Voice and Sight Tag Program and Leash Regulations Monitoring

Interim Status Report – 2016 Monitoring

City of Boulder
**OPEN SPACE &
MOUNTAIN PARKS**

Voice and Sight Tag Program and Leash Regulations Monitoring

Monitoring Report

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Cover photograph: Dog under Voice and Sight control on an OSMP trail. Credit: OSMP Image

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EXECUTIVE SUMMARY

During the summer of 2016 (between June and October) Open Space and Mountain Parks (OSMP) conducted the second of three planned monitoring cycles (2014, 2016 and 2018) for the Voice and Sight Dog Tag Program (Tag Program). Tag Program monitoring is designed to evaluate compliance rates with select dog regulations on OSMP lands and to assist with evaluation of any potential effects resulting from the Tag Program enhancements (1 hour educational class) that were enacted in 2015. A brief background of the Tag Program, high-level compliance results for key monitoring measures, and some initial recommendations based on the most recent set of monitoring results are presented below in this executive summary. Full results, including a general overview of methods, more detailed analysis of key measures, and additional recommendations for the upcoming 2018 monitoring cycle are presented in the *Voice and Sight Tag Program and Leash Regulations: Interim Status Report - 2016 Monitoring*.

BACKGROUND

The Voice and Sight Dog Tag Program (Tag Program) is a management strategy within the Visitor Master Plan (City of Boulder, 2005). Under the Tag Program, launched in the summer of 2006, visitors wishing to have their dog(s) off-leash and under voice and sight control when visiting designated OSMP voice and sight areas are required to have a voice and sight tag visibly displayed on their dog(s). In 2011, under the direction of the City of Boulder Council, OSMP began developing Tag Program enhancement to try and increase compliance with voice and sight regulations. Tag Program enhancements were implement in 2015 and since that time, individuals wishing to participate in the program have been required to attend an hour-long in-person Tag Program training session before they can register with the Tag Program and purchase tag.

During the development of the 2015 Tag Program enhancements, the Voice and Sight Dog Tag Monitoring Program (Tag Monitoring Program) was also reviewed, resulting in significant revisions to the existing protocol (used from 2006 and 2010). The new protocol integrated methods developed through and extensive collaboration between OSMP staff, public stakeholder groups, and individuals. The updated monitoring protocol was first enacted as part of the 2014 monitoring cycle and has now fully superseded the previous monitoring protocol that was in effect between 2006 and 2010. The 2016 monitoring cycle also utilized the updated protocol and was the second of three cycles, with monitoring being conducted before (2014), soon after (2016) and scheduled for three years after (2018) implementation of Tag Program enhancements in 2015.

MAJOR FINDINGS

The Tag Monitoring Program collects two primary datasets related to dog compliance on OSMP lands: compliance with off-leash dog regulations on designated voice and sight trails and compliance with on-leash regulations for permanent and seasonally leash required trails. Key measures for each regulation category are reported below.

Voice and Sight

For the voice and sight component of the 2016 monitoring cycle, the **overall normalized[1] compliance rate was 68%**. This result is comparable to the 67% overall normalized compliance observed during the 2014 cycle. Compliance on individual measures varied from 56% (tag display) to 99% (no charging, chasing, or aggressive

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[1] Compliance data have been normalized to help account for differences in collection methods across monitoring years. An explanation of normalization methods can be found in the full *Voice and Sight Tag Program and Leash Regulations: Interim Status Report - 2016 Monitoring*.

behavior). All compliance results detailed below are reported at the visitor party level. Not all visitor parties observed necessarily had an opportunity to demonstrate compliance with a particular measure. Therefore, the corresponding sample size for each measure has also been reported.

- **Tag Display:** 56% (*n=337*)
- **Within Sight:** 98% (*n=337*)
- **No more than 2 dogs off-leash per guardian:**
  - Only parties with 3 or more dogs in visitor party: 76% (*n=17*)
  - All visitor parties: 99% (*n=337*)
- **Voice Control:** 63% (*n=27*)
- **No charging, chasing, or otherwise displaying aggression toward any person or dog:** (*n=224*)
  - Interactions and Passes: 99% (*n=224*)
  - Interactions only: 98% (*n=82*)
- **No chasing, harassing or disturbing wildlife or livestock:** (*n=4*)
  - Only four opportunities for wildlife interaction were observed. Two opportunities had no interaction between the dog(s) under observation and the wildlife. One had an interaction as the dog was off trail and attentive to the wildlife (but did not chase) while the fourth had multiple failed attempts to recall the dog as it chassed the wildlife.

Permanent Leash Required
On permanent leash required trails, staff observed a total of 326 visitor parties. Of these, 248 visitor parties had all of their dogs on leash for an **overall compliance rate of 76%**. Of the noncompliant visitor parties, 72 had all dogs off-leash and 6 had a mix of on and off-leash.

Seasonal Leash Required
For the 2016 monitoring cycle, staff evaluated leash compliance on seasonal leash required trails from September through mid-October. These trails have seasonal closures as they are frequent foraging locations for bears. Staff observed a total of 209 visitor parties on seasonal leash trails. Of these, 130 visitor parties had all their dogs on leash for an **overall compliance rate of 62%.** Of the noncompliant visitor parties, 71 had all dogs off-leash and 6 had a mix of on and off-leash.

DISCUSSION
Overall compliance for the Tag program in 2016 was estimated at 68%. This result is the highest so far of any monitoring cycle, as shown in the table below.

Table 1 Overall compliance for Tag Program monitoring between 2006 and 2016.

Compliance Category	Monitoring Year				
	2006	**2007**	**2010**	**2014**	**2016**
Noncompliant	34%	45%	41%	34%	32%
Compliant	66%	56%	59%	67%	68%

While this indicates a slight trend toward better compliance, it is important to note that overall compliance requires successful compliance will all components of the voice and sight requirements. In 2016, the normalized overall compliance rate of 68% was influenced most significantly by the tag display component (56%). Other measures, such as keeping dogs within sight (98%) and no charging or chasing people or dogs (99%) indicate that the frequency of non-compliant behaviors on voice and sight trails is relatively low. However, given the relatively large number of dog visits to OSMP, the number of individual incidents may still be noticeable to visitors over time.

RECOMMENDATIONS

Given that compliance rates vary among measures, with overall compliance shifting only marginally between monitoring years, it may be most useful to focus recommendations for program modification on specific components of dog management. For example, tag display is largely administrative in nature while following charging or chasing wildlife and livestock is skills based on the part of the guardian. By focusing future modifications on specific components of dog management, rather than trying to address all components in combination, targeted treatments can be developed. Given the results from the 2016 monitoring cycle staff have developed the following preliminary recommendations:

1. Increase outreach and education to non-participating dog guardians who visit OSMP (those who are not displaying a voice and sight tag) that currently let their dogs off-leash to increase participation in the program.
2. Clarify regulatory sign language to make it clearer that guardians must be actively participating in the program to manage their dogs off-leash
3. Increase education in the voice and sight class regarding the purpose for permanent and seasonal leash required trails. At current, roughly half of non-compliant visitor parties in the leash required monitoring were noted as having a voice and sight tag. 2019 will be the first year of the mandatory 5 year refresher course, so results from the previous 2014 and 2016 monitoring, along with the upcoming 2018 monitoring, can help inform this recommendation.
4. Develop sample methods that account for the unequal distribution of wildlife across the system to increase sample size for assessing the degree of charging and chasing wildlife.

1 INTRODUCTION

Between June 15th and October 19th 2016, Open Space and Mountain Parks (OSMP) conducted the second of three monitoring cycles (2014, 2016 and 2018) for the Voice and Sight Dog Tag Program (Tag Program). This monitoring program is designed to evaluate compliance rates with dog regulations on OSMP lands and to assist with evaluation of the Tag Program enhancements that were enacted in 2015.

1.1 BACKGROUND

The Voice and Sight Dog Tag Program (Tag Program) is a management strategy within the Education and Outreach, Safety and Enforcement, Recreation Opportunities and User Conflict Reduction Initiatives of the Visitor Master Plan (City of Boulder, 2005). Under the Tag Program, launched in the summer of 2006, visitors wishing to manage their dog(s) off-leash and under voice and sight control are required to have a voice and sight tag visibly displayed on their dogs. From 2006 through 2014, the process of obtaining a voice and sight tag required an applicant to view a video describing the requirements of voice and sight control, acknowledge understanding of those requirements, pay a fee, and complete a registration form. Beginning in 2011, OSMP staff received direction from the Boulder City Council to revise the Voice and Sight Tag Program. Through collaboration between OSMP staff, public stakeholder groups, and individuals, Tag Program enhancements were developed. Program enhancements were implemented in 2015, which now require individuals wishing to participate in the program to attend an hour-long in-person Tag Program training session before they can register with the Tag Program and purchase tag. Dog guardians not registered in the program or who do not have a voice and sight tag visibly displayed on their dog are required to keep their dog on-leash while visiting Open Space and Mountain Parks (OSMP) lands and other City of Boulder properties- where voice and sight control is not an option.

Along with the development of the 2015 Tag Program enhancements, the Voice and Sight Dog Tag Monitoring Program (Tag Monitoring Program) was also reviewed, resulting in significant revisions to the existing protocol (used from 2006 and 2010). The new protocol integrated methods developed through and extensive collaboration between OSMP staff, public stakeholder groups, and individuals. The updated monitoring protocol was first enacted as part of the 2014 monitoring cycle and has now fully superseded the previous monitoring protocol that was in effect between 2006 and 2010. The 2016 monitoring cycle also utilized the updated protocol and was the second of three cycles, with monitoring being conducted before (2014), soon after (2016) and scheduled for three years after (2018) implementation of Tag Program enhancements in 2015. Minor recommendations for Tag Program management are provided after each monitoring cycle. Once the 2018 cycle is completed, a more extensive review of results from all three cycles is planned to help evaluate Tag Program enhancements and inform future management decisions regarding the Tag Program.

This report has been compiled to provide results from the 2016 monitoring cycle as well as preliminary trend comparisons with results from the 2014 monitoring cycle. Where applicable, some results from the previous iteration of the Voice and Sight Monitoring Program (2006 – 2010) have also been included. The recently completed 2016 cycle and upcoming 2018 cycle are based on the same underlying goals, objectives and methods as the 2014 cycle. This report focuses on results from the current monitoring program and provides only a limited discussion of the Voice and Sight Monitoring Program's genesis. A more comprehensive discussion on development of the 2014 – 2018 monitoring program can be found in the 2014 monitoring report (VanderWoude & Bitume, 2015) and the 2016 monitoring protocol (VanderWoude, Magtanong, & Leslie, 2016).

1.2 GOALS AND OBJECTIVES

The goal of the Tag Monitoring Program is to evaluate compliance with OSMP and City of Boulder (CoB) dog regulations by visitors to OSMP lands at a system-wide level. Evaluative measures in the Tag Monitoring Program are based on the goals of the Tag Program. The table below displays Tag Program goals on the left and corresponding monitoring measures on the right.

Table 2 Tag Program goals and corresponding monitoring measures.

Tag Program goals	Monitoring measures
Increase the proportion of dog guardians visiting OSMP lands who have control over their dogs as required by applicable regulations, including proof of current dog rabies vaccinations.	*Visible voice and sight tag display*
	Dog(s) within sight
	Off leash dog(s) under voice control
Maintain a safe, high-quality visitor experience for all	*No charging, chasing, or otherwise displaying aggression toward any person or dog*
Contribute to natural resource conservation.	*No chasing, harassing or disturbing wildlife or livestock*
	No more than 2 dogs off-leash per guardian
	Dog(s) on leash on permanent and seasonally leash required trails

The Tag Program enhancements project's objective relevant to this monitoring study is to:

Increase compliance with observed dog regulations and voice and sight control rules.

1.3 GUIDANCE FROM VISITOR MASTER PLAN

The Tag Program is a management strategy within the Education and Outreach, Safety and Enforcement, Recreation Opportunities and User Conflict Reduction Initiatives of the Visitor Master Plan (VMP) (City of Boulder, 2005). Under the Tag Program, launched in the summer of 2006, visitors wishing to manage dogs off-leash and under voice and sight control were required to have a voice and sight tag visibly displayed on their dogs and comply with all other program requirements. The 2005 VMP outlined monitoring measures associated with dog management on OMSP (City of Boulder, 2005 p. 59, 63, 64). All measures initially had a proposed standard of 90% visitor compliance.

Currently potential dog management actions are implemented through Trail Study Area (TSA) processes and plans, with strategies associated with the OSMP management area designation guiding dog management decisions (City of Boulder, 2005 p. 48-50). The VMP established the four management area designations (Passive Recreation Areas, Natural Areas, Agricultural Areas, and Habitat Conservation Areas) based upon characteristics of visitation and current resource status, and describes general management objectives for each. Management strategies for dog management range from voice and sight control with off-trail opportunities (maximum access) to dogs prohibited (no access). Typically, Passive Recreation Areas have the greatest amount of access for dogs/guardians and Habitat Conservation Areas have the least access.

2 METHODS

The Voice and Sight Tag Monitoring Program utilized naturalistic[2] observation methods to record attributes and behaviors of visitor parties[3] on OSMP trails. To do this, predefined points and sections of the trail have were established where observers could view a visitor party as they pass by specific points or traverse predefined sections of trail. Observers utilized a series of data sheets with predefined data fields and value codes to systematically and objectively record attributes and behaviors of the visitor party under observation.

The 2016 monitoring cycle employed the same methods as the 2014 cycle. A detailed protocol for the 2016 monitoring cycle is available from OSMP upon request (VanderWoude et al., 2016).

2.1 REGULATORY FOUNDATIONS

The Voice and Sight control definition below serves as the regulatory foundation for which behaviors were included or exempted as part of the methods development.

Boulder Revised Code – Voice and Sight Control Definition (B.R.C. 6-1-2)

"Voice and sight control" means the ability of a guardian or keeper to adequately control a dog by using voice commands and sight commands (such as hand gestures). In order for a guardian or keeper to have voice and sight control over a dog, the guardian or keeper must: (1) be able to see the dog's actions; and (2) be able to prevent the dog from engaging in the following behaviors, using voice and sight commands, without regard to circumstances or distractions:

> *(a) Charging, chasing or otherwise displaying aggression toward any person or behave toward any person in a manner that a reasonable person would find harassing or disturbing;*

> *(b) Charging, chasing or otherwise displaying aggression toward any dog;*

> *(c) Chasing, harassing or disturbing wildlife or livestock; or*

> *(d) Failing to come to and stay with the guardian or keeper immediately upon command by such person.*

2.2 STUDY AREA

For 2016, the study area remained consistent with 2014 to simplify trend comparison across all three planned monitoring cycles. The study area was bound to designated trails on OSMP that include sanctioned opportunities for guardians to bring dogs on open space. Only properties where OSMP has enforcement responsibility are included. Mountain peaks and other hard to reach areas greater than a 60-minute hike from an access point were excluded from the study area.

Figure 1 shows a map of monitoring locations included in the 2016 sample. Points for permanent and seasonal leash monitoring sites represent the location of line transects across the trail that were used for observing the leash status of dogs in visitor parties as they passed the transect. Voice and sight points represent the location where the observer was stationed such that they could see visitor parties as they traversed previously mapped linear sections of trail.

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[2] *Naturalistic* means a research method commonly used by psychologists and other social scientists which involves observing subjects in their natural environment.

[3] *Visitor party* refers to a combination of people and dogs who appear to be traveling together as an intentional group.
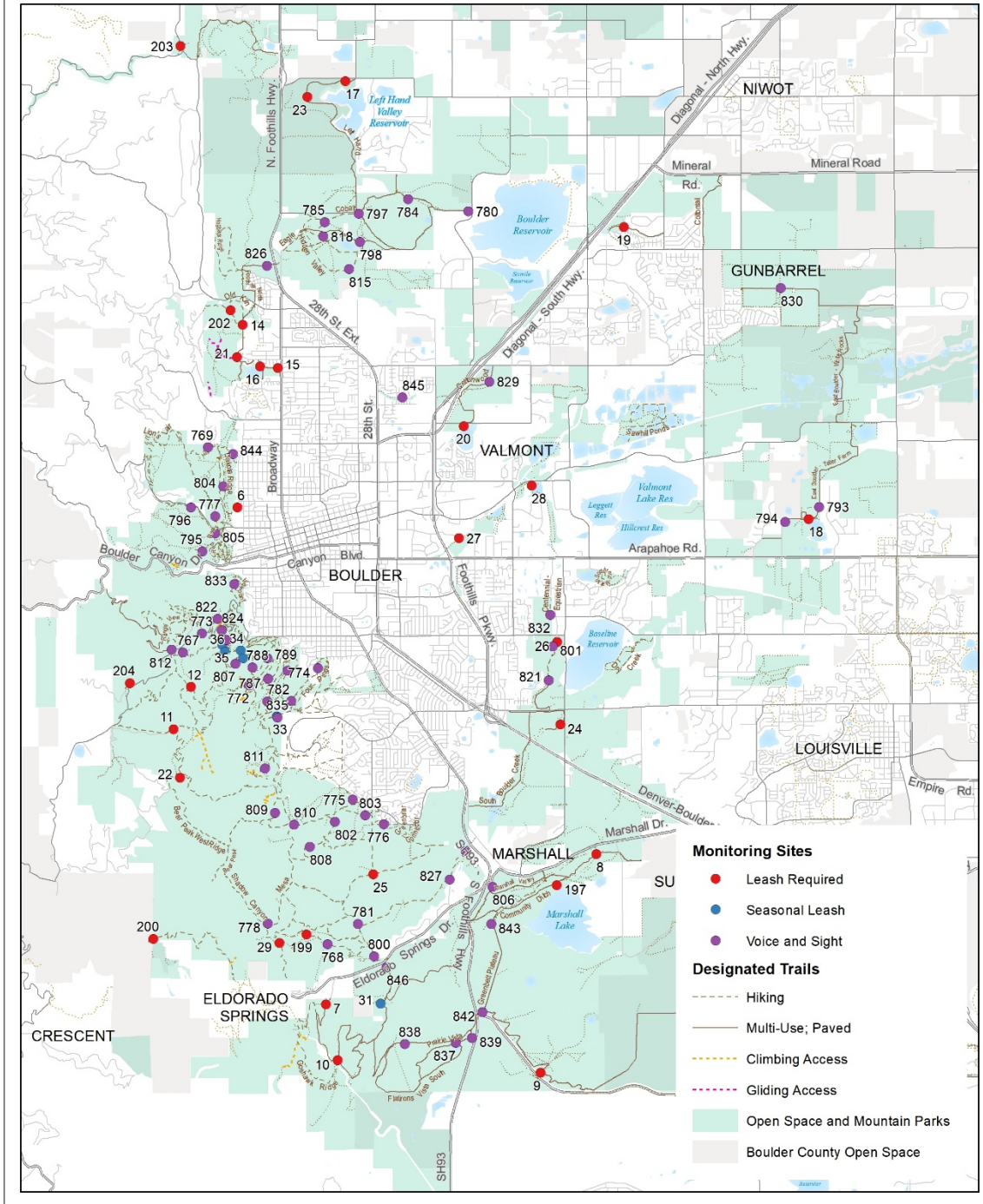
Figure 1 Map of all Tag Program monitoring sites on OSMP symbolized by type of monitoring site (voice and sight, leash required and seasonal leash).

2.2.1 Site Characteristics

The following criteria were considered when selecting monitoring locations for the current monitoring program. Any given site does not meet or include all criteria; see the 2016 protocol for additional detail on site selection) (VanderWoude et al., 2016):

- Sight distance of at least 400 feet (Voice and Sight component only)
- Audio distance of at least 400 feet (Voice and Sight component only)
- Few visual obstructions on/along trail such as boulders, shrubs, trees, trail undulations or switchbacks
- Ease of access and available legal parking for field technician
- Location along trail continuum; need to represent various locations along the trail (trailhead, first quarter mile, interior)
- Recreation setting (combination of biophysical, managerial and social conditions along with infrastructure development); need to represent a range of recreation settings
- Existence of a potential challenge for dog management (water access, prairie dogs, livestock)
- Topographical setting; need to represent flats, hills, peak access, canyons
- Not within a Trailhead Leash[4] area
- Underlain by OSMP owned and managed property (OSMP has enforcement responsibility)

2.3 SAMPLE SELECTION

The 2016 sample for each monitoring component was drawn using multi-stage sampling methods to construct a final, randomized list of locations, dates, and start times for observation periods (Table 3).

Table 3 General sample selection methods for each stage of the multi-stage sample construction.

Stage	Sample Method	Additional Criteria
Stage 1: Sites	Simple Random with Replacement	None
Stage 2: Dates	Simple Random with Replacement	Max Replacement = 2
Stage 3: Times	Simple Random with Replacement	Only daylight hours (7am – 7pm)

By utilizing a simple random sample with replacement for each of the sampling stages, a non-biased sample was constructed such that any given combination of a location, date, and start time had a non-zero probability of being selected for observation. This sample method helped minimize selection bias among high or low use times, dates, or locations within the list of established monitoring sites. As a result, some observation periods occurred during high use times at high use locations while others occurred at low use times and low use locations, as well as all use and location combinations in between those extremes.

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[4] Trailhead leash areas are designated zones on voice and sight trails, typically with a few hundred feet of the parking area or trailhead, where dogs are required to be kept on a leash. This helps reduce conflict and increase visitor and dog safety within these areas.

2.4 DATA COLLECTION

2.4.1 Voice and Sight Regulations

The voice and sight component of the monitoring was a naturalistic observational study designed to evaluate dog and guardian compliance with observable aspects of specific dog regulations of the voice and sight ordinances. Data were collected by three dedicated field staff who received extensive training prior to data collection on how to observe visitor party attributes, dog and human behaviors, and guardian responses. Observers utilized a series of data sheets with predefined data fields and value codes to systematically and objectively record attributes and behaviors of the visitor party under observation. Observations were categorized as "pass" events when no dog behaviors were recorded, "interactions" when the dog under observation exhibited a behavior toward another person, dog, wildlife or livestock and as "other" when the dog was out of sight and/or the guardian issued a command (and these observations were not associated with a pass or interaction event). The structure for observation data collected in the field provided context and a chronological understanding of each party's behaviors and interactions. Once all data collection was completed, field observations were evaluated by the monitoring, Tag Program, and ranger staff to determine a final compliance outcome for each visitor party. This post-collection review reduces the influence of on-site subjectivity and helped normalize compliance determinations across all field staff and observation sessions.

An important part of the B.R.C. code states that guardians must have voice control over their dog while off-leash. To issue a voice and sight command means that the guardian spoke an audible command to the dog with their voice; issued commands may include other signals (including but not limited to vocalizations [words, whistles, whoops, etc.], clapping, or by making noises with their person or a device, or by motions, movements or positions of their person); and that the signal appeared to the observer to be communication intended to establish control of the dog including but not limited to gaining the dog's attention and/or requiring the dog to stop or return to the guardian.

Specifically, this monitoring program used the following guidance for voice and sight commands:

> *Intended to establish control means that the guardian spoke discreet commands such as "come here" and that the direction of movement of the guardian, tone of voice and/or rate of speech used by the guardian is more urgent or stern than a friendly or relaxed behavior or tone would be.*

For purposes of this report, and to limit ambiguity, we separated commands into those that were clearly meant to establish voice and sight control over a dog and "other attempts" that were less clear. Only commands that included a word or phrase associated with a voice and sight regulation were included in the voice control compliance measure.

For the voice and sight component, overall compliance was calculated by quantifying the following selected measures for each visitor party.

- visible display of voice and sight tag
- dog within sight of guardian
- No more than 2 dogs per guardian
- Wildlife/livestock violation (charging, chasing or disturbing wildlife/livestock)
- Human or dog violation (charging, chasing, or disturbing a human or dog)
- No response to voice and sight command of guardian

If a visitor party was not compliant with any one of these regulations, they were considered noncompliant in the overall compliance measure. However, compliance results for each measure have also been reported separately

in the results section. For each measure (individual and overall) the number of noncompliant visitor parties was divided by the total observed parties to obtain the compliance measure. 95% confidence intervals were calculated for primary measures using the *Test of Equal or Given Proportions* in R (R Development Core Team, 2017).

Normalizing unsure tag status

Overall compliance is a combination of compliance with all individual measures. In 2014 and 2016, there were a number of visitor parties where the observer was not able to definitively confirm the presence or absence of a tag. In these instances, the tag compliance was recorded as "unsure". 2016 had a slightly higher rate of unsure tag identifications, which may be due to a number of factors including the tag color for the 2016 year and a growing preference for attaching the tag flush to the side of the collar (instead of hanging). The flush tag placement means observers can only confidently confirm tag display if they can see both sides of the collar, which requires the dog to walk both directions in the observation zone.

When computing overall compliance, if a visitor party had a tag status of unsure, but was compliant on all other measures, those results were normalized using the proportions for confirmed tag status. This method was developed during analysis of the 2014 data to facilitate better trend analysis with the previous monitoring program. In the previous implementation of the monitoring program (2006 – 2010), all unsure tag status were defaulted to compliant with the tag display regulation. To facilitate better comparability across monitoring cycles, tag display observations between 2006 and 2010 were reanalyzed using the normalization procedures outlined above.

2.4.2 Permanent and Seasonal Leash Required

The permanent and seasonal leash required components evaluated compliance with leash requirements by observing dogs at specific points on designated leash trails across OSMP. The monitoring program included 35 permanent leash required and 8 seasonal leash required monitoring locations.

Field observations were recorded on datasheets using many of the same fields as the voice and sight component to record visitor party attributes and tag display. When a visitor party passed through a designated line transect across the trail the number, leash and tag status of all dogs in the visitor party were recorded. No behaviors were recorded as part of the leash requirement components. Compliance determinations are based solely on whether all dogs in the visitor party were on a leash, regardless of the presence or absence of a voice and sight tag.

2.5 FIELD METHODS

For all components, field personnel arrive at the monitoring site at least ten minutes prior to the start of the monitoring period. Most monitoring sites required a hike from the trailhead or other parking area and the time necessary to access the site was appropriately planned for. Once at the locations, staff conducted a continuous three-hour observation session. Field personnel did not wear attire that identified them as OSMP staff and conducted observations from predefined locations set back from the observation zone or transect. This allowed for observers to remain largely inconspicuous so they did not influence the behavior of the visitor party under observation.

2.5.1 Voice and Sight Regulations

For voice and sight observations, the observer watched the first visitor party with one or more off-leash dogs that entered the observation area (from any direction). The observer recorded the visitor party data using a structured data sheet with pre-defined fields and observation codes. The observer watched the visitor party the entire time the party remained in the observation area. Once the party being observed left the observation

area, the observer waited for a new dog containing party to enter the observation area (so that it could be observed for the entire zone) and repeated the data collection process.

2.5.2 Permanent and Seasonal Leash Required

For leash required observations, the observer recorded every visitor party with one or more dogs that crossed over the observation point (coming from all directions). The observer recorded the visitor party data using a structured data sheet with pre-defined fields and observation codes.

2.6 QUALITY CONTROL

To produce the highest quality data set possible and maintain data integrity, monitoring staff implemented the quality assurance/quality control procedures listed below.

2.6.1 Protocol and definitions training

Prior to the start of monitoring, staff members responsible for collecting data received extensive training in the office including topics such as: code definitions, scenario review, datasheet review, protocol review, numerous group discussions and reading of relevant literature. Project staff also participated in numerous field tests in real-time and these provided an opportunity for staff to observe the behaviors and conditions being evaluated by this monitoring. Field technicians were trained to identify the current OSMP voice and sight control tag and decipher this tag from other common tags such as the Boulder County rabies tag and the City of Boulder dog license tag (Figure 2).

OSMP voice and sight tag   **City of Boulder dog license**   **Boulder County rabies tags**

Figure 2 Dog tags commonly found in Boulder, Colorado.

2.6.2 Inter-observer variability test

In any study where more than one observer is responsible for collecting data, the results can be compared using an inter-rater reliability (IRR) statistic. Cohen's kappa (κ) is the most commonly used and widely acceptable statistic for comparing IRR (Viera and Garrett, 2005). There were three observers collecting data for this project.

After office and field training, a real-time field test was conducted to measure the level of IRR in data collection. During this field test, data collection staff silently and simultaneously completed an observation session of three hours. While data were collected for a variety of variables and behaviors, staff only tested reliability for those measures that were relevant to the B.R.C and inferred compliance or non-compliance of a visitor party.

Perfect agreement would be indicated by $\kappa = 1$, while agreement equivalent to chance is indicated by $\kappa = 0$. The minimum level of adequate consistency was set at $\kappa = 0.6$, which is an accepted practice among researchers involved in similar studies (Landis & Koch, 1977; Sim & Wright, 2005). Kappa was calculated in R (R Development Core Team, 2017) using package "irr" (Gamer, Lemon, Fellows, & Singh, 2012).

Across all variables and all observers, the κ ranged from 0.59-1.00 and averaged 0.91, indicating substantial agreement across observers. The average κ-value of 0.91 is above the normally acceptable 0.6, and thus observations between observers collected during the study period could be considered reliably collected.

3 RESULTS

3.1 GENERAL RESULTS AND INTERPRETATION

The majority of OSMP trails are included in the master sampling site list. However, as a result of selecting monitoring sites with a maximum of a 60-minute hiking access time, compliance estimates generated by this study should only be generalized to the population of dog guardians that visit trails on OSMP that allow dogs and have similar dog management as to those trails listed in Appendix B (i.e. no mountain summits or other areas more than a 60 minute hike in from an access point). At this time, there is no data to indicate if compliance rates would be higher or lower in areas not included in the sample frame.

The monitoring program is designed to gain an understanding of the level of compliance with voice and sight requirements, leash regulations and excrement removal across all trails on the OSMP system that met our selection criteria. For each component, data from the 2016 study sites have been aggregated and *no comparison of the individual study sites to each other is presented*. Observations at individual sites were too few to provide statistically confident comparisons between sites.

3.2 SAMPLE COMPOSITION

3.2.1 Observation sessions

Observations for the Voice and Sight, Permanent Leash, and Seasonal Leash components were conducted between mid-June and mid-October 2016. Samples for components were distributed across all trail zones (Figure 3) as well as all days of the week and times of day (Figure 4). While all zones were included as part of the sampling frame, the higher ratio of interior trail zones is reflective of the fact that there are more miles of interior trail on the OSMP system. Simple random sample procedures were used for all stages of the sample selection.
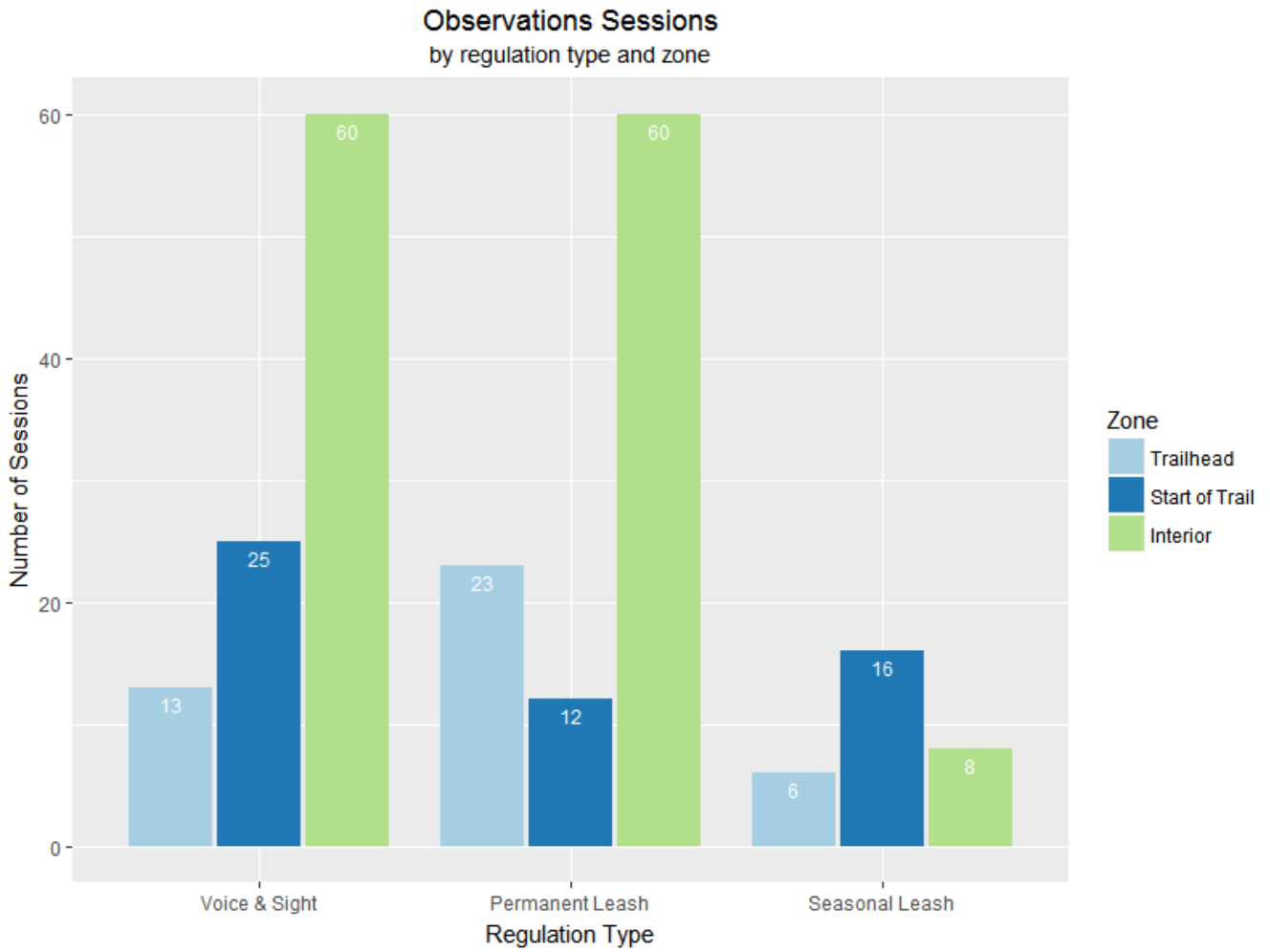
Figure 3 Distribution of observation sessions for each monitoring component, grouped by trail zone.
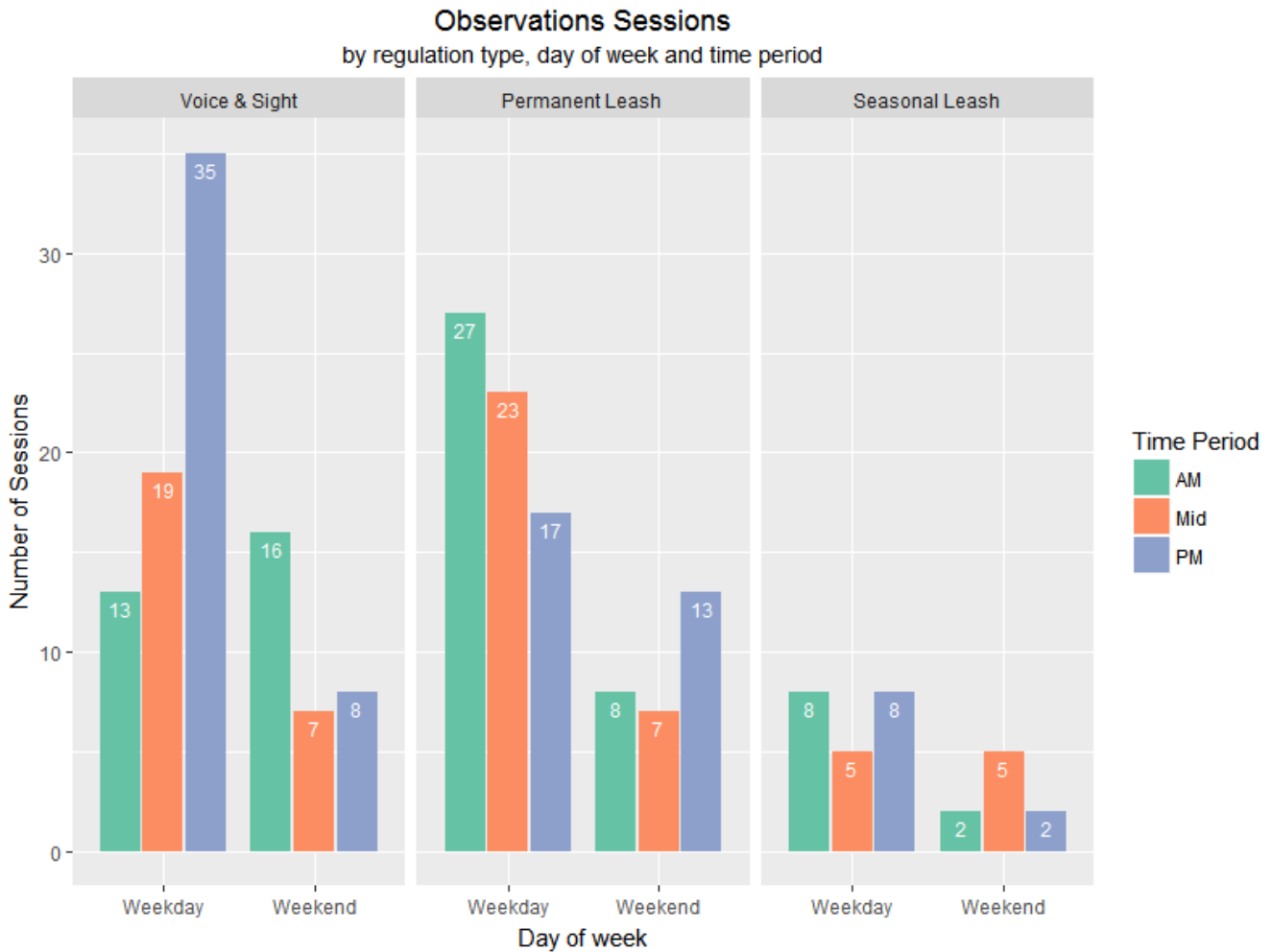
Figure 4 Distribution of observation sessions for each monitoring component, grouped by weekend/weekday and time period of the day.

Each observation session was conducted for a 3 hour period. Over the course of the 2016 monitoring cycle, staff conducted a total of 98 observation sessions for the voice and sight component, 95 for the permanent leash required component, and 30 for the seasonal leash required component. Three primary field staff conducted the majority of collections for a combined total of roughly 670 hours total observation time.

3.2.2 Visitor party demographics

The total number of visitor parties observed by staff was 337 for the voice and sight component, 326 for the permanent leash required component, and 209 for the seasonal leash required component (Figure 5). For all three components, hikers were the largest activity group and runners were the second. Roughly 77% of visitor parties had only one dog, 20% had two dogs, and 3% had three dogs Table 4.

Number of visitor parties
by monitoring type
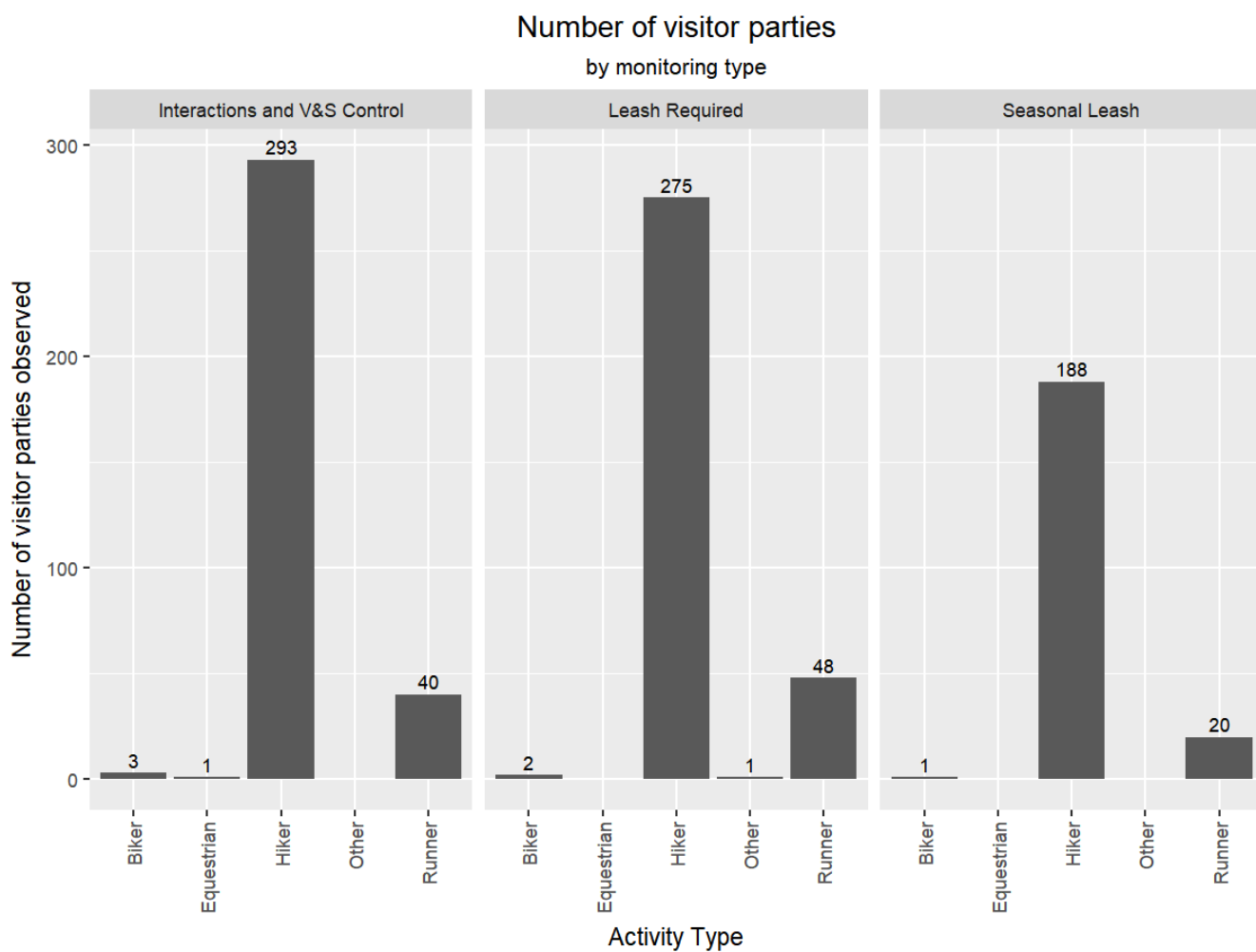
Figure 5 Distribution of visitor parties for each monitoring component, grouped by primary activity of the visitor party.

Table 4 Number of off-leash dogs by visitor party.

Number of off-leash dogs	Number of visitor parties	Total number of dogs	Percent of Observed parties
1	260	260	77.1%
2	67	134	19.9%
3	10	30	3.0%
Total	*337*	*424*	*100%*

3.3 VOICE AND SIGHT REGULATIONS

3.3.1 Overall compliance rate

The overall Tag Program compliance rate for the voice and sight regulation component was 68% (95% CI, 63.9 to 74.0). Table 5 shows compliance rates for all monitored years between 2006 and 2016. The 2016 cycle, like previous monitoring cycles, had unsure tag identifications where the observer could not definitively confirm the presence or absence of a voice and sight dog tag.

Table 6 shows compliance rates for all monitoring years with the unsure category normalized, using procedures outlined below, which puts the compliance rate for 2016 within one percent of the overall 2014 rate.

Table 5 Overall compliance rates for 2006, 2007, 2010, 2014 and 2016.

Compliance Category	Monitoring Year				
	2006	**2007**	**2010**	**2014**	**2016**
Noncompliant	34%	40%	37%	31%	24%
Compliant	66%	49%	53%	61%	52%
Unsure[i]	n/a	12%	10%	9%	23%

i Due to unsure tag display on one or more dog in the visitor party

Table 6 Overall compliance rates for 2006, 2007, 2010, 2014 and 2016 (normalized without unsure).

Compliance Category	Monitoring Year				
	2006	**2007**	**2010**	**2014**	**2016**
Noncompliant	34%	45%	41%	34%	32%
Compliant	66%	56%	59%	67%	68%

3.3.2 Tag display

For tag display, staff observed a total of 337 visitor parties. A visitor party was considered compliant if *all* off-leash dogs in the party had a tag visibly displayed. A visitor party was considered noncompliant if *at least one* off-leash dog in the party did not have a tag visibly displayed. A visitor party was considered unsure if at least one off-leash dog had unsure tag display (and the party did not also include a no tag display dog).

Of the 337 visitor parties observed, 190 had tags visibly displayed for all off leash dogs, for a compliance rate of 56% (95% CI, 50.9 to 61.7) (Table 7). For the tag display component, observers noted a number of visitor parties where they could not definitively confirm the presence or absence of a tag and thus recorded the tag status as unsure. In these instances, visitor parties were only reported as unsure if the observer was unable to confirm tag presence or absence. If there were any no tag dogs in the visitor party, the party was evaluated as noncompliant.

Table 7 Compliance of visitor parties (n=337) and dogs (n=424) with voice and sight tag display.

Compliance Category	Visitor Parties		Dogs	
	Number	Percent	Number	Percent
Compliant	190	56%	246	58%
Noncompliant	67	20%	78	18%
Unsure	80	24%	100	24%

3.3.3   Within sight

Staff observed 8 out of 337 visitor parties where one or more dogs were out of sight in the observation zone on one or more occasions, resulting in a compliance rate of 98%.

Table 8 Number and compliance outcomes with the out of sight regulation at the visitor party level.

Year	Visitor Parties	Out of sight	Compliance
2014	310	21	93%
2016	337	8	98%

3.3.4   No more than 2 dogs off leash

Compliance with the requirement for no more than two off leash dogs per guardian was 99% for all visitor parties observer (with at least one off-leash dog) and 76% for parties with three or more total dogs in the visitor party (Table 9). Due to limitations in the observer's ability to attribute guardianship of dogs to specific people in the visitor party, compliance for parties with three or more dogs was evaluated by comparing the ratio of off-leash dogs to number of adult persons in the visitor party. If the number of off leash dogs is greater than two times the number of adults, the visitor party is considered non-compliant. Out of 337 visitor parties, 17 had more than two dogs per guardian, with 4 of those 17 exceeding two off-leash dogs per guardian.

Table 9 Number and compliance outcomes with the no more than 2 dogs off-leash regulation.

Year	Visitor Parties[i]	> 2 dogs off leash	Compliance Parties with > 2 dogs	Compliance Parties with >=1 dogs[ii]
2014	8	7	12%	98%
2016	17	4	76%	99%

i Only includes visitor parties with 3 or more dogs in the visitor party
ii Includes all visitor parties observed with 1 or more off-leash dogs

3.3.5 Charging or chasing

Person and dog

For charging, chasing, or aggressive behaviors, compliance was 99% including both passes and interactions and 98% for interactions only (Table 10). Compliance for this measure is reported at the visitor party level, grouped by the type of event. Out of the 337 visitor parties observed, there were 224 unique combinations of visitor parties and types of events. A visitor party could have multiple events, but those events were grouped by the type of opportunity within that specific visitor party. For example, if the dog in the visitor party under observation had recorded events for two opportunities involving a person and dog and three opportunities involving only a person, they were reported once within each category. Using the same scenario, if at least one of the three events involving only people resulted in an interaction, that visitor party would be reported in the "Person interactions" category; either as no violation or a violation depending on the outcome of that type of event.

Table 10 Number and compliance outcomes by type of event (at the visitor party level).

Type of event/ visitor party level	No violation	Violation[i]	Total	Compliance both	Compliance interactions only
Person passes	110	n/a	110		
Person interactions	39	0	39		
Person & dog passes	31	n/a	31		
Person & dog interactions	31	1	32	99%	98%
Observer passes	1	n/a	1		
Observer interactions	10	1	11		
Total	*222*	*2*	*224*		

i All pass events are compliant by default and have therefore been reported as n/a rather than zero

Dog only

There were observed events where only a dog in the receiving party (with no people in proximity) was the opportunity. All opportunities that involved one or more dogs in party B also included at least one proximate person and thus were reported as a pass or interaction under the *person & dog* category in Table 10.

Wildlife and livestock

During 2016, no events involving livestock were observed and only four events involving wildlife. For wildlife events, two visitor parties were observed as having an opportunity, but no interaction, between the dog(s) under observation and the wildlife occurred. Of the remining two visitor parties, both resulted in interactions between the dog and wildlife. In one instance, the dog was off trail and attentive to the wildlife, but did not

chase. In the other instance, the dog in the visitor party chassed the wildlife with multiple failed attempts to recall the dog by the guardian. Given the low sample size, there are too few observations to make any statistical claims regarding compliance frequencies for dogs chasing wildlife.

However, it is worth noting that after almost 300 hours of observation for the voice and sight component, the low frequency of occurrences suggests that opportunities for wildlife interactions may generally be rare to begin with on many voice and sight trails.

It is worth noting that because Voice and Sight observations only occur on designated Voice and Sight trails, there is some pre-existing selection within the regulatory system for areas with lower chance of wildlife encounters. By comparison, trails in Habitat Conservation Areas (HCA) likely have higher probabilities for wildlife encounters. However, HCAs are almost exclusively permanent leash required so were not observed using the Voice and Sight observation methodology.

3.3.6 Voice Recall

Voice recall had an overall compliance rate of 63% (95% CI, 42.5 to 79.9) when aggregated to the visitor party level (Table 11). Due to the low sample size (n=27), this measure has a wide 95% confidence interval. The Voice and Sight result category includes only commands that could be definitively related to a Voice and Sight command, such as "come" or "here". Other phrases such as "hey" or only the dog's name were considered other command attempts and reported separately. Combined, the overall compliance for any command type issued is 72% (95% CI, 57.1 to 83.9).

Table 11 Number, type of event, and compliance outcome for command events (at the visitor party level).

Command Type	Type of Event	No Violation	Violation	Total	Compliance Rate
Voice & Sight	Pass	6	1	7	85%
	Interaction	10	9	19	53%
	Isolated	1	0	1	100%
	Subtotal	*17*	*10*	*27*	*63%*
Other	Pass	7	1	8	88%
	Interaction	9	2	11	82%
	Isolated	1	0	1	100%
	Subtotal	*17*	*3*	*20*	*84%*
	Total	*34*	*13*	*47*	*72%*

Dog excrement pickup and removal

Dog excrement pickup and removal (B.R.C. 6-1-18 Removal of Animal Excrement Required) is not a specific requirement of the Voice and Sight Tag Program but the observation methods did offer an opportunity to record these events alongside the primary data collection. Compliance with the regulation requires that a dog guardian bag and take with them the dog excrement. Bagging the dog excrement but leaving it on the trail is not

compliant with removal regulation. Out of 19 observed dog poop events, 17 visitor parties bagged their pet waste and 11 bagged and took it with them immediately. Compliance frequencies have not been reported as the small sample size resulted in a wide confidence interval. Furthermore, the location of observation zones - generally interior of the trailhead where dogs are more likely to defecate - makes it difficult to generalize these observations back to the greater population.

3.4   PERMANENT LEASH REQUIRED
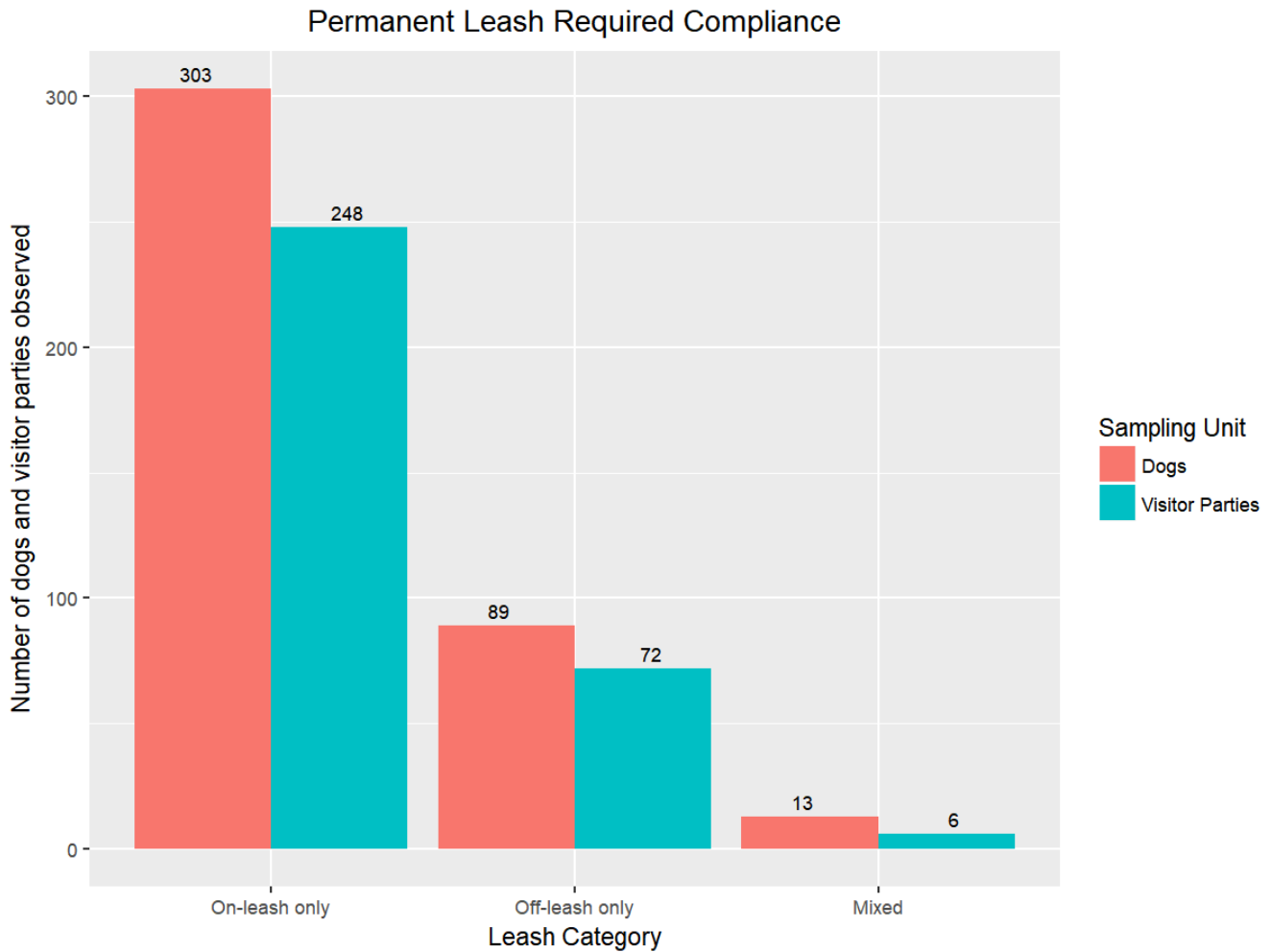
Figure 6 Number of visitor parties and dogs observed by leash status for the permanent leash required component.

Out of 326 visitor parties observed, 248 had all dogs on leash for an overall compliance rate of 76% (95% CI, 71.0 to 80.5) (Figure 6). Some visitor parties had a mix of on and off-leash dogs, which have been reported in a separate "Mixed" category. However, to be compliant with leash regulations on leash required trails all dogs, regardless of tag status, must be on a leash. Figure 7 shows the number of visitor parties and dogs further broken out into tag status of dog in the visitor party by leash status.

Figure 7 Number of visitor parties and dogs observed by leash and tag status for the permanent leash required component.

3.5 SEASONAL LEASH REQUIRED

Seasonal leash regulations to reduce wildlife conflict are in place on a number of trails between August 15th and November 1st. These trails are distinct from permanent leash required trails in that they operate under Voice and Sight for the majority of the year, with seasonal leash requirements to help reduce conflict with wildlife. During the 2016 cycle staff continued collection efforts past the primary collection period, which allowed OSMP to evaluate late season seasonal leash trails for bear closures. Staff observed 209 visitor parties of which 130 had all dogs on leash for an overall compliance rate of 62% (95% CI, 55.2 to 68.7) (Figure 8).

As with the permanent leash required observations, some visitor parties had a mix of on and off-leash dogs. Figure 9 shows the number of visitor parties and dogs further broken out into tag status of dog in the visitor party by leash status.
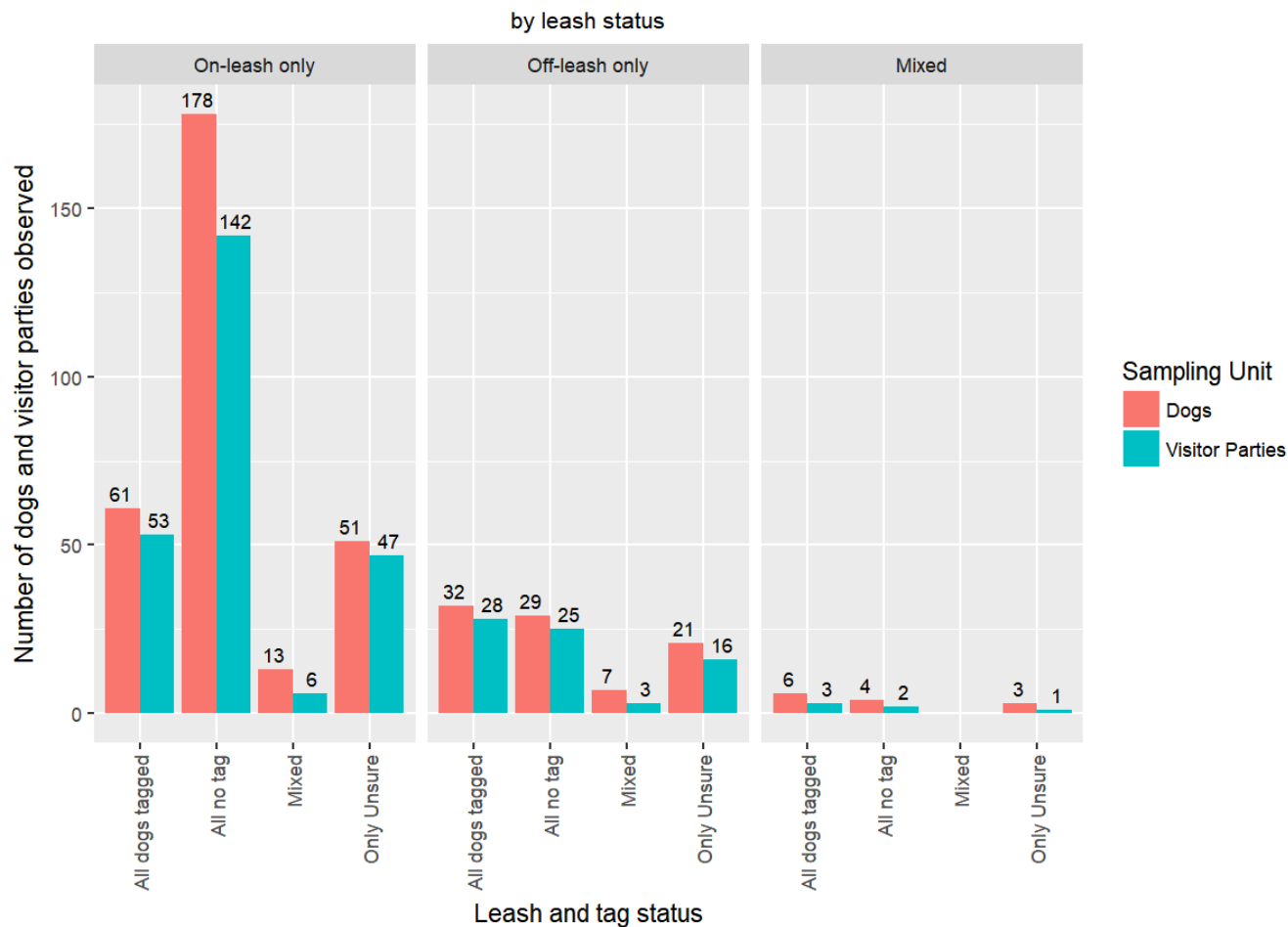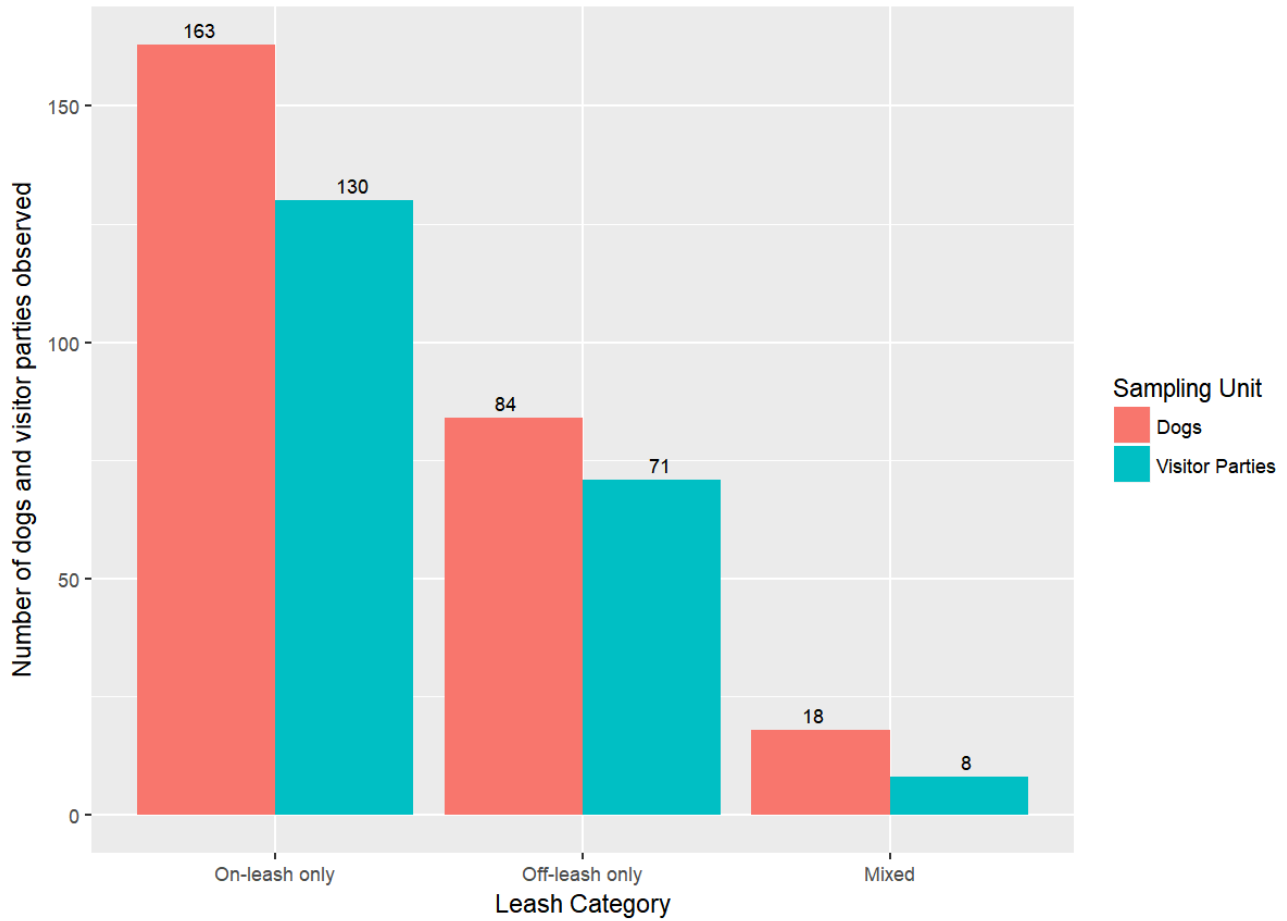
Figure 8 Number of visitor parties and dogs observed by leash status for the seasonal leash required component.
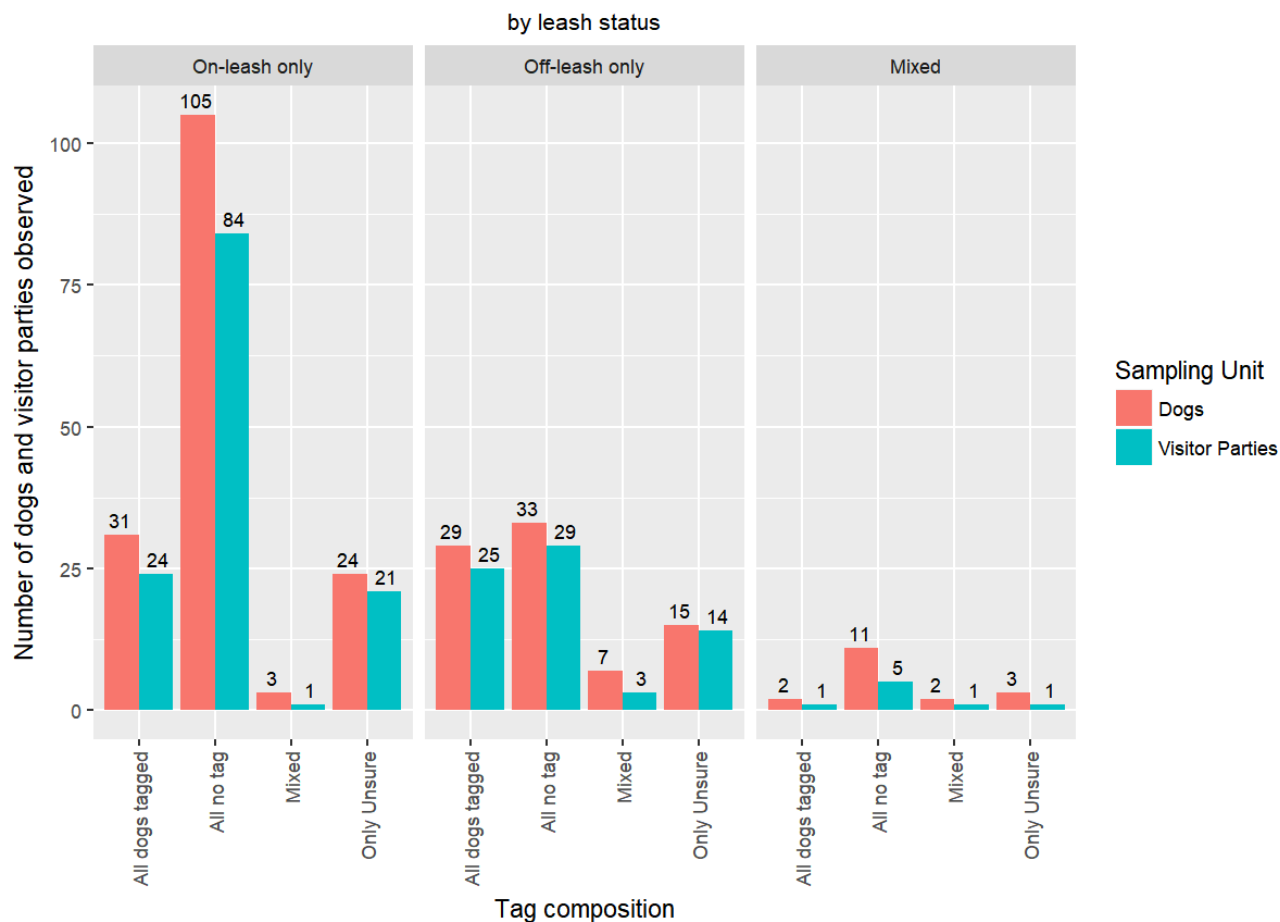
Figure 9 Number of visitor parties and dogs observed by leash and tag status for the seasonal leash required component.

4   DISCUSSION

The Tag Program monitoring structure is designed to assess compliance with dog regulations across the OSMP system. Observations for the voice and sight, permanent leash required, and seasonal leash required components were conducted at randomly selected locations and times across the system between mid-June and mid-October 2016. While the sample sizes obtained for most measures are adequate to evaluate system-wide compliance, they are too small to calculate statistically confident site-specific compliance. Any findings from this report as well as past or future voice and sight monitoring reports should be read in the context of system-wide compliance and trends.

The overall Tag Program compliance rate for 2016 was 68% (95% CI, 63.9 to 74.0), which is within one percent of the 67% overall compliance rate measured in 2014. Compliance on individual measures for 2016 ranged between 56% (no more than 2 dogs off leash) to 99% (charging, chasing, or otherwise displaying aggression toward any person). These results vary widely so it is worth considering some of the specific factors that may be influencing the findings for each component.

4.1   VOICE AND SIGHT REGULATIONS

Overall compliance for the Tag program was estimated between 56% and 66% between 2006 and 2010, 67% for 2014, and 68% for 2016 (Table 6). While this indicates a slight trend toward better compliance, it is important to note that overall compliance requires successful compliance will all components of the voice and sight

requirements. Compliance for individual components may change significantly between monitoring cycles, even if the overall compliance does not. Primary components of the Voice and Sight Tag Program include tag display, keeping dogs within sight, non-aggressive behaviors, voice and sight recall, and not chasing wildlife. Each of these components vary in both level of occurrence on the system and compliance outcomes.

For example, the tag display component had a compliance rate of 58% (Table 7) with staff positively confirming a total of 190 out of 337 visitor parties displaying tags on all dogs. The tag component also had the greatest total number of noncompliant (67) and unsure (80) visitor parties out of any category. The lack of tag display may be attributed to any number of factors including guardians who have never participated in the program or guardians who have participated but have lost or not replaced their tags.

Other components however showed much higher compliance rates such as keeping dogs within sight at 98% (Table 8) or not charging, chasing, or harassing people or dogs at 99% (

Table 10). When considering the not charging, chasing, or harassing people or dogs measure, it should be noted that this measure was evaluated based on the displayed behaviors of the dog in the party under observation and the response behaviors of the receiving party. When observing responses from people or dogs in the receiving party, staff recorded any clear verbal or physical protests or avoidances to the initiating dog. These behaviors were considered in context by the review panel and were used in the determination of behavioral compliance for the event. To maintain a high degree of objectivity, if clear verbal or physical behaviors were not demonstrated by people or dogs in the receiving party, staff did not attempt to make any interpretation about how the receiving party perceived the interaction.

Three components of potential concern include no more than two dogs off leash at 76% (Table 9) for parties that had more than 3 dogs, chasing wildlife, and voice commands at 63% (Table 11). For each of these components, the compliance rates have been reported only for visitor parties that had an opportunity to demonstrate compliance with each measure. For chasing wildlife, only four visitor parties were observed within proximity of visible wildlife, with two dogs demonstrating pass events and two interacting with wildlife. Of the two that interacted, one resulted in a clear violation with the dog chasing wildlife and multiple failed recall events. For wildlife, events are considered interactions if the dog moves off trail and demonstrates directional eye gaze and body alignment toward the wildlife. For all three of the components described above, the sample sizes were small. However, the results indicate that compliance may be of concern. These components should be further studies but may necessitate more targeted monitoring efforts to get the requisite sample sizes necessary to calculate statistically confident figures.

4.2   PERMANENT LEASH REQUIRED
The permanent leash required component had a compliance rate of 76%, with 248 out of 326 visitor parties having all dogs on leash when they passed the observation transect (Figure 6). Of the visitor parties that did not have all dogs on a leash, 72 had no dogs on-leash while 6 had a mix of on and off-leash. When further broken down by tag status, within the off-leash only category, roughly and equal number of visitor parties had all dogs with tags (28) and no dogs with tags (25) (Figure 7).

4.3   SEASONAL LEASH REQUIRED
The seasonal leash required component had a compliance rate of 62%, with 130 out of 209 visitor parties having all dogs on leash (Figure 8). This is lower than the 76% observed on permanent leash required trails. However, similar to the permanent leash required, when further broken out by tag status, roughly an equal number of visitor parties had all dogs with tags (25) and no dogs with tags (29) within the off-leash only category (Figure 9).

5 RECOMMENDATIONS

Given the results from the 2016 monitoring cycle, staff have developed the following preliminary recommendations which fall into two primary categories: Tag Program recommendations and recommendations for the upcoming 2018 monitoring cycle.

5.1 TAG PROGRAM RECOMMENDATIONS

Compliance rates vary among measures, with overall compliance shifting only marginally between monitoring years, it may be most useful to focus recommendations for program modification on specific components of dog management. For example, tag display is largely administrative in nature while following charging or chasing wildlife and livestock is skills based on the part of the guardian. By focusing future modifications on specific components of dog management, rather than trying to address all components in combination, targeted treatments can be developed.

1. Increase outreach and education to non-participating dog guardians who visit OSMP (those who are not displaying a voice and sight tag) that currently let their dogs off-leash to increase participation in the program.
2. Clarify regulatory sign language to make it clearer that guardians must be actively participating in the program to manage their dogs off-leash
3. Increase education in the voice and sight class regarding the purpose for permanent and seasonal leash required trails. At current, roughly half of non-compliant visitor parties in the leash required monitoring were noted as having a voice and sight tag. 2019 will be the first year of the mandatory 5 year refresher course, so results from the previous 2014 and 2016 monitoring, along with the upcoming 2018 monitoring, can help inform this recommendation.
4. Develop sample methods that account for the unequal distribution of wildlife across the system to increase sample size for assessing the degree of charging and chasing wildlife.

5.2 2018 MONITORING RECOMMENDATIONS

This monitoring project was implemented using protocols developed and first implemented in 2014. The 2016 monitoring cycle was the second of three planned monitoring cycles, with the third to be competed in 2018. As such, the following recommendations are focused on improvements to the monitoring framework that can be enacted within the bounds of the current monitoring protocol. This will ensure comparability between all three monitoring cycles to the highest degree possible. Primary recommendations for 2018 include:

1. Increase sample size by extending monitoring period to April – September to better account for seasonal variation in dog visitation
   - While the sample size for the Voice and Sight component was large enough to support analysis of overall compliance, specific components had too small a sample to produce statistically reliable findings. This is due to the fact that certain behaviors, such as voice commands and wildlife encounters, only occur for a small subset of observations where the conditions provide the opportunity for those behaviors to be expressed. At this time, increasing the number of observational sessions by extending to more months of the year offers the best chance of increasing the number of observations for these low frequency events.
2. Conduct more extensive technician training and observational pre-testing to increase definitive tag presence identification
   - 2016 had a larger number of visitor parties categorized as unsure tag status. There are some practical and relatively straightforward improvements that can be made prior to conducting the 2018 study to try and decrease this uncertainty. One challenge is the distance staff must observe from in order to maintain a continuous field of view of the visitor party. Better optics

(binoculars) should assist staff with making positive identifications of tag status. In addition, seasonal staff will receive more extensive training to help increase confidence and consistency in tag identification.

3. Repeat seasonal leash required monitoring component
   - 2016 was the first year that seasonal leash required trails were sampled. Results indicated that compliance on seasonal leash trails was lower than on permanent leash trails. Staff highly recommend repeating this component again for 2018 to gather at least two years of data for trend comparison. The longer duration of the 2018 observation period will allow staff to capture early season breeding bird closures in addition to repeating late season bear closures.

4. Re-test observer variability and review methods during each data collection interval
   - Observer variability testing will be repeated as a standard component of the pre-collection training for all new staff. In addition to early season testing, staff will conduct periodic observer variability tests throughout the monitoring period since it will occur over an extended time period.

5. Refine analysis techniques and database structure
   - The data collected for this monitoring program are complex both in acquisition and storage. Staff will continue to refine the analysis techniques and database structures for the Voice and Sight monitoring program in order to increase processing efficiency and delivery of results from the program.

In 2018, staff will be conducting the third and final (as currently planned) cycle of the Voice and Sight Monitoring Program. The 2018 round of monitoring will occur approximately three years after the implementation of the 2015 Tag Program enhancements and will provide a quantitative assessment of any measurable improvements to system-wide compliance as a result of program enhancements. In preparation for the release of results from the 2018 monitoring, OSMP staff will convene a multi-disciplinary group to review findings from the three monitoring cycles and develop recommendations for future Tag Program modifications and opportunities.

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7 ACKNOWLEDGEMENTS

APPENDIX A

GLOSSARY OF TERMS

Definitions used in this report are modified specifically for the purpose of the dog management monitoring project and should not be considered universal except for those quoted from the Boulder Revised Code.

Boulder Revised Code – Animal Control Related
6-1-2 Definitions

http://www.colocode.com/boulder2/chapter6-1.htm#section6_1_2

"Guardian" means owner.

"Leash" means a chain, rope, cord, or strap with a clip or snap for rapid attachment to a choke chain, collar, or harness, all the parts of which are of sufficient strength to hold at least four times the weight of the dog and are suitable for walking the dog and controlling it.

"Owner" means each person who owns an animal. If an animal has more than one owner, all such persons are jointly and severally liable for the acts or omissions of an animal owner under this chapter, even if the animal was in possession and control of a keeper at the time of an offense.

"Voice and sight control" means the ability of a guardian or keeper to adequately control a dog by using voice commands and sight commands (such as hand gestures). In order for a guardian or keeper to have voice and sight control over a dog, the guardian or keeper must: (1) be able to see the dog's actions; and (2) be able to prevent the dog from engaging in the following behaviors, using voice and sight commands, without regard to circumstances or distractions:

a) Charging, chasing or otherwise displaying aggression toward any person or behave toward any person in a manner that a reasonable person would find harassing or disturbing;
b) Charging, chasing or otherwise displaying aggression toward any dog;
c) Chasing, harassing or disturbing wildlife or livestock; or
d) Failing to come to and stay with the guardian or keeper immediately upon command by such person.

Other Terms
Event: A unit of observation developed to define the parameters for which an observation is separate from another or the next observation and to define one line item from the next on the datasheets. Events can be passes, interactions, commands given or out of sight occurrences.

Field of view/Observation zone: The extent of the landscape to be included in the observation. The field of view includes areas off-trail within the observation zone typically within 180° equidistant from the observer and to include the depth of field as defined by the flushing distances of wildlife species included in this study. The field of view is also defined by the typical visual and auditory observation abilities of a field technician.

Frequency distribution: The number or percent of subjects within each possible response for a particular variable.

Inter-rater or Inter-observer reliability: The degree to which different raters/observers give consistent ratings/estimates of the same phenomenon using the same rating system; variation which occurs between observers when collecting and interpreting field data.

http://www.socialresearchmethods.net/kb/reltypes.php

Naturalistic observation: A research method commonly used by psychologists and other social scientists which involves observing subjects in their natural environment. This type of research is often utilized in situations where conducting lab research is unrealistic, cost prohibitive or would unduly affect the subject's behavior. http://psychology.about.com/od/nindex/g/naturalistic.htm

Out of sight: The dogs in a visitor party are not within the immediate 360° field of view of the guardian(s) at all times.

Recreation setting: A combination of the physical, biological, managerial and social conditions within a recreation area that give value to a place (Clark and Stankey 1979).

Reliability: The extent to which an experiment, test or any measuring procedure yields the same result on repeated trials. http://writing.colostate.edu/guides/page.cfm?pageid=1386

Sampling Frame: The sampling frame consists of two components: 1) All the OSMP trails with designated dog opportunities meeting our selection criteria and 2) All the dates and time periods within the data collection period.

Target Population: The group of interest to be investigated.

Validity: The degree to which a study accurately reflects or assesses the specific concept that the researcher is attempting to measure.

Visitor trip: A trip to the study area, regardless of how much time a visitor spent on OSMP during their trip.

Voice and Sight Tag Program: An OSMP program designed to certify dog guardians' understanding of what "voice and sight" dog management means while visiting OSMP lands. After watching a video demonstrating what voice and sight dog management means, a dog guardian can purchase a tag for their dog allowing them to manage their dog under voice and sight control in designated areas.

APPENDIX B

VOICE AND SIGHT MONITORING LOCATIONS

Table 12 List of 2016 Voice and Sight monitoring locations including the number of sessions conducted and visitor parties ultimately observed at each location.

Site ID	Site Name	Trail Location	# Sessions Conducted	# Visitor Parties Observed
807	Amphitheater Trail	Start of Trail	2	2
795	Anemone Trail	Interior Trail	6	2
788	Bluebell - Baird Trail	Interior Trail	1	2
787	Bluebell Road	Interior Trail	1	11
801	Bobolink Trail New	Start of Trail	3	28
832	Centennial Greenway	Start of Trail	2	3
805	Centennial TH	Trailhead	1	6
785	Cobalt Trail	Interior Trail	2	3
822	Contact Corner Trail + Spurs	Start of Trail	1	1
829	Cottonwood Trail	Start of Trail	1	5
824	Crown Rock TH	Trailhead	1	0
823	Crown Rock Trail	Start of Trail	2	0
846	Doudy Draw TH	Trailhead	1	0
798	Eagle Shelter	Interior Trail	1	0
780	Eagle TH	Trailhead	1	3
769	East Ridge Trail	Interior Trail	2	9
786	Enchanted Mesa Trail	Interior Trail	2	6
844	Goat Trail	Start of Trail	1	0
809	Fern Canyon Trail	Interior Trail	1	0
775	Fern Meadow - Cragmoor Trail	Start of Trail	1	0
773	Flagstaff Trail	Interior Trail	1	1
772	Flatirons Loop Trail	Interior Trail	1	4
839	Flatirons Vista TH	Trailhead	1	4
838	Flatirons Vista Trail	Interior Trail	1	2
826	Foothills TH New	Start of Trail	1	0
774	Four Pines Trail	Start of Trail	1	5
845	Fourmile Creek Greenway	Interior Trail	1	7
842	Greenbelt Plateau TH	Trailhead	1	0
843	Greenbelt Plateau Trail	Interior Trail	1	0
767	Gregory Canyon Trail	Interior Trail	2	15
830	Gunbarrel Trail	Interior Trail	2	4
815	Hidden Valley Trail	Interior Trail	1	0
768	Homestead Trail	Interior Trail	1	5
790	Kohler Mesa Trail	Interior Trail	1	0
776	Lehigh Connector - South Trail	Start of Trail	1	3

Site ID	Site Name	Trail Location	# Sessions Conducted	# Visitor Parties Observed
811	Mallory Cave Trail	Interior Trail	1	0
806	Marshall Mesa TH	Trailhead	1	7
818	Mesa Reservoir Trail	Interior Trail	2	0
782	Mesa/Enchanted Mesa	Interior Trail	2	37
810	Mesa/N. Shanahan	Interior Trail	2	0
777	Mt Sanitas Trail	Start of Trail	2	19
837	Prairie Vista Trail	Start of Trail	2	0
812	Realization Point TH	Trailhead	1	2
797	Sage TH	Trailhead	2	7
784	Sage Trail	Interior Trail	1	2
804	Sanitas Valley Trail	Interior Trail	2	31
778	Shadow Canyon North	Interior Trail	1	0
808	Shanahan - South Fork Trail	Interior Trail	4	8
802	Shanahan Connector	Interior Trail	1	6
803	Shanahan Ridge	Start of Trail	2	21
835	Skunk Canyon Trail	Interior Trail	1	0
821	South Boulder Creek at EBCC	Interior Trail	2	18
820	South Boulder Creek West TH	Trailhead	2	3
827	South Boulder Creek West Trail	Interior Trail	4	4
800	South Mesa TH	Start of Trail	4	21
781	South Mesa Trail New	Interior Trail	1	1
796	Sunshine Canyon Trail	Interior Trail	1	1
794	Teller Farm TH	Trailhead	1	2
793	Teller Farm Trail	Interior Trail	2	4
789	Upper Chautauqua Trail	Interior Trail	2	9
833	Viewpoint Trail	Interior Trail	2	3

PERMANENT LEASH REQUIRED MONITORING LOCATIONS

Table 13 List of 2016 permanent leash required monitoring locations including the number of sessions conducted and visitor parties ultimately observed at each location.

Site ID	Site Name	Trail Location	# Sessions Conducted	# Visitor Parties Observed
22	Bear Peak West Ridge/Bear Canyon	Interior Trail	4	3
27	Boulder Creek Path - Foothills	Interior Trail	3	15
203	Buckingham Park	Trailhead	2	4
24	Cherryvale TH	Trailhead	4	0
19	Cottontail Trail	Interior Trail	1	7
20	Cottonwood TH	Trailhead	4	21
8	Cowdrey Draw	Interior Trail	2	1
6	Dakota Ridge Trail	Start of Trail	4	47
12	E.M. Greenman	Interior Trail	1	3
18	East Boulder - Teller Lake ADA	Interior Trail	5	3
200	Eldorado Canyon Trail	Interior Trail	1	0
14	Foothills South/Old Kiln	Interior Trail	1	14
7	Fowler Trail	Start of Trail	2	6
11	Green Mountain West Ridge/Green Bear	Interior Trail	6	9
9	High Plains Trail	Interior Trail	1	0
199	Homestead Leash Trail	Interior Trail	5	35
28	KOA Lake Greenway	Interior Trail	3	0
23	Lefthand Trail	Interior Trail	3	1
17	Lefthand Trailhead	Trailhead	2	0
204	Lost Gulch Trail	Trailhead	8	17
25	Lower Big Bluestem/Bluestem Connector	Interior Trail	6	16
197	Marshall Lake Lookout	Interior Trail	2	2
202	Old Kiln Trail	Interior Trail	2	6
29	Old Mesa Trail	Interior Trail	4	0
26	South Boulder Creek Greenway	Start of Trail	2	0
10	Spring Brook Loop North	Interior Trail	3	2
21	Wonderland Hill Trail	Start of Trail	5	25
15	Wonderland Lake TH	Trailhead	3	61
16	Wonderland Lake Trail	Interior Trail	6	28

SEASONAL LEASH REQUIRED MONITORING LOCATIONS

Table 14 List of 2016 seasonally leash required monitoring locations including the number of sessions conducted and visitor parties ultimately observed at each location.

Site ID	Site Name	Trail Location	# Sessions Conducted	# Visitor Parties Observed
195	Amphitheater Trail	Start of Trail	5	32
34	Baseline/Bluebell-Baird	Trailhead	6	62
31	Doudy Draw Trail	Interior Trail	4	24
35	Gregory Canyon Trail	Start of Trail	8	61
36	Saddle Rock Trail	Start of Trail	2	4
33	Skunk Canyon Trail	Interior Trail	4	26