one dog and about a tenth (11%) with 2 or 3 dogs. On the day the respondent was interviewed, over a quarter (28%) considered their activity to be walking a dog (Table 6). More than half (57%) were walking or hiking without a dog and a fifth (21%) were runners.

Table 5. Dog guardians

	Respondents	
	Number	Percent
Are you currently a dog guardian?		
No	431	46
Yes	509	54
Number of dogs currently owned		
1	364	71
2	121	24
3	21	4
4	3	1
Number of dogs with you on today's visit		
No dogs	495	56
1 dog	283	32
2 dogs	93	10
3 dogs	11	1
4 dogs	4	< 1
5 dogs	3	< 1
Frequency of walking dogs at OSMP		
Never	78	15
1 to 4 visits per month	146	29
2+ visits per week	285	56

Table 6. Activities on day of interview [1]

	Respondents	
	Number	Percent
Walking Dog	263	28
Walking / Hiking	524	57
Running	198	21
Bicycling	54	6
Bird watching	61	7
Wildlife viewing	67	7

1 Because respondents could check more than one activity, percents do not sum to 100.

All behaviors were thought to be a slight to extreme problem. The most problematic behaviors were owners not picking up after their dog, dogs causing wildlife to flee, dogs jumping on a visitor, dogs pawing a visitor and dogs flushing birds.

Across all 11 potential problem behaviors, "owners not picking up after their dogs" was considered to be an "extreme problem" by 57% of all respondents (Table 7). Almost all (91%) individuals rated this behavior as at least slightly problematic. Only 10% indicated that they had observed this behavior on the day they completed the survey.

Among the other "indirect" behaviors, "dogs causing wildlife to flee" (35%) and "dogs flushing birds" (24%) were also evaluated as extreme problems, with about three quarters indicating that these behaviors were slightly to extremely problematic. These behaviors, however, were only observed by 3% and 2%, respectively, on the day they were interviewed.

Nearly half of the respondents rated "dogs off trail" (47%) and "dogs 'play' chasing another dog" (44%) as problematic to at least some extent. A third observed dogs off trail and nearly a fifth reported seeing dogs play chasing another dog.

Among the five "direct" human-dog interaction variables, "dogs jumping on a visitor" was considered an extreme problem by 35% of the respondents; 82% rated this behavior as at least a "slight problem." "Dogs pawing a visitor" was considered a problem (slight to extreme) by three quarters of the visitors. Both of these behaviors, however, were observed by only 3% or less of the respondents on the day the survey was completed.

"Dogs approaching another visitor uninvited" and "dogs sniffing a visitor" were seen as a problem (slight to extreme) by two thirds and half of the visitors, respectively. These two behaviors were observed by about a fifth of the respondents on the day they were surveyed.

Table 7. Perceived problems associated with human-dog interactions

	Extent of Problem *if* Behavior Occurs [1]				
For dogs off leash:	Not at all a problem %	Slight problem %	Moderate problem %	Extreme problem %	Percent Observing Behavior Today
Indirect interaction					
Owners not picking up after their dogs	9	12	22	57	10
Dogs causing wildlife to flee	23	20	22	35	3
Dogs flushing birds	28	26	22	24	2
Owners repeatedly calling their dogs	30	39	22	9	12
Dogs off trail	53	29	13	5	32
Dogs "play" chasing another dog	56	26	13	5	18
Direct interaction					
Dogs jumping on a visitor	18	22	25	35	3
Dogs pawing a visitor	24	26	26	24	2
Dogs licking a visitor	35	30	19	16	6
Dogs approaching uninvited	32	32	20	16	19
Dogs sniffing a visitor	48	29	14	9	18

1. Cell entries are row percents

Consistent with perceived problem measures, 91% of the respondents agreed with the statement "It bothers me when dog owners do not pick up after their dogs" (Table 8). Over three-quarters agreed that "Dog owners who *cannot* control their dogs off leash *should not* be allowed to visit OSMP areas with their dogs off leash" and that "It is OK for a visitor to say something to a dog owner who does *not* have his or her dog under control." Seventy-five percent, however, felt that "Most dog owners are responsible individuals who keep their dogs under control at OSMP areas."

Over three quarters disagreed that "Just knowing that off leash dogs are allowed in OSMP areas is a problem for me, even if I never see them" and over half enjoyed watching dogs off leash at OSMP areas."

Table 8. Beliefs about off leash dogs [1]

	Disagree	Neutral	Agree
Just knowing that off leash dogs are allowed in OSMP areas is a problem for me, even if I never see them	78	13	9
The behavior of off leash dogs is a problem at OSMP areas	60	20	20
I do ***not*** think that there are any real impacts from off leash dogs at OSMP areas	42	25	33
I enjoy watching dogs off leash at OSMP areas	17	25	58
It's OK that off leash dogs use OSMP areas as long as they do ***not*** affect me	17	20	63
Most dog owners are responsible individuals who keep their dogs under control at OSMP areas	9	16	75
Dog owners who ***cannot*** control their dogs off leash ***should not*** be allowed to visit OSMP areas with their dogs off leash	10	13	77
It is OK for a visitor to say something to a dog owner who does ***not*** have his or her dog under control	6	16	78
It bothers me when dog owners do ***not*** pick up after their dogs	2	7	91

1. Cell entries are row percents

Normative Tolerances

Acceptability Ratings: Normative Tolerances

Social norm curves for the acceptability of the 11 behaviors are shown in Figure 3 (indirect interaction) and Figure 4 (direct interaction). These plots show the average acceptability ratings across all respondents. Four of the six indirect behaviors were always rated as unacceptable (i.e., no tolerance norms) regardless of the number of times the behavior was observed. Dogs off trail was consistently only marginally above the neutral line and dogs play chasing was somewhat acceptable across the number of times the behavior was observed (Figure 3). All of the direct interaction behaviors were "no tolerance norms" with acceptability ratings consistently below the neutral line (Figure 4).

Figure 3. Social norm curves for “indirect” human-dog interactions

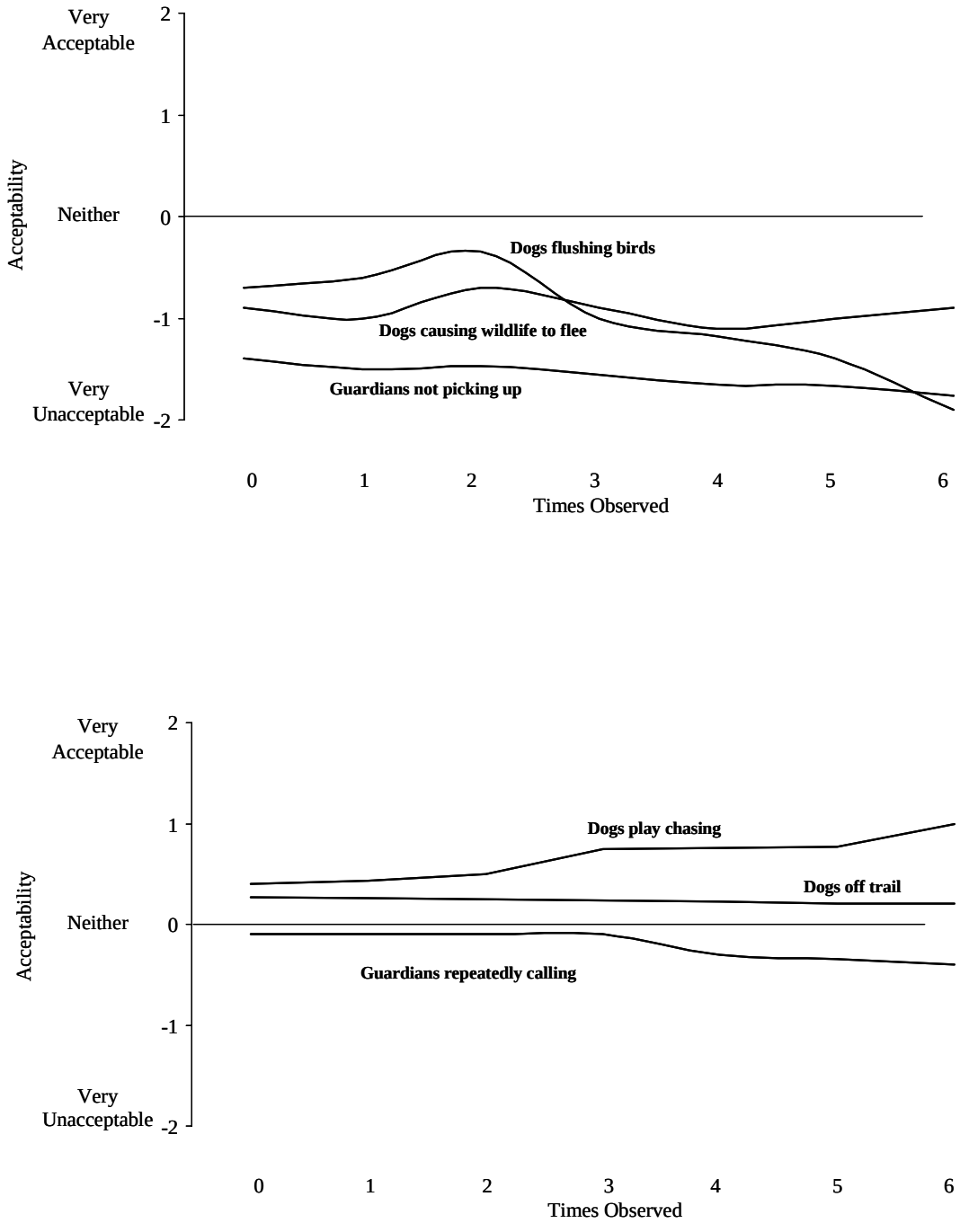
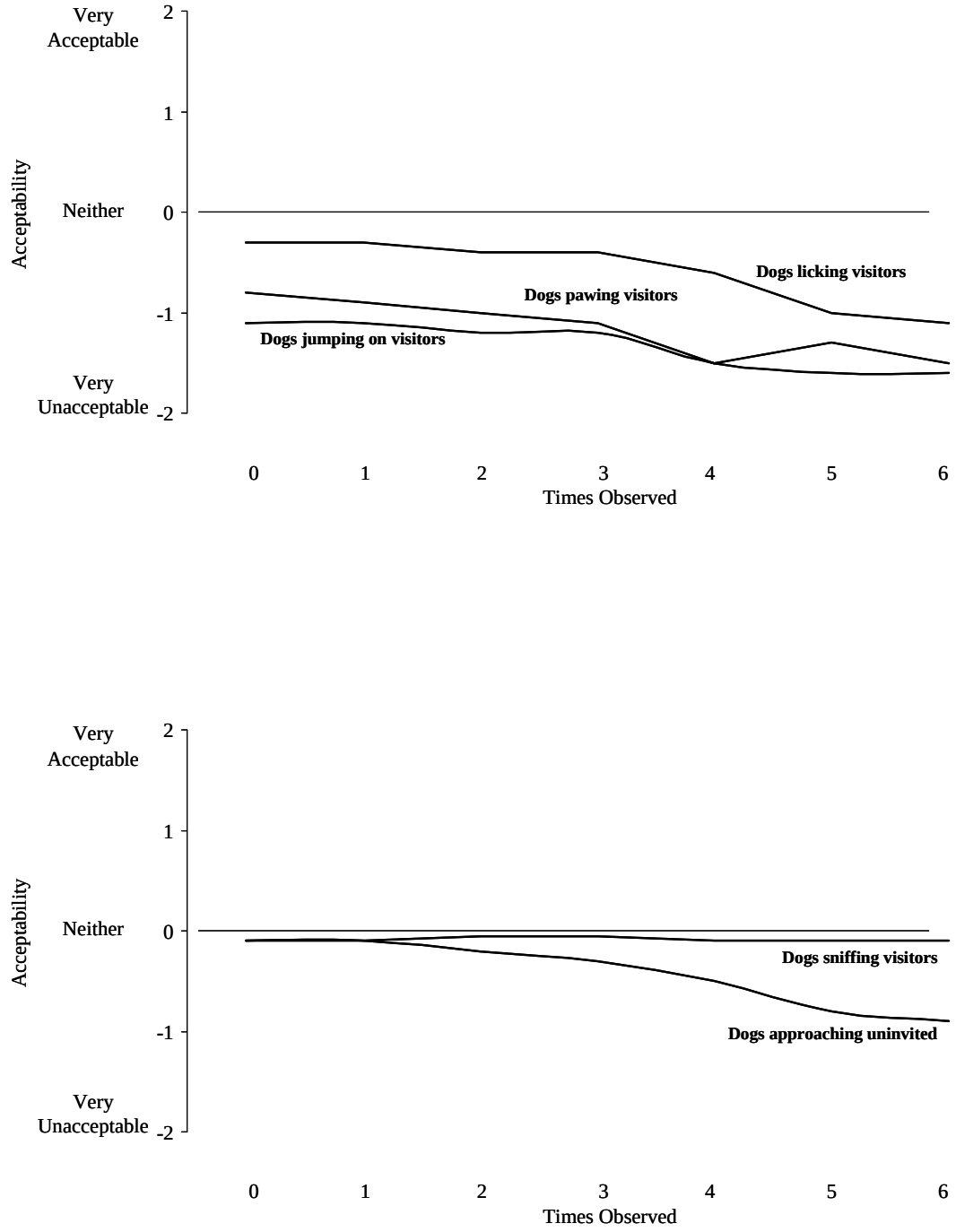


Figure 4. Social norm curves for “direct” human-dog interactions



Acceptability Ratings: Potential for Conflict Indices

Given the "no tolerance norms" (Figures 3 and 4) regardless of the number of times the behavior was observed, the next analysis step focused on respondents' level of agreement regarding the acceptability of each of the 11 behaviors. These findings (Figures 5 and 6) are shown as Potential for Conflict Indices (PCI). A PCI value can range from 0 (no conflict) to 1 (maximum conflict). The size of the bubble depicts the PCI and indicates degree of dispersion (e.g., extent of potential conflict regarding the acceptability of a behavior). A small bubble suggests little potential conflict; a larger bubble suggests more potential conflict. The center of the bubble is plotted on the Y-axis, with averages above the neutral line indicating an acceptable evaluation and those below the neutral line suggesting an unacceptable rating. Skewness is reflected by the position of the bubble relative to the neutral point (i.e., bubbles at the top or bottom of the graph suggest high degrees of skewness).

Consistent with the findings noted above, the average acceptability ratings for four of the indirect interaction behaviors fell below the neutral line and two were slightly above the neutral line (Figure 5). The most consensus (i.e., smallest bubble) occurred for guardians not picking up after their dog (PCI = .10). The least amount of agreement (PCI = .45) was for guardians repeatedly calling their dogs. This bubble straddled the neutral line suggesting that some individuals found this behavior slightly acceptable and some slightly unacceptable. The bubbles for "dogs causing wildlife to flee" and "dogs flushing birds" were both below the neutral line with PCI values of .24 and .30, respectively. Thus, on average, both of these behaviors were rated as slightly unacceptable with a "fair" amount of consensus. Conversely, the bubbles for "dogs off trail" and "dogs play chasing another dog" were both above the neutral line (i.e., on average slightly acceptable) with PCI values of .35 and .30, respectively.

The average acceptability ratings and associated PCI values for the direct interaction behaviors are shown in Figure 6. The least acceptable ratings and most consensus occurred for "dogs jumping on visitors" and "dogs pawing visitors." Both of these behaviors were considered slightly unacceptable with PCI values of .18 and .21, respectively. At the other extreme of Figure 6, the bubble for "dogs sniffing visitors" straddled the neutral line and the PCI value of .48 indicated less consensus than for the other behaviors.

To further understand individuals' normative tolerances, Table 9 displays (a) the average number of times each behavior was typically observed, (b) the maximum number of times the behavior would be tolerated, and (c) the percent of time the norm was exceeded. To calculate this latter estimate, we followed the procedures outline in Vaske and Donnelly (2002). Each respondent's reported number of times a behavior was observed was compared to his/her maximum number of times the behavior would be tolerated. If the reported observation of the behavior was greater than the maximum tolerance for that behavior, the individual saw more than his/her norm. For example, if a person saw the behavior three times on a typical visit and his/her tolerance for the behavior was zero, the individual's norm was exceeded. The last column of Table 9 is the percent of individuals in the sample who reported seeing more than their norm on a typical visit.

For "owners not picking up after their dogs," the average number of times the behavior was observed was 1.57 times. The maximum number of times that the behavior would be tolerated was .54. For the entire sample, this norm was exceeded 50% of the time. As a second example, "dogs approaching uninvited" was observed on average 2.08 times, while the maximum number of times people would tolerate this behavior was 1.92. The norm for this behavior was exceeded 35% of the time.

Figure 5. PCI acceptability norms for “indirect” human dog interactions: Entire sample

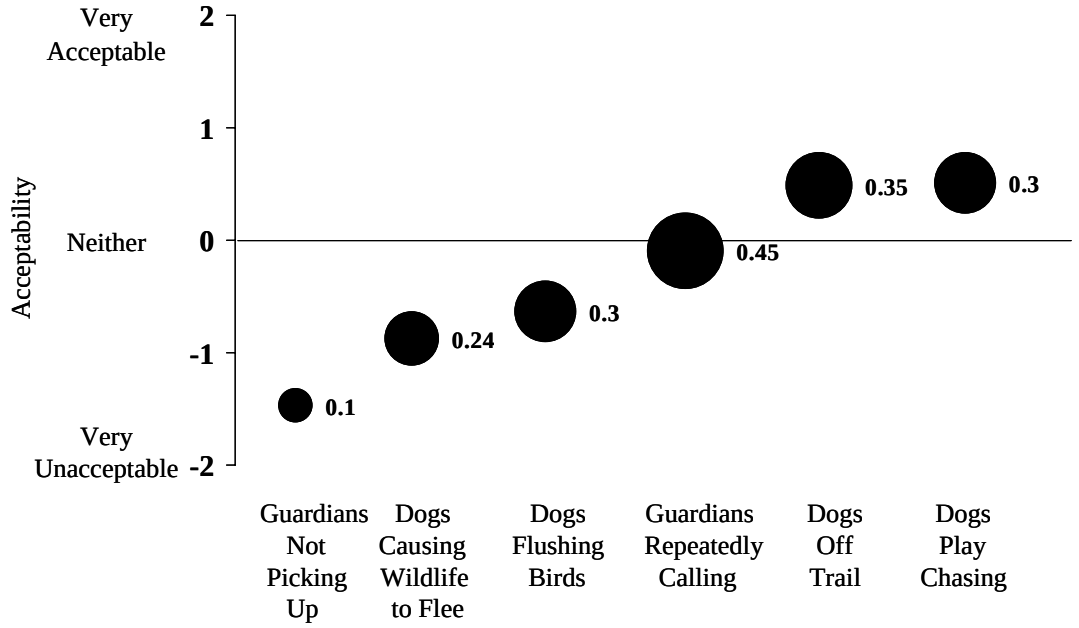


Figure 6. PCI acceptability norms for “direct” human dog interactions: Entire sample

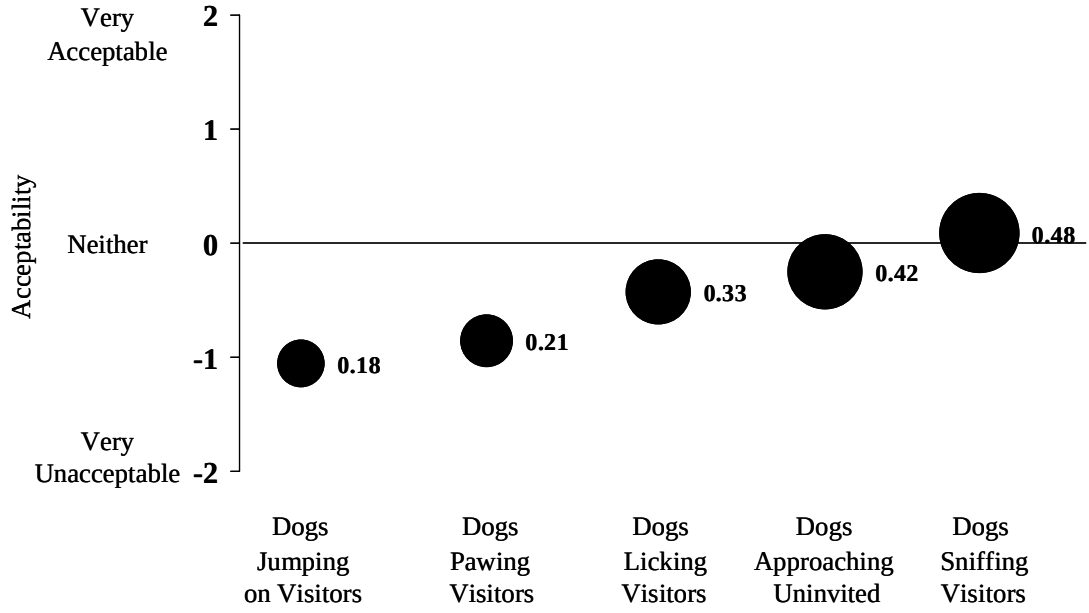


Table 9. Normative tolerances for dog behaviors

	Average Number of Times Behavior Observed	Average Maximum Number of Times Behavior Tolerated	Percent of Time Norm Exceeded
Indirect interaction			
Owners not picking up after dogs	1.57	.54	50
Owners repeatedly calling	1.73	2.04	28
Dogs off trail	2.95	3.21	28
Dogs "play" chasing another dog	2.14	2.82	18
Dogs causing wildlife to flee	.58	.86	17
Dogs flushing birds	.51	1.00	13
Direct interaction			
Dogs approaching uninvited	2.08	1.92	35
Dogs sniffing a visitor	2.13	2.39	27
Dogs jumping on a visitor	.79	.67	27
Dogs licking a visitor	.86	1.26	19
Dogs pawing a visitor	.55	.70	17

Figures 7 (indirect interaction) and 8 (direct interaction) display the norm curves and PCI values for guardians and non-guardians. As might be expected, the average acceptability ratings given by guardians were slightly more positive (although still generally negative) than those reported by non-guardians for all 11 behaviors. For the indirect interactions (Figure 7) there was slightly less agreement (i.e., larger PCI bubbles) among the guardians than the non-guardians for "guardians not picking up after their dogs," "dogs causing wildlife to flee," and "dogs flushing birds." The bubble for the guardians' evaluation of "guardians repeatedly calling their dogs" straddled the neutral line suggesting that some individuals rated this behavior as acceptable, while others did not. The guardians rated "dogs off trail" and "dogs play chasing," as slightly acceptable. The evaluations given by the non-guardians for these two behaviors straddled the neutral line. There was more agreement among the guardians (smaller bubbles) than there was among the non-guardians for these two behaviors. Similarly, for the direct interaction situations, guardians evaluated each behavior slightly more positively than the non-guardians. The guardians' PCI bubble (PCI = .5) for "dogs approaching uninvited" split the neutral line, while non-guardians judged this behavior as unacceptable and there was more agreement (PCI = .33). Guardians rated "dogs sniffing visitors" as slightly acceptable, while non-guardians evaluated this behavior as slightly unacceptable. Overall, differences between guardians and non-guardians across all 11 behaviors were minimal.

Our analyses also explored other potential predictors of the norm acceptability ratings (Table 10 and Appendix B). No significant differences were found between the demographic variables (sex, age, education) and the norm acceptability ratings for 10 of the 11 human-dog interaction behaviors. When residents living within the city limits of Boulder were compared with non-Boulder residents no significant differences emerged across all 11 acceptability ratings. Similarly, analyses contrasting Boulder city limit residents vs. Boulder County residents vs. respondents from other locations, revealed no significant differences. A similar pattern of findings (i.e., no / limited significant differences) emerged for frequency of visitation over the past year and past month, as well as for participation in activities such as walking, hiking, running and bicycling on the day the respondent was interviewed.

Table. 10. Summary of other potential predictors of norm acceptability ratings

Independent Variable	Number of Significant Differences on 11 Norm Acceptability Ratings	Acceptability Ratings with Significant Differences
Demographics		
Sex	1	Owners not picking up after their dogs
Age	1	Dogs sniffing a visitor
Education	1	Owners not picking up after their dogs
Place of Residence		
Boulder vs. Non-Boulder Residents	0	
Boulder vs. Boulder County vs. Other	0	
Frequency of Visiting		
Past 12 months	0	
Past Month	1	Owners not picking up after their dogs
Activities		
Walking / Hiking	1	Dogs play chasing
Running	0	
Bicycling	0	

Summary of Normative Tolerances

- Nine of the 11 indicators reflected "no tolerance" norms. The average acceptability ratings for these behaviors were negative irrespective of the number of times the behaviors were observed. Thus, *the visitors' reported standard for each of these nine behaviors was 0.*
- For "dogs play chasing" and "dogs off trail," a single tolerance norm was observed with acceptability ratings only slightly above neutral (i.e., the average acceptability ratings were +0.48 for "dogs off trail" and +0.51 for "dogs play chasing with another dog"). *Given that the averages were less than 1, the visitors' standard for these two behaviors was in essence 0.*
- Although statistical differences between some sub-groups (e.g., guardians vs. non-guardians, frequency of walking dogs at OSMP) were identified in our analyses, the magnitude of these differences was minimal. The "no tolerance" standards for the entire sample are thus applicable to all stakeholders.

Figure 7. PCI acceptability norms for "indirect" human-dog interactions: Guardians vs. Non-guardians

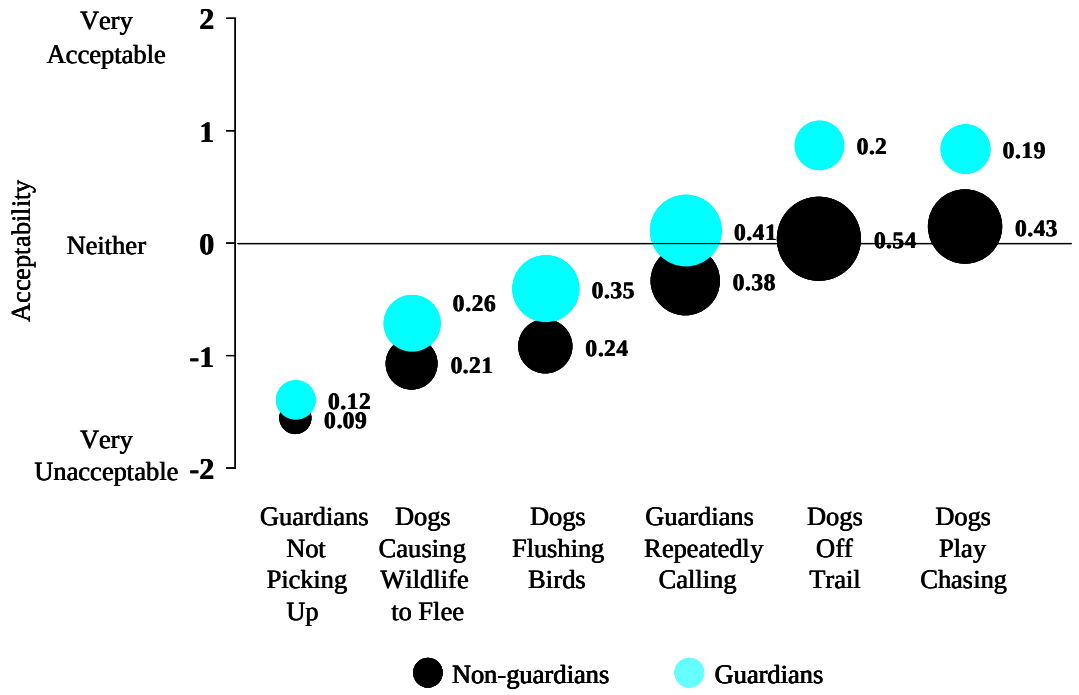
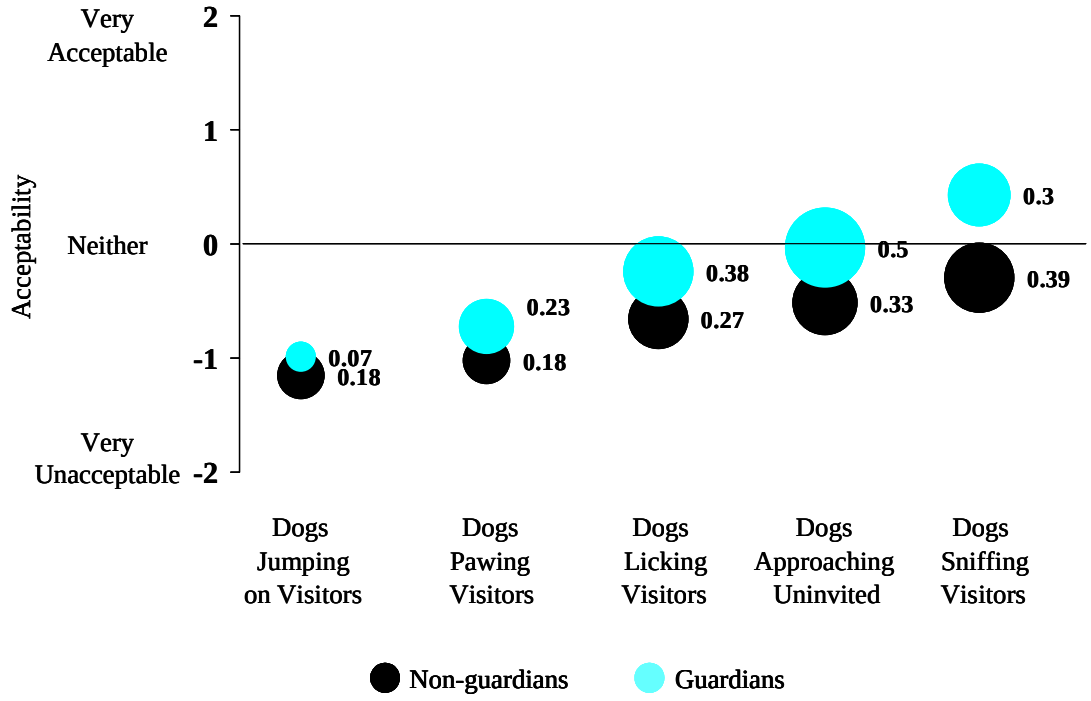


Figure 8. PCI acceptability norms for "direct" human-dog interactions: Guardians vs. Non-guardians



Discussion

Virtually all natural resource planning frameworks recommend identifying and establishing *quantitative* impact indicators and standards (e.g., the Limits of Acceptable Change [LAC], Stankey et al. 1985; Visitor Impact Management [VIM], Graefe et al., 1990; Visitor Experience and Resource Protection [VERP], National Park Service 1997). *Indicators* are the biophysical, social, managerial, or other conditions that managers and visitors care about for a given experience. *Standards* restate management objectives in quantitative terms and specify the appropriate levels or acceptable limits for the impact indicators (i.e., how much impact is too much for a given indicator). Standards identify conditions that are desirable (e.g., all visitors picking up after their dogs), as well as the conditions that managers don't want to exceed (e.g., no uninvited dogs interacting with visitors). 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.

Quantitative standards serve several important functions. First, standards articulate in unambiguous terms what outputs management is trying to provide. Natural resource experiences are created through the interaction of social, biological, and physical conditions, and the visitors' expectations and preferences for those conditions. While managers do not create *experiences*, they are responsible for creating *opportunities* for experiences by manipulating social, environmental, and managerial conditions. Quantitative standards help shape those opportunities (i.e., a demand function) and signal whether or not that opportunity is possible given existing conditions (i.e., a supply function).

Second, standards help establish priorities for management, focus on future conditions, and allow managers to be proactive. There is a need to look ahead to what actions might be employed to meet standards, as well as a need to look back at the goals management is trying to achieve (Vaske et al., 2000). Standards define minimum or optimal conditions and allow managers to note when impacts are approaching defined levels, rather than waiting for problems to occur and then reacting to them (Whittaker & Shelby, 1992).

Third, standards focus attention on specific conditions and problems or benefits and turn managers' attention to the quality of recreation opportunities. By concentrating on the conditions that create experiences, the probable causes of unacceptable impacts as well as the potential benefits to different stakeholders can be identified (Graefe et al., 1990).

Fourth, indicators and standards provide a base for measuring the rate and magnitude of change and for evaluating the acceptability of that change. The literature sometimes confuses the concepts of impact change and evaluation (Shelby & Heberlein, 1986). The confusion can be illustrated by the term "wildlife harassment." Harassment refers to both a change (an objective impact – e.g., the birds flew away when humans approached) and a value judgment that the impact exceeds some standard. While most people would agree that management actions are necessary when wildlife harassment occurs, there is less consensus about what constitutes harassment. All human use has some impact. Whether the impact is harassment depends on management objectives (e.g., protect the migratory birds), standards (e.g., migratory birds should never be flushed from their nesting areas because of the presence of humans or dogs), expert opinion, and public values. Breaking concepts like harassment into two parts – the impact component (change in wildlife behavior or experiential change) and the evaluative component (the acceptability of the change) – provides a foundation for thinking about potential problem situations.

Fifth, standards link concrete, on-the-ground conditions with more intangible, qualitative experiences. While experiences are social psychological entities, standards are tangible and specific. With the development of quantitative standards, a more rational discussion of the area's objectives can occur with the different stakeholders (Whittaker & Shelby, 1992). For example, comparing existing conditions against the standards provides a quantitative estimate of whether any experiential changes are within the limits specified by standards, and whether the benefits suggested to accrue to stakeholders have been realized.

Based on previous work (Graefe et al., 1990; Vaske et al., 2002; Whittaker & Shelby, 1992) and the findings in this report, the following discusses (a) several important characteristics of good standards and (b) offers recommendations for setting standards at OSMP.

Characteristics of Good Standards

As noted by some investigators (Vaske et al., 2002; Whittaker & Shelby, 1992), a good standard is: (a) quantifiable, (b) attainable, and (c) output oriented. 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 less than 5% of OSMP visitors will be approached uninvited by dogs off leash. Specifying that there should only be "a few" visitors that will be approached by unleashed dogs is not a good standard because it does not define how many constitutes "a few."

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 (Whittaker & Shelby, 1992).

For each important indicator, standards should be set at levels that reflect management's intent for resource or experiential outcomes in the area (Vaske et al., 2002). 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).

Standards should be "*output*" rather than "input" oriented (Vaske et al., 2002; Whittaker & Shelby, 1992). 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 "only 50 unleashed dogs per day in an OSMP area" is not a good standard because it refers to an action (use limits) rather than an acceptable impact. "Less than 5% of visitors should be approached by unleashed dogs" is a better standard because it emphasizes the acceptability of different impact conditions.

Potential Standards for Human-Dog Interactions at OSMP

This report examined 11 human-dog interaction indicators in terms of respondents' normative tolerances for these behaviors. These indicators had been identified and collectively agreed upon by OSMP staff and citizen interest groups. Nine of the 11 indicators reflected "no tolerance" norms. In other words, the average acceptability ratings were negative for these behaviors (Column 1, Table 12). This implies that the evaluations of these behaviors were unacceptable, regardless of the number of times the behaviors were observed. *The visitors' reported quantitative standards for these nine behaviors were thus 0* (Column 2, Table 11).

The other two indicators were "single tolerance" norms with acceptability ratings near the neutral line (i.e., the average acceptability ratings were +0.48 for "dogs off trail" and +0.51 for "dogs play chasing with another dog," Column 1, Table 11). *Given that the averages were less than 1, the visitors' standard for these two behaviors was in essence 0.*

Results indicated that these standards were exceeded 13% of the time or more. The most serious violation of a standard occurred for "owners not picking up after their dogs." This standard was exceeded 50% of the time. The standard for "dogs approaching uninvited" was exceeded 35% of the time.

Table 11. Reported "no tolerance" normative standards for human-dog interaction indicators

	Visitors Mean Acceptability Ratings [1]	Visitor Standards Based on Mean Acceptability Ratings	Percent of Time Standard Exceeded
Indirect interaction			
Guardians not picking up after dogs	– 1.47	0	50
Guardians repeatedly calling	– 0.10	0	28
Dogs causing wildlife to flee	– 0.88	0	17
Dogs flushing birds	– 0.64	0	13
Dogs off trail	+ 0.48	0	28
Dogs "play" chasing another dog	+ 0.51	0	18
Direct interaction			
Dogs approaching uninvited	– 0.25	0	35
Dogs sniffing a visitor	– 0.09	0	27
Dogs jumping on a visitor	– 1.06	0	27
Dogs licking a visitor	– 0.43	0	19
Dogs pawing a visitor	– 0.86	0	17

1. Means based on Figures 5 and 6.

Although statistical differences between some sub-groups (e.g., guardians vs. non-guardians, frequency of walking dogs at OSMP) were identified in our analyses, the magnitude of these differences was generally minimal. The "no tolerance" standards for the entire sample are thus applicable to all stakeholders.

Given the "no tolerance" standards for the 11 indicators, one might recommend a management standard of "no more than 0% of the visitors should have their norms exceeded" for any of these human-dog interaction variables. A good standard, however, should be attainable. A standard of 0% is likely to be unrealistic short of eliminating all off leash dogs at OSMP. As alternatives, management could consider less restrictive standards. Table 12 outlines three scenarios for situations where no more than 5%, 10% and 20% of visitors have their standards exceeded for each of the 11 human-dog interaction indicators. If the management standard is set at "no more than 10% of all visitors should have their norms exceeded," the visitors' standards would be exceeded under current conditions for all 11 indicators. Setting the standard at 20% implies that the visitors' standards would be met for three of the indirect (i.e., dogs causing wildlife to flee, dogs flushing birds, dogs play chasing other dog) and two direct (i.e. dogs licking a visitor, dogs

pawing a visitor) interaction indicators. Remember, however, that when standards are too easy, little is accomplished. We, therefore, do ***not*** recommend this third scenario where "no more than 20% of visitors have their norms exceeded."

Table 12. Potential management standards based on visitor reported percent time standard was exceeded

	Visitor Reported Percent of Time Standard Exceeded	Management Standard: No more than ___ % of visitors should have their normative standards exceeded [1]		
		5%	10%	20%
Indirect interaction				
Owners not picking up after dogs	50			
Owners repeatedly calling	28			
Dogs causing wildlife to flee	17			✓
Dogs flushing birds	13			✓
Dogs off trail	28			
Dogs "play" chasing another dog	18			✓
Direct interaction				
Dogs approaching uninvited	35			
Dogs sniffing a visitor	27			
Dogs jumping on a visitor	27			
Dogs licking a visitor	19			✓
Dogs pawing a visitor	17			✓

1. ✓ indicates that the standard would be met; a blank indicates that the standard would not be met.

If one accepts the logic presented here, the "no more than 0% (or 20%) of visitors having their norms exceeded" are not viable options. The former management standard (0%) is likely to be unachievable. The latter management standard (20%) may not result in desired visitor experiences and is likely to fall short of management goals and objectives. Of the other two suggested management standards for off leash dogs, the "no more than 10% of visitors having their norms exceeded" is consistent with the standards currently in the OSMP Visitor Master Plan. For example, one OSMP standard states that there should be 90% compliance with dog control and excrement removal. Although the proposed standard of 10% is never met under current conditions, OSMP's Voice and Sight Tag (VST) Program had just been implemented at the time our data were collected.

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Appendix A

Survey and Descriptive Findings

1. About ***how many years*** have you been coming to Open Space & Mountain Parks?

	Respondents	
Number of years visiting OSMP	Number	Percent
1st year	84	9
1 to 2 years	146	16
3 to 5 years	147	16
6 to 10 years	190	21
11 to 20 years	216	24
21 to 30 years	96	10
More than 30 years	41	4
Total	920	100
Mean	10.94	
Standard Deviation	10.48	
Minimum	0	
Maximum	61	

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

	Respondents	
Number of visits during past 12 months	Number	Percent
1 to 10 visits	246	26
11 to 30 visits	179	19
31 to 90 visits	158	17
91 to 180 visits	172	18
181 to 365 visits	194	20
Total	949	100
Mean	92.56	
Standard Deviation	107.62	
Minimum	1	
Maximum	365	

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

	Respondents	
Number of times visited OSMP during past month	Number	Percent
1 visit	171	18
2 to 3 visits	139	15
4 to 5 visits	126	13
6 to 10 visits	188	20
11 to 20 visits	188	20
21 to 31 visits	109	12
More than 31 visits	18	2
Total	952	100
Mean	10.34	
Standard Deviation	10.36	
Minimum	1	
Maximum	60	

4. Many people enjoy visiting Open Space & Mountain Parks (OSMP) with their dogs off leash.
In thinking about ***a typical visit*** to OSMP areas, for dogs off leash, please estimate:
   a) The number of times you ***personally observed each*** of the following behaviors on a typical visit to OSMP?
   b) In general, please rate how acceptable ***each*** of the behaviors is at OSMP areas.
   c) What would be the ***maximum number of times*** that you would find the observed behavior acceptable on a typical visit to OSMP areas?

For dogs off leash:	(a) Number of times *personally observed* on a typical visit to OSMP areas (*Circle one number*) *%*							(b) In general, how acceptable is this behavior at OSMP areas? Very Unacceptable … Very Acceptable *%*					(c) ***Maximum number of times*** that you would find the observed behavior acceptable on a typical visit to OSMP *%*						
	0	1	2	3	4	5	6+	-2	-1	0	+1	+2	0	1	2	3	4	5	6+
A. Dogs off trail	17	17	14	14	7	7	24	11	14	22	24	30	18	13	12	11	6	10	30
B. Owners repeatedly calling or yelling at their dogs	29	29	17	9	4	4	8	15	25	28	19	13	27	22	17	12	6	6	10
C. Dogs "play" chasing another dog	27	21	16	10	8	6	12	9	13	26	23	29	21	19	12	10	7	7	24
D. Dogs flushing birds	75	13	5	3	1	1	2	37	21	24	8	11	64	12	6	8	3	2	5
E. Dogs causing wildlife to flee	71	16	6	3	1	1	2	45	20	19	6	9	66	14	7	4	2	2	5
F. Dogs approaching uninvited	26	18	20	14	9	4	9	22	23	25	17	13	36	19	12	10	6	5	12
G. Dogs jumping on a visitor	61	20	10	4	1	1	3	52	21	15	8	7	70	14	7	3	2	1	3
H. Dogs licking a visitor	60	19	10	5	2	2	3	27	22	28	13	10	51	20	10	7	2	2	8
I. Dogs pawing a visitor	73	15	5	2	2	1	2	41	25	21	6	7	69	15	6	5	1	1	3
J. Dogs sniffing a visitor	27	20	16	15	6	6	10	15	17	29	20	19	28	16	15	12	6	5	18
K. Owners not picking up after their dogs	39	23	14	9	4	3	8	72	13	8	3	4	77	10	5	3	2	1	2

5. To what extent do you feel ***each*** of the following is a ***problem for <u>you</u> if it ever occurs*** at OSMP areas? (***Circle one number for each statement***)

For dogs off leash:	Not at all a problem %	Slight problem %	Moderate problem %	Extreme problem %
A. Dogs off trail	53	29	13	5
B. Owners repeatedly calling or yelling at their dogs	30	39	22	9
C. Dogs "play" chasing another dog	56	26	13	5
D. Dogs flushing birds	28	26	22	24
E. Dogs causing wildlife to flee	23	20	22	35
F. Dogs approaching uninvited	32	32	20	16
G. Dogs jumping on a visitor	18	22	25	35
H. Dogs licking a visitor	35	30	19	16
I. Dogs pawing a visitor	24	26	26	24
J. Dogs sniffing a visitor	48	29	14	9
K. Owners not picking up after their dogs	9	12	22	57

6. From the list of items (*A* to *K*) in Question 5, did you observe any of the off leash dog-related behaviors ***today***? (***Circle all letters from the list in Question 5 that apply to today's visit***)

	Percent
A. Dogs off trail	32
B. Owners repeatedly calling or yelling at their dogs	12
C. Dogs "play" chasing another dog	18
D. Dogs flushing birds	2
E. Dogs causing wildlife to flee	3
F. Dogs approaching uninvited	19
G. Dogs jumping on a visitor	3
H. Dogs licking a visitor	6
I. Dogs pawing a visitor	2
J. Dogs sniffing a visitor	18
K. Owners not picking up after their dogs	10

7. ***On today's visit***, ***about*** how many dogs did you see at this OSMP location?

	Respondents	
Number of dogs **off leash**	Number	Percent
0	114	13
1	94	11
2	109	12
3	72	8
4	67	8
5	94	11
6 to 10	214	24
11 to 20	86	10
More than 20	23	3
Total	873	100
Mean	6.11	
Standard Deviation	8.84	
Minimum	0	
Maximum	50	

	Respondents	
Number of dogs **on leash**	Number	Percent
0	139	17
1	139	17
2	151	18
3	104	13
4	93	11
5	68	8
6 to 10	105	13
11 to 20	20	2
More than 20	11	1
Total	830	100
Mean	3.54	
Standard Deviation	4.71	
Minimum	0	
Maximum	50	

8. Do you own a dog?

	Respondents	
	Number	Percent
No – I have never owned a dog	151	16
No – But I used to own a dog	280	30
Yes	509	54
Total	940	100

If yes, how many dogs do you currently own?

Number of dogs currently owned	Respondents Number	Percent
1	364	71
2	121	24
3	21	4
4	3	1
Total	509	100

If yes, about how frequently do you visit OSMP locations with your dog? (***Check one response***)

	Respondents	
	Number	Percent
Never	78	15
Once a month	55	11
Twice a month	32	6
3 times per month	18	3
4 times per month (once a week)	41	8
2 times per week	59	12
3 to 4 times per week	89	18
5 to 6 times per week	68	13
Daily	69	14
Total	509	100

9. During this visit ***today***, how many dogs did you have with you? (***Check one response***)

	Respondents	
	Number	Percent
No dogs	495	56
1 dog	283	32
2 dogs	93	10
3 dogs	11	1
4 dogs	4	< 1
5 dogs	3	< 1

10. Were the dogs that you had with you today: (***Check all that apply***)

	Respondents	
	Number	Percent
Leashed ***all*** of the time?	72	17
Leashed ***part*** of the time?	237	55
Leashed ***none*** of the time?	76	18
Did not have a dog with me	258	48

11. Which activities did you participate in ***today*** at this particular OSMP location? ***(Check all that apply)***

	Respondents	
	Number	Percent
walking / hiking	524	57
walking your dog	263	29
running	198	21
bird watching	61	7
wildlife viewing	67	7
bicycling	54	6
climbing	18	2
other	20	2

12. Please indicate whether you agree or disagree with ***each*** of the following statements.
(***Circle one number for each statement***)

	Percent				
	Strongly disagree %	Disagree %	Neutral %	Agree %	Strongly agree %
I enjoy watching dogs off leash at OSMP areas	8	9	25	23	35
It's OK that off leash dogs use OSMP areas as long as they do ***not*** affect me	7	10	20	32	31
Just knowing that off leash dogs are allowed in OSMP areas is a problem for me, even if I never see them	60	18	13	6	3
The behavior of off leash dogs is a problem at OSMP areas	35	26	19	13	7
I do ***not*** think that there are any real impacts from off leash dogs at OSMP areas	16	27	24	17	16
Dog owners who ***cannot*** control their dogs off leash ***should not*** be allowed to visit OSMP areas with their dogs off leash	5	5	13	37	40
It is OK for a visitor to say something to a dog owner who does ***not*** have his or her dog under control	1	4	16	45	34
Most dog owners are responsible individuals who keep their dogs under control at OSMP areas	2	6	17	45	30
It bothers me when dog owners do ***not*** pick up after their dogs	1	1	7	26	65

13. What is your sex?

	Respondents	
Sex	Number	Percent
Male	386	44
Female	492	56
Total	878	100

14. What is your age?

	Respondents	
Age categories	Number	Percent
≤ 20	32	4
21 to 30	155	18
31 to 40	206	24
41 to 50	228	27
51 to 60	170	20
61 to 70	56	6
71 +	13	1
Total	860	100
Mean	42.24	
Standard Deviation	13.09	
Minimum	15	
Maximum	84	

15. Where do you live? (***Check one response***)

	Respondents	
	Number	Percent
Boulder (within city limits)	419	48
Louisville	51	6
Lafayette	44	5
Superior	23	3
Longmont	21	2
Unincorporated Boulder County	122	14
Other city in Boulder County	10	1
Metro Denver	94	11
Other area in Colorado	31	3
Out of state	63	7
Out of country	5	1
Total	883	100

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

	Respondents	
	Number	Percent
8th grade or less	2	< 1
some high school	5	< 1
high school graduate or GED	34	4
business / trade school, some college	71	8
college graduate	307	35
some graduate school	95	11
masters degree	245	28
doctoral / professional degree	119	14
Total	878	100

Month of Interview	Number	Percent
July	406	43
August	471	49
September	74	8
Total	951	100

Time of Interview	Number	Percent
am	416	44
midday	307	32
pm	228	24
Total	951	100

Day of Interview	Number	Percent
Monday	76	8
Tuesday	84	9
Wednesday	99	10
Thursday	100	11
Friday	85	9
Saturday	228	24
Sunday	279	29
Total	951	100

Location of Interview	Number	Percent
East Boulder – Gunbarrel	53	6
East Boulder – Teller Farm	21	2
Dry Creek	79	8
Bobolink	72	8
South Boulder Creek at EBCC	31	3
Marshall Mesa	66	7
Greenbelt Plateau	12	1
Doudy Draw	18	2
South Mesa	107	11
Shanahan Ridge	52	5
Chautauqua	216	23
Sanitas	64	7
Foothills	15	2
Sage	44	5
Eagle	53	6
Gregory Canyon	48	5
Total	951	100

Version of Survey	Number	Percent
Open-ended norms questions	396	42
Closed-ended norms questions	554	58
Total	950	100

Appendix B

PCI Graphs for Selected Sub-Groups of Respondents

Figure B1. PCI acceptability norms for "indirect" human-dog interactions: Frequency of walking dogs at OSMP

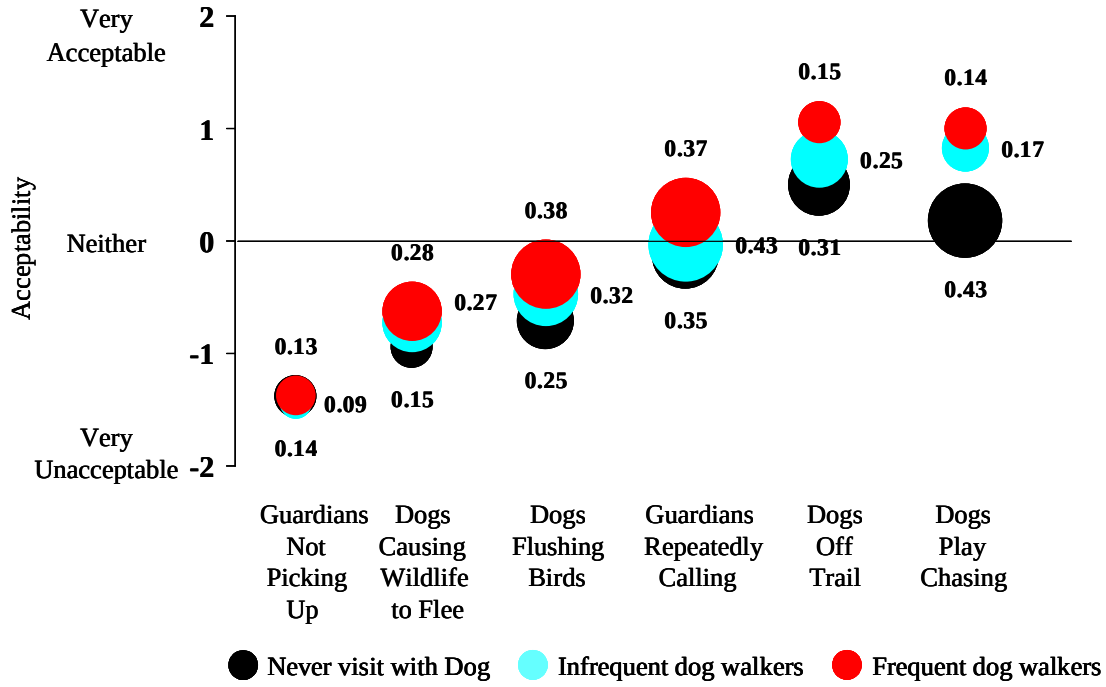


Figure B2. PCI acceptability norms for "direct" human-dog interactions: Frequency of walking dogs at OSMP

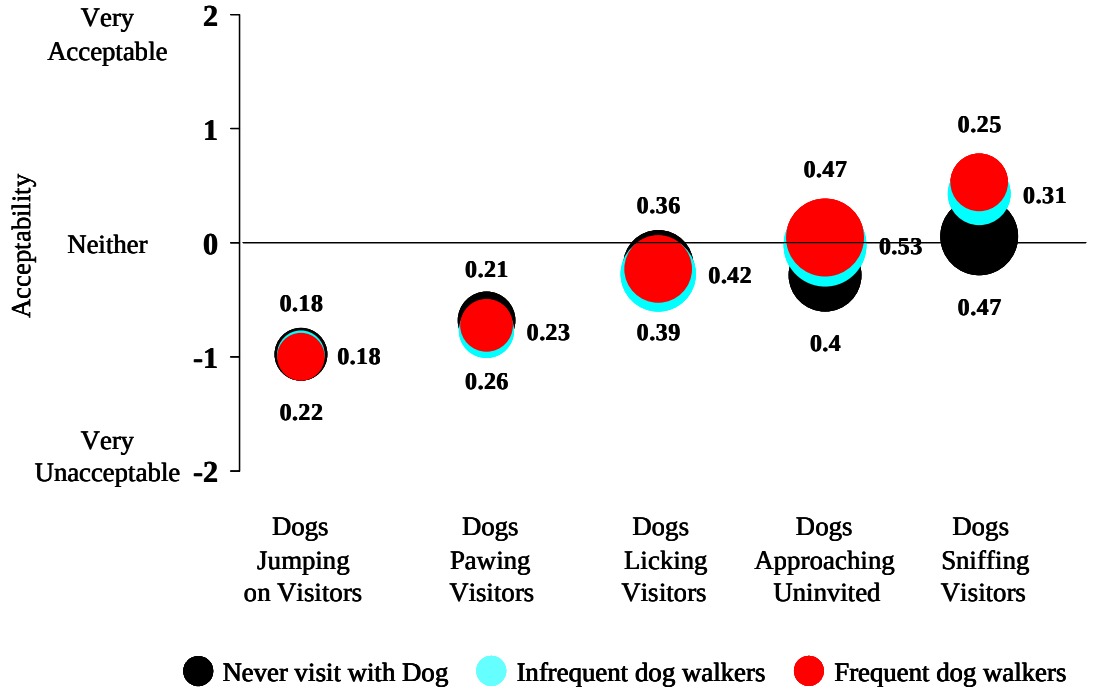


Figure B3. PCI acceptability norms for "indirect" human-dog interactions: Walking dog on day of interview

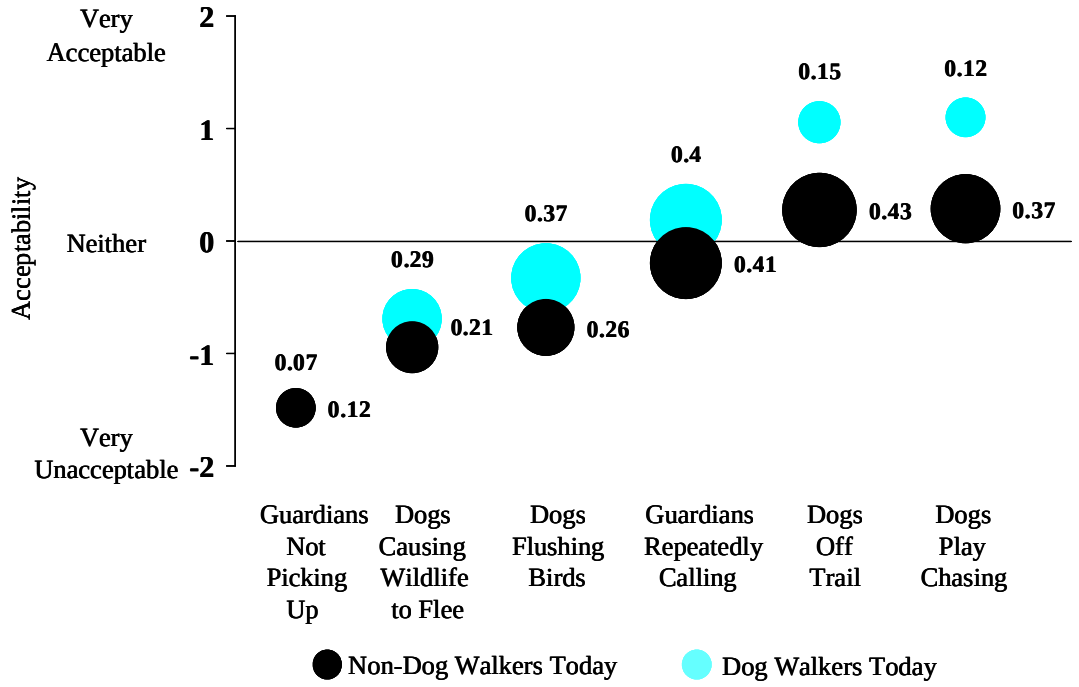


Figure B4. PCI acceptability norms for "direct" human-dog interactions: Walking dog on day of interview

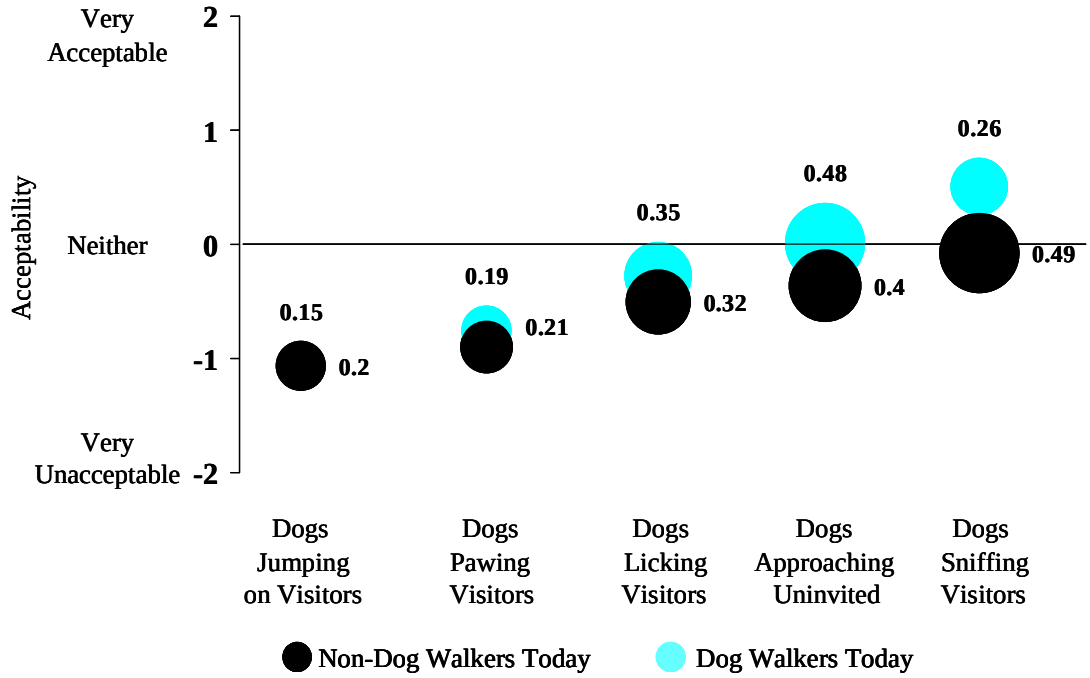


Figure B5. PCI acceptability norms for "indirect" human-dog interactions: Years visiting OSMP

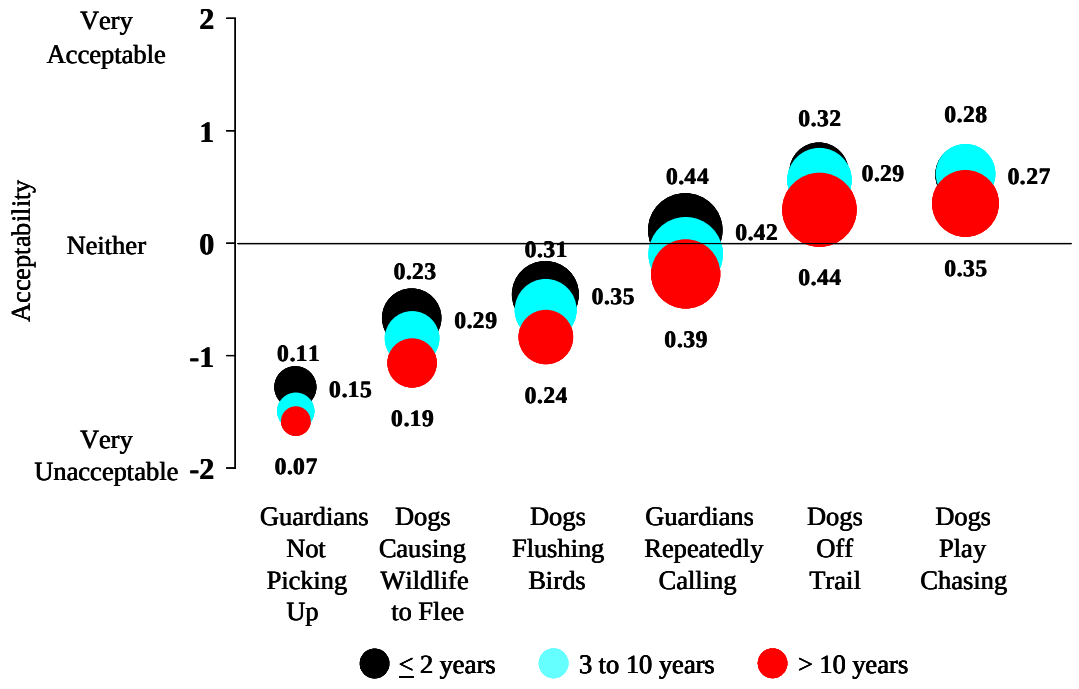
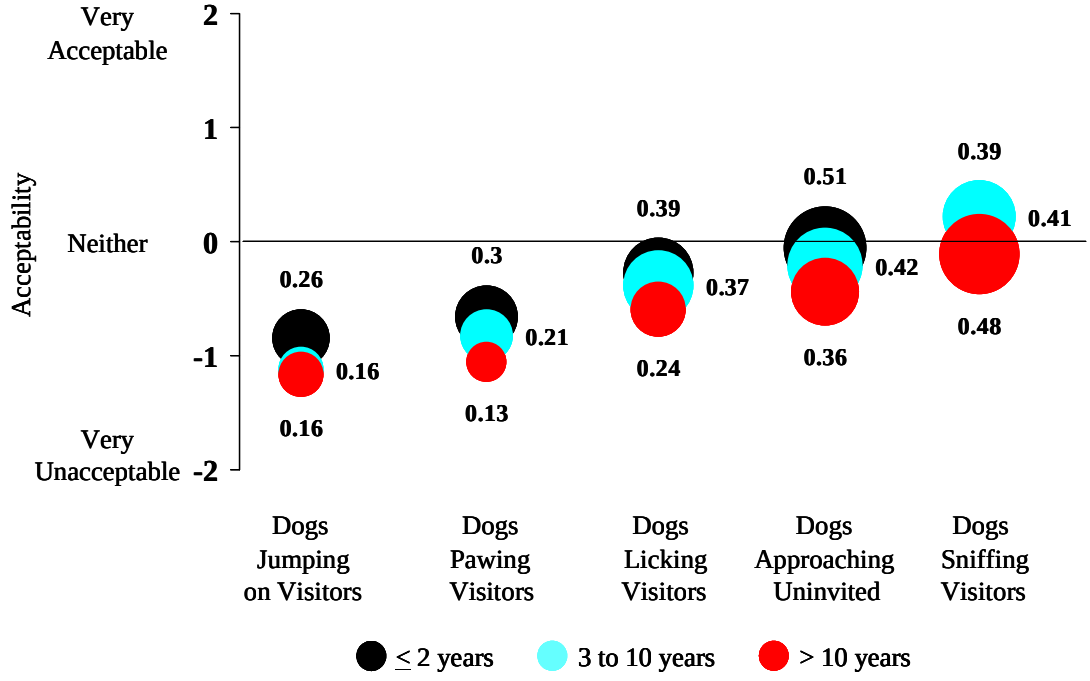


Figure B6. PCI acceptability norms for "direct" human-dog interactions: Years visiting OSMP



Appendix C

Multivariate Cluster Analyses

Visitor Clusters: Normative Tolerances

To provide a multivariate perspective on the normative acceptability ratings, we conducted a series of cluster analyses (Table C1). Cluster analysis allows classification of individuals into smaller more homogeneous groups based on patterns of responses across the 11 acceptability rating variables. The variables included in these analyses were the percent of time the norm had been exceeded for each of the acceptability evaluations. These variables were coded as 0 (norm not exceeded) and 1 (norm exceeded). A series of cluster analyses ranging from 2 to 6 group solutions showed that the 4-group solution provided the best fit for the data. To validate this solution, we randomly sorted the data and conducted a cluster analysis after each of 3 random sorts. These additional analyses supported the solution identifying four distinct groups of individuals.

Across all indirect and direct human-dog interaction variables, 60% of all respondents never had their norm exceeded (cluster 1). Cluster 2 contained individuals whose norm had been exceeded primarily for the indirect interactions (16%), while cluster 3 included respondents whose norm had mostly been exceeded for the direct interaction variables (12%). The final cluster reflected those individuals who norm had been consistently exceeded across all 11 acceptability evaluations (12%).

Tables C2 through C7 examine the relationships between the 4-group cluster solution and selected independent variables. We used Cramer's *V* to compare the strength of the relationships. A value of .1 on this effect size statistic can be considered a "minimal" relationship (Vaske, Gliner, & Morgan, 2002). A Cramer's *V* of .3 is considered "typical" and effect sizes of .5 or greater are "substantial" relationships.

Table C1. Visitor clusters: Normative tolerances

	Cluster 1 Norm Never Exceeded	Cluster 2 Mostly Indirect	Cluster 3 Mostly Direct	Cluster 4 Norm Always Exceeded
Indirect interaction				
Owners not picking up after their dogs	0	1	1	1
Dogs causing wildlife to flee	0	0	0	1
Dogs flushing birds	0	0	0	1
Owners repeatedly calling their dogs	0	1	0	1
Dogs off trail	0	1	0	1
Dogs "play" chasing another dog	0	0	0	1
Direct interaction				
Dogs jumping on a visitor	0	0	1	1
Dogs pawing a visitor	0	0	1	1
Dogs licking a visitor	0	0	0	1
Dogs approaching uninvited	0	1	1	1
Dogs sniffing a visitor	0	0	0	1
Percent of sample	60%	16%	12%	12%

Coding: 0 = Norm not exceeded 1 = Norm exceeded

The variables of sex, age, education and one of the place of residence variables (i.e., within Boulder city limits vs. outside city limits) did not vary statistically by norm tolerance clusters ($\chi^2 \leq 21.81$, $p \geq .058$ in all cases, Table C2). The effect sizes for these relationships were minimal (Cramer's $V = .097$ to .116). This implies, for example, that females were no more likely to have their norm exceeded than males. Individuals with college graduate degrees were no more likely than those with a high school education to have their norm exceeded.

For the second place of residence variable (i.e., within Boulder city limits, within Boulder County, outside Boulder county), there was a statistical difference among the four clusters ($\chi^2 = 24.43$, $p < .001$). Individuals who live outside of Boulder County were less likely to have their norm exceed (70%) compared to those living within Boulder County (45%) or within the city limits of Boulder (55%). Although these distributions varied statistically, the effect size was only .143; suggesting that there was not a strong relationship.

Table C2. Demographics by norm tolerance clusters [1]

	Norm Never Exceeded	Mostly Indirect	Mostly Direct	Norm Always Exceeded	χ^2	*p*-value	Cramer's *V*
Sex					6.51	.089	.106
Male	62	18	9	11			
Female	57	14	14	16			
Age					21.81	.240	.116
< 20	69	12	11	8			
21 to 30	62	20	6	12			
31 to 40	56	12	20	12			
41 to 50	60	17	12	11			
51 to 60	57	15	11	17			
61 to 70	54	25	7	14			
> 70	50	12	0	38			
Mean age	40.30	40.95	40.01	42.82			
Education					17.33	.299	.097
High school or less	69	19	6	6			
Some college	68	5	12	15			
College graduate	60	19	12	9			
Some graduate school	62	14	11	13			
Masters degree	57	15	11	17			
Doctoral / professional degree	49	16	17	18			
Place of Residence					7.48	.058	.114
Within Boulder city limits	55	17	11	17			
Outside city limits	63	16	12	9			
					24.43	< .001	.143
Within Boulder city limits	55	17	11	17			
Within Boulder County	45	23	15	17			
Outside Boulder County	70	13	10	7			

1. Cell entries are row percentages

Three frequency of visitation variables were examined (Table C3). Significant differences were observed between the four cluster groups and (a) number of years visiting OSMP ($\chi^2 = 48.61$, $p < .001$), (b) number of visits during the past 12 months ($\chi^2 = 47.63$, $p < .001$), and (c) number of times visiting OSMP locations during the past month ($\chi^2 = 32.54$, $p = .019$). In general, for all three visitation variables, those with more prior visitation experience were more likely to have their norm exceeded. The effect sizes for these relationships were again in the minimal range (Cramer's $V = .133$ to .160).

Table C3. Frequency of visitation by norm tolerance clusters [1]

	Norm Never Exceeded	Mostly Indirect	Mostly Direct	Norm Always Exceeded	χ^2	*p*-value	Cramer's *V*
Number of years visiting OSMP					48.61	< .001	.160
1st year	90	6	2	2			
1 to 2 years	65	16	11	8			
3 to 5 years	60	16	12	12			
6 to 10 years	64	12	10	14			
11 to 20 years	49	22	13	16			
21 to 30 years	43	25	16	16			
More than 30 years	44	13	26	17			
Number of visits during past 12 months					47.63	< .001	.159
1 to 10 visits	80	11	5	4			
11 to 30 visits	54	22	8	16			
31 to 90 visits	52	17	15	16			
91 to 180 visits	48	17	20	15			
181 to 365 visits	59	14	15	12			
Number of times visited OSMP during past month					32.54	.019	.133
1 visit	77	10	5	8			
2 to 3 visits	62	21	8	9			
4 to 5 visits	54	21	11	14			
6 to 10 visits	52	17	18	13			
11 to 20 visits	52	16	14	18			
21 to 31 visits	62	11	14	13			
More than 31 visits	60	10	20	10			

1. Cell entries are row percentages

Two of the four dog guardian variables were statistically related to membership in the four clusters (Table C4). Individuals who are currently dog guardians were less likely to have their norm exceeded than those who were not dog guardians ($\chi^2 = 33.85$, $p < .001$). Respondents visiting with two or more dogs on the day they were interviewed were also less likely to have their norm exceeded ($\chi^2 = 30.34$, $p < .001$). The number of dogs currently owned and the frequency of walking dogs at OSMP were not statistically related to the norm tolerance clusters. Again, however, the strength of all of these relationships can be characterized as minimal.

Table C4. Dog guardian indicators by norm tolerance clusters [1]

	Norm Never Exceeded	Mostly Indirect	Mostly Direct	Norm Always Exceeded	χ^2	*p*-value	Cramer's *V*
Are you currently a dog guardian?					33.85	< .001	.234
No	52	19	10	19			
Yes	67	13	14	6			
Number of dogs currently owned					7.70	.261	.102
1	63	15	15	7			
2	74	9	13	4			
3+	86	7	7	0			
Number of dogs with you on today's visit					30.34	< .001	.156
No dogs	54	19	11	16			
1 dog	67	14	14	5			
2+ dogs	74	10	13	3			
Frequency of walking dogs at OSMP					5.59	.471	.093
Never	72	11	9	8			
1 to 4 visits per month	60	18	15	7			
2+ visits per week	69	11	15	5			

1. Cell entries are row percentages

Three of the six activity participation variables (i.e., walking dog, walking / hiking, bird watching) were statistically related to the norm tolerance clusters ($\chi^2 \geq 9.90$, $p < .019$ in all cases). For example, more walkers / hikers always had their norm exceeded than those not participating in these activities (Table C5). Those who were bird watching were more likely to have their norm exceeded than those not engaged in this activity. Although these differences were statistically significant, the effect sizes were minimal. Running, bicycling and wildlife viewing were not related to the extent to which the norm was exceeded.

Table C5. Activities by norm tolerance clusters [1]

	Norm Never Exceeded	Mostly Indirect	Mostly Direct	Norm Always Exceeded	χ^2	*p*-value	Cramer's *V*
Walking Dog					15.81	.001	.156
No	57	17	11	15			
Yes	66	13	15	6			
Walking / Hiking					12.60	.006	.144
No	60	16	16	8			
Yes	59	16	9	16			
Running					5.93	.115	.102
No	62	14	11	13			
Yes	52	21	15	12			
Bicycling					5.91	.116	.093
No	59	16	13	12			
Yes	76	6	6	12			
Bird Watching					9.90	.019	.136
No	61	15	12	12			
Yes	41	28	8	23			
Wildlife Viewing					2.55	.466	.067
No	61	15	12	12			
Yes	52	23	9	16			

1. Cell entries are row percentages

All nine belief statements regarding off leash dogs were statistically related to cluster membership ($\chi^2 \geq 13.11$, $p < .041$). For five of these relationships, the Cramer's *Vs* were greater than .3, suggesting a "typical" strength of relationship (Table C6). Individuals who agreed with the statement "the behavior of off leash dogs is a problem at OSMP areas" were more likely to have their norm always exceeded (44%) than those who disagreed (3%). Those who agreed that "I do not think that there are any real impacts from off leash dogs at OSMP areas" were less likely to have their norm exceeded (81% norm never exceeded) than those who disagreed with the statement (37% norm never exceeded). Respondents who disagreed with the statement "Just knowing that off leash dogs are allowed in OSMP areas is a problem for me, even if I never see them" were less likely to have their norm exceeded (67% norm never exceeded) than those who agreed (15% norm never exceeded). Individuals who enjoyed watching dogs off leash were less likely to have their norm exceeded (73% norm never exceeded) than those who disagreed (27% norm never exceeded).

Table C7 shows the relationships between perceived human-dog interaction problems and the norm tolerance clusters. All 11 relationships were statistically significant at $p < .001$. Individuals who perceived the indirect and direct interaction issues to be problematic, were more likely to have their norms exceeded. For example, those who felt that dogs off trail was an "extreme problem," were more likely to have their norm exceeded (23% norm never exceeded) than those who felt that this behavior was "not at all a problem" (77% norm never exceeded). Forty-nine percent of respondents who felt that dogs sniffing a visitor was an extreme problem, always had their norm exceeded, compared to only 5% of those who thought that this behavior was not a problem.

Table C6. Beliefs about off leash dogs by norm tolerance clusters [1]

	Norm Never Exceeded	Mostly Indirect	Mostly Direct	Norm Always Exceeded	χ^2	*p*-value	Cramer's *V*
Just knowing that off leash dogs are allowed in OSMP areas is a problem for me, even if I never see them					106.88	< .001	.323
Disagree	67	15	12	6			
Neutral	43	16	8	33			
Agree	15	22	18	45			
The behavior of off leash dogs is a problem at OSMP areas					173.02	< .001	.403
Disagree	76	12	9	3			
Neutral	55	23	15	7			
Agree	18	21	17	44			
I do ***not*** think that there are any real impacts from off leash dogs at OSMP areas					118.10	< .001	.312
Disagree	37	22	16	25			
Neutral	71	14	12	3			
Agree	81	9	6	4			
I enjoy watching dogs off leash at OSMP areas					112.19	< .001	.314
Disagree	27	26	12	36			
Neutral	50	20	11	19			
Agree	73	11	13	3			
It's OK that off leash dogs use OSMP areas as long as they do ***not*** affect me					50.49	< .001	.229
Disagree	36	19	10	35			
Neutral	59	16	14	11			
Agree	65	15	12	8			
Most dog owners are responsible individuals who keep their dogs under control at OSMP areas					82.31	< .001	.308
Disagree	20	12	12	56			
Neutral	45	21	17	17			
Agree	67	15	11	7			
Dog owners who ***cannot*** control their dogs off leash ***should not*** be allowed to visit OSMP areas with their dogs off leash					27.74	< .001	.146
Disagree	69	13	9	9			
Neutral	83	5	9	3			
Agree	54	18	13	15			
It is OK for a visitor to say something to a dog owner who does ***not*** have his or her dog under control					13.11	.041	.100
Disagree	69	9	9	13			
Neutral	73	5	10	12			
Agree	57	18	12	13			
It bothers me when dog owners do ***not*** pick up after their dogs					22.83	.001	.119
Disagree	79	0	21	0			
Neutral	79	3	15	3			
Agree	56	17	12	14			

1. Cell entries are row percentages

Table C7. Perceived problems by norm tolerance clusters [1]

	Norm Never Exceeded	Mostly Indirect	Mostly Direct	Norm Always Exceeded	χ^2	*p*-value	Cramer's *V*
Indirect interaction							
Owners not picking up after their dogs					30.22	< .001	.124
Not at all a problem	83	5	7	5			
Slight problem	68	13	11	8			
Moderate problem	67	17	11	5			
Extreme problem	53	17	13	17			
Dogs causing wildlife to flee					33.41	< .001	.135
Not at all a problem	68	13	12	7			
Slight problem	69	14	11	6			
Moderate problem	63	9	16	12			
Extreme problem	50	22	10	18			
Dogs flushing birds					32.32	< .001	.138
Not at all a problem	70	13	11	6			
Slight problem	65	12	14	9			
Moderate problem	60	19	11	10			
Extreme problem	46	20	11	23			
Owners repeatedly calling their dogs					88.45	< .001	.226
Not at all a problem	80	10	8	2			
Slight problem	61	16	16	7			
Moderate problem	48	21	9	22			
Extreme problem	31	20	13	36			
Dogs off trail					146.41	< .001	.297
Not at all a problem	77	9	13	2			
Slight problem	50	23	15	12			
Moderate problem	33	28	5	34			
Extreme problem	23	17	9	51			
Dogs "play" chasing another dog					67.58	< .001	.195
Not at all a problem	71	13	12	4			
Slight problem	52	17	14	17			
Moderate problem	39	26	9	26			
Extreme problem	44	17	4	35			
Direct interaction							
Dogs jumping on a visitor					65.98	< .001	.184
Not at all a problem	80	16	3	1			
Slight problem	71	13	10	6			
Moderate problem	60	13	17	10			
Extreme problem	45	20	13	22			
Dogs pawing a visitor					64.11	< .001	.184
Not at all a problem	67	12	7	4			
Slight problem	64	18	15	3			
Moderate problem	60	13	12	15			
Extreme problem	41	20	14	25			
Dogs licking a visitor					81.78	< .001	.216
Not at all a problem	79	9	9	3			
Slight problem	56	21	13	9			
Moderate problem	52	16	16	16			
Extreme problem	34	22	12	32			
Dogs approaching uninvited					159.17	< .001	.301
Not at all a problem	85	7	7	1			
Slight problem	65	14	15	6			
Moderate problem	38	24	20	18			
Extreme problem	31	23	6	40			
Dogs sniffing a visitor					100.05	< .001	.256
Not at all a problem	73	12	10	5			
Slight problem	58	19	15	8			
Moderate problem	33	23	16	28			
Extreme problem	35	11	5	49			

1. Cell entries are row percentages

The *Multivariate* analyses of the norm acceptability ratings suggested the following conclusions:

- Cluster analyses identified four norm tolerance segments:
  - √ 60% of all respondents *never* had any of their norms exceeded
  - √ 16% had their norms exceeded for *indirect* interactions
  - √ 12% had their norms exceeded for *direct* interaction variables
  - √ 12% had their norms exceeded for *all* 11 acceptability evaluations
- Demographic, visitation pattern and activity participation variables that were statistically related to membership in the four clusters included:
  - √ one *demographic* indicator (place of residence) (within Boulder city limits vs. within Boulder County vs. Outside Boulder County)
  - √ all three *frequency of visitation* variables (number of years visited, number of visits during past 12 months, number of visits during past month)
  - √ two *dog guardian* variables (currently a dog guardian, number of dogs on today's visit)
  - √ three *activity participation* variables (walking dog, walking / hiking, bird watching)

  The strength of all these relationships, however, was minimal.
- All nine *beliefs* statements regarding *off leash dogs* were statistically related to norm cluster membership and the effect sizes were generally larger.
- All 11 relationships between *perceived human-dog interaction problems* and the norm tolerance clusters were statistically significant.