

# Draft 2017 System-Wide Visitation Estimates for the Master Plan System Overview

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Analysis summary

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## ABSTRACT

The preliminary results of this analysis indicate that system-wide visitation has increased from approximately 4.68 million visits in 2005 (95% CI, 4.38 – 5.00 million) to 6.25 million visits in 2017 (95% CI, 5.5 – 7.0 million), roughly a 34% increase over the last 12 years<sup>1</sup>. Over the same 12-year time frame, the percent of nighttime use decreased from 1.40% of total annual visitation in 2005 to 0.66% in 2017, from around 65,520 to 41,250 annual visits, respectively. Annual dog visitation in 2017 is estimated to be between 15% and 30% of annual person visits or roughly 930,000 and 1,875,000 annual dog visits. These are considered draft results and a full visitation study, including final visitation estimates for specific sites, will be completed and released by May 2018.

## INTRODUCTION

In 2016, Open Space and Mountain Parks (OSMP) began a multi-year, system-wide, visitation study to establish updated visitation metrics for the OSMP land system. One primary objective of this study is to determine an updated estimate of system-wide visitation, which was last assessed empirically in 2005. As of February 2018, the full dataset from this study is currently in the final stages of analysis. However, several key metrics were prepared for the February 21, 2018 release of the Master Plan System Overview. Selected metrics, which are based on data collected between 2016 and 2017, include: system-wide annual visitation, percent of nighttime use (11pm – 6am), and system-wide annual dog visitation. Note that all metrics are reported in terms of “visits,” which is distinct from “visitors.” Visits refers to unique times that a visitor accesses Open Space and Mountain Parks (OSMP) owned or managed lands. For example, if the same visitor goes for a hike one day and then goes for another hike the following day, the occurrences are counted as two distinct visits.

The following provides a general overview of how visitation was measured and analyzed to produce the current system-wide visitation estimates. A more detailed explanation of methods, including specific examples of analysis steps, will be included in the forthcoming visitation estimate report. The estimates in the report are intended to finalize the estimates reported here.

## METHODS

### Approach

To measure system-wide visitation levels, OSMP used automated trail counters to detect the number of people that passed by a given point on a trail or road. Trail counters were generally placed as close as possible to access points. OSMP defines access points as any point where a person can enter OSMP owned or managed land, typically on a road or trail, and may either be at the beginning of a trail (trailhead) or where a trail transitions onto OSMP land from an adjoining management agency. Counts of the number of people that pass-through access points on the OSMP system are then processed and combined into a model to estimate total system-wide visitation.

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<sup>1</sup> As of 2017, there are approximately 150 miles of designated trails on OSMP lands, up from 130 miles in 2005.

## Sample Design

Between June 2016 and May 2017, OSMP staff deployed automated trail counters at 189 access points on the OSMP land system. Of the 189 selected access points, 48 received continuous monitoring for a minimum of one *annual* (356 days) cycle. The remaining 141 *temporary* locations were monitoring for a minimum of two weeks (14 days).

## Technology

The automated trail counters utilized for this study were primarily TRAFx passive infrared units (Figure 1) with a few TrailMaster active infrared units also deployed at select locations. One Eco-Counter unit was also utilized on a Greenway multi-use path that is managed by OSMP. All automated trail counters, regardless of technology type, tend to slightly undercount due to technical limitations of the counters and site-specific environmental factors. To correct for this, staff calibrated each of the 48 annual counters for a minimum of 9 hours using direct observation to record the number of people detected by the counter and the number of actual people that passed by the counter. Calibration observations (observed number of people and detections by the counter) were then modeled using simple linear regression to compute correction coefficients (factors) for each counter, including the 95% confidence interval of the lower and upper correction coefficients.



*Figure 1 Metal enclosure containing a TRAFx trail counter unit, mounted on a post along an OSMP trail/road.*

A simplified calibration method was used for the 141 temporary locations where three cycles of 20 person passes by the counter were recorded. This method provided a simplified correction factor for all the temporary counters, but unlike the simple linear regression method used for the 48 annual counters, 95% confidence intervals cannot be computed.

## Quality Control

All data were manually reviewed by staff for erroneous or missing data that may have resulted from counter malfunctions, environmental issues (weather, bugs, etc.), or vandalism. Erroneous data were flagged and then later cross checked using automated outlier tests. Missing or erroneous data will be replaced using interpolation methods for the final report. However, to calculate the annual system-wide visitation, these data were simply excluded as the remaining valid data provided a sufficient sample size for the analysis methods employed.

## Annual visitation

To estimate system-wide annual visitation, the calibrated and quality-controlled data from the 48 annual and 141 temporary counters were combined into a visitation model. The basic structure of the model involves determining the volume class for each access point and then multiplying the number of access points in each volume class by the mean annual visitation of that volume class. OSMP currently defines four distinct volume classes, which are based on the total annual visitation at the access point (Table 1).

*Table 1 OSMP's volume classes for access points, represented as annual and average daily visitation levels.*

Volume Class	Annual Visitation	Average Daily Visitation (rounded for clarity)
High	> 75,000	> 200
Medium	25,000 – 74,999	70 - 200
Low	10,000 – 24,999	30 - 70
Very Low	1,000 – 9,999	3 - 30

First, the average hourly count for each 24-hour period of the day (1:00, 2:00, 3:00, etc.) is calculated and then summed to compute an average daily count. Second, an estimate of annual visitation is extrapolated by multiplying the average daily count computed in the previous step by 365. The resulting annual visitation number is then used to classify each access point into its corresponding volume class.

For the 48 annual counters, the annual visitation at each location can be extrapolated directly from the average daily count, as the data include counts taken during every month of the year. For the 141 temporary counters, data were collected during shorter periods and during different months of the year. As is the case for many public lands, OSMP's visitation is typically higher during summer months and lower during winter months. To account for the inherent seasonal variation in measurements with the temporary counters, data were seasonally adjusted (weighted) before being extrapolated to an annual visitation estimate. Seasonal weights were computed using data from the 48 annual trail counters.

Finally, a mean annual visitation for each volume class is derived from the subset of 48 annual counters. Because the calibration method utilized for the annual counters includes an upper and lower correction estimate, an upper and lower mean was also calculated for each volume class.

## Nighttime use

Nighttime use was estimated using the subset of 48 annual counters. The annual estimated total visitation was calculated for nighttime hours (11pm – 6am), which is commensurate with the time period used during the 2005 visitation study. Nighttime use was then divided by the total use for a final estimate of 0.66% percent nighttime use.

## Dog visits

OSMP has not conducted any studies to date that were specifically designed to estimate the number of dog visits relative to person visits on OSMP. For the System Overview, dog visitation was estimated using several different data sources, which have provided an estimate range rather than a single figure. The two data sources used to generate dog visitation proportions for this estimate were the 2016-2017 visitation survey and calibration data from the 48 annual trail counters. The survey included questions on how many dogs as well as how many people were in each visitor party that took the survey. By combining the number of dogs in each visitor party with the number of people, a ratio of the number of dogs to people was calculated. This provided a final estimate of 30% dog visits relative to people. Put another way, there are approximately 300 dog visits for every 1000 person visits. Calibration observations for the trail counters, which included a separate field to record the number of dogs observed passing each counter, provided an estimate of 15%, or 150 dog visits for every 1000 person visits. Given the range between these two datasets, 15% has been selected as the lower bound of the dog visitation estimate and 30% as the upper bound.

## RESULTS AND DISCUSSION

### Annual visitation

Preliminary estimates from this analysis place OSMP's annual system-wide visitation around 6.25 million (95% CI, 5.5 – 7.0 million). The previous estimate, conducted in 2005, estimated an annual system-wide visitation of 4.68 million (95% CI, 4.38 – 5.00 million). In general, this represents a 34% increase in system-wide visitation over the last 12 years. Given the large interval between the two collection periods, it is difficult to say exactly what growth looked like on a year-to-year basis.

### Nighttime use

Nighttime use (11pm – 6am) was estimated at 0.66% of total annual use for 2017. This represents a decrease from the previous 2005 estimate of 1.40%. In terms of estimated number of total nighttime visits this also represent a decrease, from roughly 65,520 (95% CI 61,320 - 70,140) in 2005 to 41,250 (95% CI 36,300 – 46,200) in 2017. However, the distribution of nighttime use likely varies somewhat by location. The forthcoming analysis will include site-specific nighttime use estimates for the 48 annual trail counters.

### Dog visits

Dog visits are estimated be an additional 15% to 30% of annual people visitation. Using the central estimate of 6.25 million, dog visitation is between 930,000 and 1,875,000 or roughly 1 to 2 million annual dog visits. At this time, OSMP has limited data from which to estimate the proportion of off-leash visits. The most recent, related data source, is the reported preference for visiting off-leash and on-leash areas from the 2016 Resident Survey. In the resident survey, 59% of respondents indicated they had an equal preference for visiting off-leash or on-leash areas, 28% reported a preference for visiting off-leash areas and 12% for visiting on-leash areas.

## NEXT STEPS

The system-wide estimates that have been compiled for the Master Plan System Overview represent a first draft look at preliminary results of OSMP's most recent visitation study. The annual system-wide estimate of 6.25 million is based on an aggregation of all valid data collected during the year-long data collection period (approximately June 2016 – May 2017). While the percent of valid data remaining after the quality control review was more than sufficient for determining annual level estimates, additional processing steps are necessary before data can be fully analyzed at smaller time scales (weeks/days/hours) and at site specific levels.

Over the next few months, staff will be completing data processing along with a comprehensive analysis of visitation metrics from both the use estimate and survey components of the visitation study. The current timeline for a public release of results for the full visitation study is mid-May 2018. Results from the final use estimate and survey will be posted to the OSMP and Master Plan websites prior to the confirmation of Master Plan focus areas and will be available to help guide conversations during future windows of public engagement for the Master Plan.