OSU Research Forests Recreation Survey Report

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Chad Kooistra, PhD and Ian Munanura, PhD

Oregon State University
College of Forestry

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Introduction

Oregon State University (OSU) College of Forestry's Research Forests are a special resource for OSU, community members across the greater Corvallis region, and visitors from many other places. The Forests offer many activities that include logging, education and instruction, research, and a variety of recreation opportunities. The McDonald and Dunn Forests are part of the OSU Research Forest system and encompass approximately 11,250 acres of land surrounded mostly by private landowners. According to previous estimates, at least 11,000 people visit the McDonald and Dunn Forests each year resulting in more than 100,000 non-motorized recreation visits annually and these numbers are likely increasing (Needham & Rosenberger, 2011). Forest managers and administrators recognize and value the recreation opportunities within these Forests and the need to develop and foster strong relationships with neighboring landowners. Indeed, the 2005 Research Forests Management Plan states two pertinent goals:

- *"Provide safe, quality recreation opportunities, compatible with College Forest characteristics and other goals."*
- *"Proactively establish, maintain, and enhance good relationships with neighbors and others connected with College Forest properties."*

Visions for collaborative forest and recreation management on the OSU Research Forests have continued to be refined in the past 10 years through various efforts including surveys of *onsite* visitors in 2009, focus groups with key stakeholders in 2014, and the subsequent development of management documents (e.g., 2016 Recreation and Engagement Goals and Objectives document, 2015 Recreation Collaborative Recommendations Report, 2015 Interpretive Plan and Style Guide, and a recent 5-year plan). As Forest managers and administrators embrace more visitors and the need for relevant and clear management guidelines, continued monitoring of visitor experiences and their attitudes about recreation and other activities on the Forests remains necessary.

Considering the current trajectory of growth in the OSU and Corvallis populations, demand for recreation will continue to increase. While this presents the OSU College of Forestry with an opportunity to provide social and other benefits to the local community, it also presents recreation managers with multiple challenges. For example, there is additional demand for

parking space at trails heads, toilet facilities, signage infrastructure, trail development and maintenance. Yet, there are limited financial resources for the Recreation and Engagement Program, as all funding for the program is generated through timber harvests on the Forests. Recreation managers at the Forests are faced with difficult decisions to prioritize improvements to recreation facilities and services. To make informed decisions, recreation managers at the Forests need accurate and empirically supported information regarding visitor characteristics, recreation experiences, and the effectiveness of the Forests' information program. This information is important to facilitate planning and decision-making.

According to the 2005 Forest Management Plan, the Forests' managers are directed to assess visitor and adjacent landowner perceptions of recreation experiences and management issues periodically. An *onsite* visitor survey completed in 2009 was an important step in these efforts (Needham & Rosenberger, 2011). Nearly 10 years later, managers sought to develop and implement another similar survey of visitors and Forests-adjacent landowners. Therefore, OSU professors and students collaborated with the Forests' officials to facilitate an *onsite* and *household* survey in 2017 to assess current perceptions of recreation-related issues on the Forests. This document reports on the findings from the 2017 survey project efforts.

Project objectives

Project collaborators identified four main objectives relevant to the 2017 survey:

Objective 1. Determine the characteristics of recreation users and their visits to the Forests

Knowledge of the characteristics of recreation users and their visits to the Forests is valuable to recreation managers. Understanding who the visitors are and how they use the Forests is important for recreation managers to understand the diversity of recreation use and users and provide quality and accessible recreation benefits to all people.

Objective 2: Evaluate recreation use, experience, and preferences

Understanding visitors' recreation experiences and preferences helps managers evaluate the quality of recreation experiences at the Forests and the effectiveness of management actions aimed at improving recreation experiences. It allows managers to plan effectively for preferred recreation use experiences and has significant implications for specific aspects, such as trail signage, education and outreach, and recreation facilities development and maintenance.

Objective 3: Evaluate the Forests' information program

Forest communication plays an important role in increasing recreation users' knowledge and support for the Forests. Forest information is distributed through interpretive programs, interactive programs, and print and electronic media. It is important for managers to understand which information sources visitors prefer for receiving information about the Forests. This helps managers make informed choices about how best to communicate Forest information.

Object 4: Estimate current use levels

Outdoor recreation levels are increasing across the United States as people and communities embrace the many benefits associated with outdoor recreation. Indeed, recreation visitation to the Forests continues to rise. Obtaining accurate and current use level estimates is necessary for managers to make informed decisions as they anticipate future use and issues.

Methodology

This project consisted of two main survey efforts: 1) administering *onsite* questionnaires at various locations as visitors exited the Forest, and 2) administering mail questionnaires with Forest-adjacent *household*s. Throughout this report, these are respectively referred to as the *onsite* and *household* surveys, questionnaires, and/or respondents.

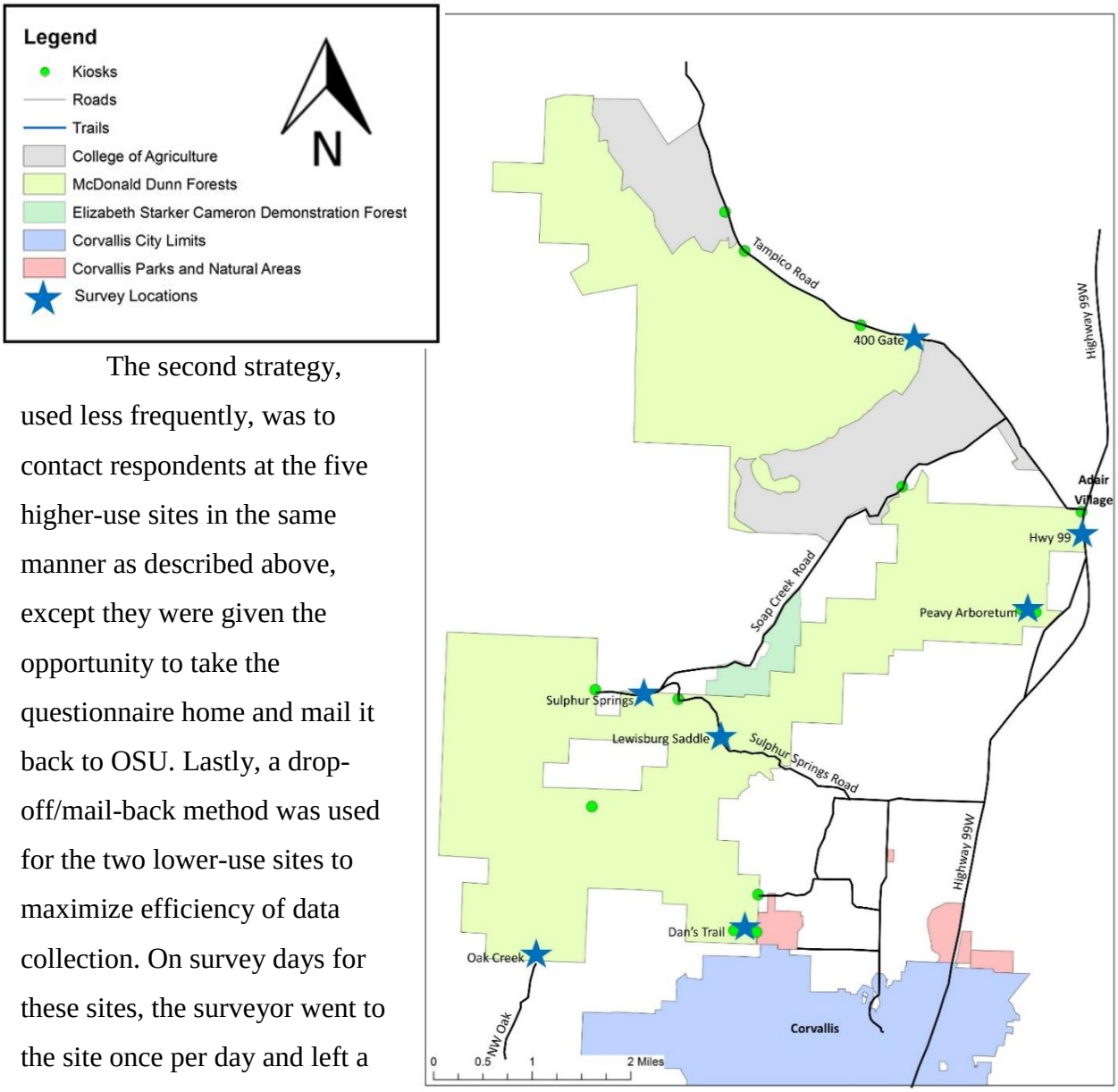
Onsite survey

Seven different parking areas or trailheads on the McDonald and Dunn Forests were selected for contacting visitors as they exited the Forests after recreating there (Figure 1). The sites were selected to represent a range of low-use areas (less than 10-20 visitors/day in the peak season) to high-use areas (20 or more visitors/day in the peak season). Higher use sites include an entrance on Hwy 99, Dan's Trail, Lewisburg Saddle, Oak Creek, and Peavy Arboretum. Lower use sites include Sulphur Springs and Gate 400. Gate 400 was the only site surveyed on the Dunn Forest. These survey sites match the 2009 survey sites to provide a comparison of use levels and recreation experiences across the Forests.

Three different strategies were used to contact visitors at the *onsite* locations. At the five higher-use sites, the primary method was to contact every visitor group as they exited the recreation site. The surveyor approached the group, informed them of the study purpose and asked if the person at least 18 years of age with the nearest birthday would complete the

questionnaire (see Appendix A for script). Most visitors contacted *onsite* who agreed to complete a questionnaire did so immediately and returned the completed questionnaire to the surveyor.

Figure 1. Locations on the Forests for the *onsite* questionnaire distribution



The second strategy, used less frequently, was to contact respondents at the five higher-use sites in the same manner as described above, except they were given the opportunity to take the questionnaire home and mail it back to OSU. Lastly, a drop-off/mail-back method was used for the two lower-use sites to maximize efficiency of data collection. On survey days for these sites, the surveyor went to the site once per day and left a survey packet on each car in the parking area. The packet included a questionnaire, cover letter, and pre-paid return envelope (see Appendix B for the cover letter).

There were a total of 175 survey days. We used a stratified clustered sampling approach (Vaske, 2008) where the strata were trailheads, weekday vs. weekends, and seasons and the clusters were time blocks (morning vs. afternoon). More specifically, we randomly selected

sampling days from each month (Jan. 2017 to Jan. 2018) to represent a mix of weekdays (Monday - Thursday) and weekends (Friday - Sunday and Federal holidays). Sampling times were then selected for morning and afternoon sessions. The morning sampling periods involved contacting recreationists exiting between 7:30am -12:30pm in the fall, 8:00am-12:00pm in the winter, and 8:00am -1:00pm in the spring and summer. The afternoon sampling periods involved contacting recreationists exiting gates between 12:30-5:30pm in fall, 12:00pm – 4:00pm in the winter, and 1:00pm- 6:00pm in the spring and summer. Visitors were not allowed to complete the questionnaire if they had already completed it in a previous visit. See Tables 1 and 2 for the number of survey days at each location organized by morning/afternoon, weekday/end and by season. Survey days were selected using the same method as the 2009 survey so that results could be accurately compared over time.

Table 1. The number of ***ONSITE*** survey days at each location by morning/afternoon and weekday/end

	Number of **morning** survey sessions	Number of **afternoon** survey sessions	Number of **weekend** survey days	Number of **weekday** survey days	**Total number of survey days**
Hwy 99	24	12	12	24	36
Dan's Trail	23	10	23	10	33
Lewisburg Saddle	8	26	12	22	34
Oak Creek	12	24	12	24	36
Peavy	25	11	11	25	36
Total	**92**	**83**	**70**	**105**	**175 days**

Table 2. The number of ***ONSITE*** survey days at each location by season

	Winter	**Spring**	**Summer**	**Fall**	**Total number of survey days**
Hwy 99	9	9	9	9	36
Dan's Trail	7	8	9	9	33
Lewisburg Saddle	7	9	9	9	34
Oak Creek	8	10	9	9	36
Peavy	9	9	9	9	36
Total	**40**	**45**	**45**	**45**	**175 days**

Household survey

To account for users who access the Forests from their properties, a random sample of Forest-adjacent landowners were selected to participate in the survey. A sample frame of 500 addresses that were within 750 feet of the Forests' boundaries was developed using publicly available records obtained through the Benton County Planning Division. Of these 500

addresses, 95 addresses were removed due to outdated information or the primary landowner resided outside of the county. The remaining 405 addresses were randomly organized and every other address on the list was selected to receive a survey packet in the mail. This process resulted in a final sample of 202 addresses to which the *household* survey packet was mailed (cover letter, questionnaire, and pre-paid return envelope; see Appendix C for the letter). The packet was mailed on March 1, 2017 and there were no follow-up mailings. One of the first questions in the questionnaire asked *household* respondents if they had already completed the questionnaire *onsite*. Four *household* respondents indicated they had already completed a questionnaire and their responses were removed from the *household* respondent dataset.

Questionnaire development and implementation

The first step in developing the questionnaire was to review the questionnaire from the 2009 study (Needham & Rosenberger, 2011). Many of the exact questions were retained. Some questions from the previous questionnaire were removed if the information was no longer a priority, the information was not as useful as expected in the previous effort, or to make room for new higher priority questions. Several questions were added to address recent issues on the Forests. The *onsite* and *household* questionnaires were nearly identical, and any differences are noted in the text of this report (see Appendices D and E for the complete *onsite* and *household* questionnaires, respectively). One main difference was that the *onsite* questionnaire often asked respondents about their activities or experiences on the day they were surveyed, whereas *household* respondents were asked to think about their *typical* activities or experiences.

The questionnaire included four main sections. The first section asked about visitation characteristics and included questions about visitor activities at the Forests, their skill level, the frequency and duration of their visits to the Forests, the size of their group, their transportation mode to the Forests, and how they recreate at the Forests with dogs. The second section was about their recreation experiences at the Forests. Questions included measures of overall satisfaction with their experiences, the importance of and satisfaction with specific characteristics of the Forests and their experiences, their perceptions of crowding at the Forests, and their perceptions of conflict with other visitors at the Forests. The third section asked respondents about their attitudes towards different potential management strategies, how they prefer to receive information about the Forests, and their engagement in volunteer and

stewardship activities. The final section asked respondents about their socio-demographic characteristics.

A team of people including OSU students, faculty, Forest managers, and the Forest Recreation Advisory Council (FRAC) reviewed the draft questionnaire for formatting, wording, and to ensure that it covered the most relevant information. OSU graduate students were then recruited and trained to administer the questionnaires.

Data analysis

Data from the *onsite* and *household* questionnaire were entered into an Excel spreadsheet then transferred to SPSS (Statistical Package for the Social Sciences) for analysis. After data cleaning procedures, basic descriptive analyses were performed to find percentages and means (where appropriate) of the different variables in the questionnaire. Responses were often collapsed into fewer categories (e.g., 'support' and 'strongly support' were combined into the percentage of respondents who supported different management options). The *onsite* and *household* questionnaires with un-collapsed percentages are in Appendix F and G, respectively.

Many of the findings were compared across the different survey site locations and/or primary typical activity groups (i.e., the activity a respondent selected as their primary typical activity). When appropriate, independent sample t-tests were used to compare mean responses across two groups, and analysis of variance (ANOVA) tests were uses to compare means across more than two groups. When using ANOVA, post-hoc tests were conducted to examine differences across sites or activity groups. We used Hochberg's GT2 test because it accounts for varied sample sizes and we confirmed the post-hoc findings with the Games-Howell test statistics because it accounts for uncertainty about population variance equivalency (Fields, 2013). We used a significance level of 95% ($p<.05$) for all tests of statistical significance in this report. Some caution should be taken when considering 'significant' differences between sites or activity groups because larger and uneven sample sizes can lead to finding statistical significance even if the effect size is quite small (Vaske, 2008). However, it is still useful to see the results compared across sites and activity groups to indicate where key differences and similarities exist.

Lastly, there were several open-ended questions where respondents could provide more information about a topic. Responses were reviewed and organized by their primary theme. The themes are summarized in this report and all comments are available in the appendices.

Additional observations from survey sessions

Between September 21, 2017 and December 30, 2017, surveyors collected additional observations about visitors as the visitors exited the site. A total of 1,089 groups (including single visitors) were observed over 51 observation/survey sessions. Surveyors recorded the group size, the number of adults and children (who appeared under 16 years including infants), activity type (biking, running, hiking/walking, or horseback riding), and the number of dogs in each group. We used these observations to add further insights about visitor characteristics and assess the potential for non-response bias error.

Use level estimates

During *onsite* survey sessions throughout the entire sampling period (i.e., January 2018 – January 2019), surveyors also collected information to estimate annual visitation rates at the Forests. Visitors were counted as they exited the recreation site at the five main survey locations (Hwy 99, Dan's Trail, Lewisburg Saddle, Peavy, and Oak Creek). The exit count data were collected by counting each individual who exited the Forests during the sampling session. "Exiting" was operationalized as recreations who were moving towards the parking lot from the Forests. If multiple visitors were recreating in a group, each individual in the group was counted as they exited the Forests. If visitors entered the Forests during the sampling session but did not exit by the end of the sampling period, they were not included in the exit count. The surveyor's table was set up at or near the exit gates for each of the sampling locations, which allowed them to determine if the visitor was exiting or not. The count data was recorded in a spreadsheet for each sampling period and organized first by trailhead, then chronologically.

Estimates for the number of annual *visits* were calculated using the exit count data. Similar to the 2009 study, estimates for the number of visits were calculated based on the number of visitors counted per weekday (Monday through Thursday), weekend (Friday through Sunday and holidays), time of day (morning and afternoon, daylight hours only), and sampling site location (i.e., the 5 main sites) (Needham & Rosenberger, 2011). Calculations for each site were based on average number of people counted per hour, which was then extrapolated out by number of hours per day (daylight hours only) for each day, week, and season. More specifically:

- The average number of *visits* per hour at each of the five sites was calculated separately for weekdays and weekends for the 4 different seasons. This was accomplished by using

morning and afternoon counts on weekdays and weekends at each site to estimate the average hourly visits (by dividing the total exit counts by the total number of survey hours for each site for each season for weekdays and weekends separately).

- The hourly visits estimate was then extrapolated to calculate estimates for daily visits for weekdays and weekends at each site. It was assumed that there were 91.25 days/season (365 days divided by 4 seasons), which includes 65.18 weekdays per season (91.25 days/7 days = 13.04 * 5 = 65.18) and 26.07 weekend days per season (13.04 x 2 = 26.07).
- Note, although Fridays were considered weekends for sampling purposes, we counted Fridays as weekdays for use level estimate purposes to be consistent with previous methodologies (Needham & Rosenberger, 2011).
- The number of weekdays and weekend days were multiplied by the number of daylight hours to get a total of daylight hours per season. Spring and summer calculations were based on 11-hour days and fall and winter calculations were based on 9.5-hour days.
- For each site, for weekdays and weekends, and for each season, the average visits/hour were multiplied by the total number of daylight hours to get visitation estimates for each site by week day/end for each season.
- The average visits/day for weekdays and weekends for each season were then summed for each site. The total for each of the five sites were then summed for an overall total estimate of annual visitation (i.e., visits) from January 2017 to January 2018.

The estimate for annual visitation was then used to estimate **the number of unique or individual visitors** from January 2017 to January 2018. In the 2009 study, Needham and Rosenberger (2011) assumed a weighted average of 9 visits/person, with a range of 6 visits/person on the low end and 18 visits on the high end. With the estimate of 105,000 total visits in 2009, they estimated that there were 11,702 separate or unique individual visitors that year plus or minus 5,851 (i.e., a 50% margin of error = 5,851 to 17,553 visitors) in 2009. We used the same estimate of 9 visits/person and the 50% margin of error to estimate the number of visitors in 2017. As discussed later, visitation frequency did not change significantly between 2009 and 2017, so this approach should be appropriate for achieving this estimate. However, the sampling did not attempt to quantify use on the Dunn Forest or with people entering from unauthorized points or neighboring properties. This means our estimates may be conservative.

Response rate

Onsite survey response rate

A total of 1,257 completed questionnaires were received from *onsite* visitors for an **overall response rate of 61% for the *onsite* survey efforts** (Table 3). Response rates ranged between 53% and 66% for the five sites where visitors were contacted directly. These are typical response rates for trailhead-exit surveys. The response rates at Sulphur Springs (49%) and Gate 400 (38%) were lower than the other sites, as can be expected when direct contacts with visitors is not an option. This sample size for *onsite* visitors allows for generalizations about the total population of visitors at +/- 2.75% with 95% confidence and +/- 3.62% with 99% confidence.

Table 3. Response rates for the ***ONSITE*** survey for each location and overall

	# of visitors or groups **contacted**	# of questionnaires **completed *onsite***	# of questionnaires **mailed back complete**	Total # of **completed questionnaires**	**Response rate**
Hwy 99	352	188	12	200	57%
Dan's Trail	294	136	19	155	53%
Lewisburg Saddle	472	287	25	312	66%
Oak Creek	475	300	9	309	65%
Peavy	386	226	12	238	62%
Sulphur Springs*	59*	n/a	29	29	49%
Gate 400*	37*	n/a	14	14	38%
Total	**2,075**	**1,137**	**120**	**1,257**	**61%**

**Total number of vehicles that questionnaires were left on at Sulphur Springs and Gate 400 sites*

Caution should be taken when interpreting findings from the lower use sites (Sulphur Springs and Gate 400) due to very small sample sizes there. Similarly, several user groups were likely underrepresented to some extent in the survey efforts. Horseback riders and hunters were likely underrepresented due to survey locations and perhaps survey timing. Furthermore, we acknowledge that this survey does not account for opinions of people who choose to no longer recreate at the Forests or those who intentionally avoid contact with other visitors or managers. Forest managers and/or the Forest Recreation Advisory Council (FRAC) may want to pursue the underrepresented groups through more targeted survey efforts (e.g., emailing an online version of the questionnaire to registered hunters or to equestrian groups and users) or focus groups with people known to have stopped recreating at the Forests or who have significantly altered their recreation patters there for reasons that could be of interest to managers.

The most common reasons given by visitors who declined taking the questionnaire were that they did not have time, they were too tired, and/or the questionnaire was too long. The surveyors noted that mountain bikers and runners were more likely to pass by the surveyors without stopping because they were either wearing headphones and could not hear the surveyors speaking to them or they were travelling too fast to be contacted. Although not a prevalent reason, several other visitors chose not to participate because they were first time visitors and did not feel they could provide adequate information. Additional observations of visitors indicated minimal differences between observed characteristics of visitors and questionnaire respondents. This suggests that non-response bias may not have been a major issue and that survey results are likely representative of typical users at the survey locations. However, these additional observations were only recorded for a four-month period and not the entire 12-month survey period, therefore limiting the confidence that the observations reflect fluctuations over the year.

Household survey response rate

A total of 74 completed questionnaires were returned by *household* respondents. Given the sample frame of 202 addresses, the response rate for *household* respondents was 37%. Four *household* respondents indicated that they also completed a questionnaire *onsite*. Those four respondents were removed from the *household* dataset because there was no way to identify which questionnaires were theirs in the *onsite* dataset. **Thus, there were 70 completed *household* questionnaires used in analysis for a total response rate of 35%**. Assuming a population of 500 *household*s within 750 feet of the Forests' boundaries, the sample size (n=70) for *household* visitors allows for generalizations about the total population of *household* visitors at +/- 10.87% with 95% confidence and +/- 14.31% with 99% confidence. There was no non-response bias check conducted among non-respondents in the *household* survey efforts.

Findings

The findings from the *onsite* and *household* surveys are presented in seven different sections:

- Visitation characteristics
- Additional observations of visitors during survey sessions
- Sociodemographic characteristics of respondents
- Recreation experiences at the Forests
- Attitudes about management strategies and communication
- Additional comments from respondents
- Recreation use level estimates

In each section, the results from the 2017 *onsite* survey are presented first, followed by the results from the 2017 *household* survey. We compare the 2009 *onsite* survey results to the 2017 results in each section where applicable. We also compared many of the results in each section across survey location for *onsite* visitors, as well as across activity groups for all respondents. Due to the relatively small percentage of respondents who selected certain activities as their primary typical activity (i.e., birdwatching, hunting, nature viewing), several activity types were combined into one category for visitors on foot with no dog. The following five *categories of activity groups* were used in further analysis of responses in *some* sections based on primary typical activity type: (1) other visitors on foot (hiking, nature viewing, bird watching, hunting, other), (2) trail running, (3) dog walking, (4) mountain bikers, and (5) horseback riders. Visitors who did not select 'dog walking' as their primary activity could still have dogs with them even if they were doing another activity. Anecdotal observations have indicated that visitors at the Forests who are there specifically to walk dogs should be considered separately from people who primarily do other activities (even if they also have dogs with them) because their experiences and perceptions tend to be different.

Many of the tables in this report include an '*n*' column or row to represent the number of respondents for the items in the report. This number is helpful when interpreting the percent of respondents for different responses. The '*n*' was not included in tables where there was limited space. The small sample size for respondents from Gate 400 and Sulphur Springs, as well as the activity group of horseback riders, means that the percent of respondents for these two sites and for horseback riders should be considered carefully and recognized that they may not represent visitors at these sites or among horseback riders as other sites and activity groups with larger sample sizes.

Visitation characteristics

Findings related to the following topics are presented in this section:

- Activity group participation
- Skill level
- Frequency and duration of visitation
- Group size
- Transportation to the Forests
- Bringing dogs to the Forests
- *Household* respondents' use of the McDonald and Dunn Forests for recreation

Activity group participation

Activity groups among ONSITE respondents

Onsite respondents were asked to: (a) select one primary activity in which they typically participate at the Forests, (b) check all of the activities in which they had ever participated in at the Forests, and (c) select the activity in which they participated on the day they were surveyed. The distributions of the primary typical activity reported by *onsite* respondents in 2017 were similar to the 2009 survey on the Forests (Table 4). The most notable difference is that 51% of *onsite* respondents in 2017 said their typical primary activity was hiking or walking, compared to 42% of respondents in 2009. The percent of visitors whose primary typical activity at the Forests is dog walking increased from 17% in 2009 to 19% in 2017. The portion of mountain bikers and trail runners decreased since 2009 by 3% and 5%, respectively. However, as mentioned earlier, mountain bikers and trail runners were more likely to not complete the questionnaire in 2017. This means that the percent of visitors whose primary typical activity is mountain biking or trail running may be slightly higher than reported here.

Table 4. Primary typical activity group participation for ***ONSITE*** respondents in 2009 compared to *onsite* respondents in 2017 (% of respondents)

	2009 *Onsite* respondents	**2017 *Onsite* respondents**
n	*1,068*	*1,223*
Hiking or walking	42	51
Dog walking	17	19
Trail running or jogging	21	16
Mountain biking	15	12
Horseback riding	3	1
Nature viewing	1	1
Other	1	1
Hunting	0	0
Bird watching	0	0

The most common activity that respondents typically participated in at each *onsite* survey location was hiking/walking (Table 5). Sixty-five percent of respondents at the Peavy trailhead listed hiking as the primary activity, compared to 58% at Hwy 99, 50% at Lewisburg Saddle, 46% at Gate 400, 44% at Dan's Trail, and 41% at both Oak Creek and Sulphur Springs. The order of other popular activities varied by site, but generally dog walking, trail running, and mountain biking were in the top four most popular activities for each site. Hiking or walking was most popular at Peavy. Dog walking appears to be more popular at Gate 400 and Oak Creek. Trail running was more popular at Lewisburg Saddle and Dan's Trail than other sites. Mountain biking appears to be more popular at Dan's Trail, Oak Creek, and Sulphur Springs. Horseback riding is most popular as a primary typical activity at Sulphur Springs.

Table 5. Primary typical activity among respondents for each ***ONSITE*** location (% of respondents)

	Hwy99	**Dan's Trail**	**Lewisburg Saddle**	**Oak Creek**	**Peavy**	**Sulphur Springs**	**Gate 400**
n	*197*	*153*	*303*	*301*	*227*	*29*	*13*
Hiking or walking	58	44	50	41	65	41	46
Dog walking	21	15	16	24	19	7	39
Trail running or jogging	16	19	20	16	10	10	15
Mountain biking	5	20	12	19	4	17	0
Nature viewing	1	1	1	1	2	3	0
Bird watching	0	0	0	0	0	3	0
Horseback riding	0	1	<1	0	<1	17	0
Hunting	0	0	0	0	0	0	0
Other [a]	0	0	1	1	1	0	0

[a] See Table 6 below for all write-in responses for 'other' for respondents at each survey site.

Approximately 1% of respondents selected 'other' for activity type. The most common 'other' activities listed were photography, mushroom hunting, trail work, and picnicking. Table 6 shows all of the comments written in for 'other' activities by respondents at different locations on the Forests. Appendix H shows all the comments about 'other' activities organized by theme for all sites combined.

Table 6. Responses for 'other' activities participated in at the Forests among ***ONSITE*** respondents

Location	Responses for 'other' activities [a]
Hwy 99	Photography (2), geocaching (2), hunting mushrooms, picnicking, mediation, volunteer work, and a wedding at Peavy.
Dan's Trail	Class field trips, creek play, foraging, meditation, OSU fish research, playing hide and seek, and scientific research.
Lewisburg Saddle	Photography (4), mushroom hunting (4), education/class (3), freight delivery, gravel biking (2), skiing (2), search and rescue (2), smoking (2), viewing plants and trees (2), picnicking, playing in the snow, races, and research.
Oak Creek	Trail building/work (6), research/education (5), photography (4), foraging and mushroom hunting (3), skiing (2), field trips, creek play, meditation, picnicking, and ukulele playing.
Peavy	Mushroom ID, photography (3), education (3), cat walking (2), plant ID (2), first aid class, geocache, picnicking, clean up dog poop and trash, trail pick up, and exercise.
Sulphur Springs	Road cycling, photography, search and rescue, volunteering and educational tours.
Gate 400	Booning (following deer trails), OSU ALI WFR scenarios, plants/flowers

[a] Each activity was mentioned by only *one* respondent at that location unless noted by the number in parentheses after the activity

There were some noticeable differences in responses between 2009 and 2017 in terms of which activities participants had ever participated in at the Forests (Table 7). Compared to 2009, slightly fewer respondents in 2017 reported that they had gone dog walking, trail running, mountain biking, horseback riding, and hunting ever in the Forests. Slightly more respondents in 2017 compared to 2009 reported going hiking, nature viewing, and birdwatching. Table 7 also shows the differences between respondents' primary activity on the survey day in each year. More respondents in 2017 were hiking than in 2009, but fewer respondents in 2017 were dog walking, trail running, mountain biking, horseback riding, and hunting than in 2009.

Table 7. Activity group participation for ***ONSITE*** respondents in 2009 and 2017 (% of respondents)

	Activities ever in the Forests in **2009** [a]	Activities ever in the Forests in **2017** [a]	Activity on day surveyed in **2009**	Activity on day surveyed in **2017**
n	*1,068*	*1,240*	*1,068*	*1,240*
Hiking or walking	94	96	41	52
Dog walking	60	58	21	20
Trail running or jogging	52	50	18	14
Mountain biking	47	41	14	11
Nature viewing	55	58	1	1
Horseback riding	7	3	3	1
Other	8	8	1	1
Bird watching	24	28	0	0
Hunting	2	1	1	0

[a] Percentages do not sum to 100% because respondents could check more than one activity

Table 8 shows the percent of respondents who had ever participated in an activity at the Forests across the survey site locations in 2017. Table 9 shows the percent of respondents who were participating in each activity on the survey day for each survey site location. Response distributions were similar to those in Table 5. Overall, hiking or walking was the most common activity at each site for activities ever participated in at the Forests and on the survey day. Dog walking was a more common activity at Oak Creek, Hwy 99, and Gate 400. Mountain biking was more common at Oak Creek, Gate 400, Sulphur Springs, and Dan's Trail.

Table 8. Activities ever participated in at the Forests among respondents for each ***ONSITE*** location (% of respondents) [a]

	Hwy99	**Dan's Trail**	**Lewisburg Saddle**	**Oak Creek**	**Peavy**	**Sulphur Springs**	**Gate 400**
n	*197*	*153*	*303*	*301*	*227*	*29*	*13*
Hiking or walking	97	96	94	96	98	83	100
Dog walking	65	45	53	69	53	52	57
Trail running or jogging	46	59	48	60	38	31	50
Mountain biking	32	48	41	54	26	45	50
Nature viewing	52	59	57	61	58	55	71
Bird watching	26	28	26	35	25	31	36
Horseback riding	2	3	2	3	3	24	21
Hunting	3	1	<1	1	1	0	0
Other	5	5	10	9	10	14	21

[a] Percentages do not sum to 100% because respondents could check more than one activity

Table 9. Activities participated in at the Forests on the **survey day** among ***ONSITE*** respondents for each survey location (% of respondents)

	Hwy99	**Dan's Trail**	**Lewisburg Saddle**	**Oak Creek**	**Peavy**	**Sulphur Springs**	**Gate 400**
n	*197*	*153*	*303*	*301*	*227*	*29*	*13*
Hiking or walking	56	50	47	42	68	55	50
Dog walking	25	6	17	24	18	10	36
Trail running or jogging	15	13	19	15	9	3	14
Mountain biking	4	20	14	16	3	14	0
Nature viewing	1	0	<1	2	1	0	0
Bird watching	0	1	<1	0	0	0	0
Horseback riding	0	1	<1	0	<1	17	0
Hunting	0	0	2	0	0	0	0
Other[c]	0	0	0	1	1	0	0

Activity groups among HOUSEHOLD respondents

Household respondents were asked to: (a) check all of the activities in which they had ever participated in at the Forests and (b) to select one primary activity in which they typically participate at the Forests. Table 10 compares the responses for these two questions among *household* and *onsite* respondents. **The most common primary typical activity for *household* respondents was hiking or walking, followed by dog walking, mountain biking, trail running, and horseback walking**. This order was similar to *onsite* respondents, except that more *onsite* respondents chose trail running than mountain biking. A higher percent of *household* respondents selected horseback riding, nature viewing, and hunting as their primary typical activity than did *onsite* respondents.

Almost all visitors (96% of *onsite* and 89% of *household* respondents) have gone hiking or walking in these Forests at some point in the past. Compared to the percent of *onsite* respondents, more *household* respondents had gone nature viewing, birdwatching, and horseback riding at the Forests. Compared to *household* respondents, a greater portion of *onsite* respondents had gone hiking, mountain biking, dog walking, and trail running at the Forests.

Table 10. Activity group participation for ***HOUSEHOLD*** respondents compared to 2017 *onsite* respondents (% of respondents)

	Primary typical activity at the Forests		**Activities ever at the Forests** [a]	
	Household respondents	***Onsite*** respondents	***Household*** respondents	***Onsite*** respondents
Hiking or walking	60	51	89	96
Dog walking	16	19	43	58
Mountain biking	8	12	29	41
Trail running or jogging	6	16	24	50
Horseback riding	5	1	7	3
Nature viewing	3	1	61	58
Hunting	2	0	1	1
Bird watching	0	0	43	28
Other [b]	0	1	1	8

[a] Percentages do not sum to 100% because respondents could check more than one activity
[b] Only one *household* respondent selected 'other' and they wrote in 'photography'

Skill level for primary typical activity

Respondents were asked to rate their skill level for their primary typical activity (Table 11). Compared to 2009 *onsite* respondents, in 2017, slightly more *onsite* respondents indicated an advanced or expert skill level and slightly fewer respondents in 2017 indicated an intermediate level than in 2009. The percent of novice and beginners were the same across years. In 2017, approximately two-thirds of *onsite* and *household* respondents indicated their skill level as either intermediate or advanced. Fewer than 10% of all respondents rated themselves at beginner or novice. These distributions were similar across the various *onsite* survey locations and primary activity type (see Tables 12 and 13, respectively) and may indicate an opportunity to provide more recreational opportunities for beginners and novices at the Forests.

Table 11. Respondent-rated skill level for primary typical activity (% of respondents)

	2009 *Onsite* respondents	**2017 *Onsite* respondents**	**2017 *Household* respondents**
n	*1,068*	*1,239*	*61*
Beginner	2	2	3
Novice	5	5	8
Intermediate	45	41	34
Advanced	36	37	31
Expert	12	16	23

Table 12. Skill level for primary typical activity for ***ONSITE*** visitors by location (% of respondents)

	***Onsite* (all)**	**Hwy 99**	**Dan's Trail**	**Lewisburg Saddle**	**Oak Creek**	**Peavy**	**Sulphur Springs**	**Gate 400**
n	*1,239*	*199*	*152*	*307*	*304*	*234*	*29*	*14*
Beginner	2	2	1	1	1	2	0	7
Novice	5	5	7	5	4	6	3	0
Intermediate	41	42	38	44	38	44	24	36
Advanced	37	39	41	34	37	36	41	21
Expert	16	13	13	15	20	12	31	36

Table 13. Skill level for primary typical activity according to activity groups for all ***ONSITE*** respondents (% of respondents)

	Other visitors on foot	**Trail running or jogging**	**Dog walking**	**Mountain biking**	**Horseback riding**
n	*635*	*196*	*231*	*144*	*9*
Beginner	2	1	2	0	0
Novice	6	5	5	0	0
Intermediate	45	39	29	43	44
Advanced	33	42	42	38	44
Expert	14	13	22	19	12

Frequency and duration of visitation

Respondents were asked three questions related to their duration and frequency of visitation at the Forests: (a) how many years they have been recreating at the Forests, (b) how often they have visited the Forests in the past 12 months, and (c) how many hours they typically spend at the Forests. Similar to the 2009 study, repeat visitation is high (Table 14). In 2017, *onsite* respondents reported visiting the Forests for about 3 more years than in 2009.

Household respondents have been recreating on the Forests for more years than the 2017 *onsite* respondents (t=-3.68, p<.001) for an average of almost 19 years. *Onsite* respondents in 2017 had been recreating on the Forests for an average of approximately 13 years and more than half of them have been recreating on the Forests for at least 10 years. More than half of the *household* respondents have been recreating in the Forests for at least 20 years.

Table 14. Frequency and duration of visitation to the Forests

	Percent (%) of respondents or mean/median		
	2009 *Onsite* Respondents	**2017 *Onsite* respondents**	**2017 *Household* respondents**
Years recreating in Forest			
1 year or less	15	16	7
2 to 4 years	21	14	9
5 to 9 years	18	14	4
10 to 19 years	26	20	24
20 or more years	20	36	56
Mean (average)	10.51 years	13.26 years	18.90 years
Median	8.00 years	10.00 years	18.50 years
Visitation in the past 12 months			
This is my first visit	n/a	8	0
Less than once a month (< 12 times/year)	17	15	16
About once a month (`20 times/year)	11	11	11
About 2-3 times/month (~ 40 times/year)	19	16	11
About once a week (52 times/year)	18	16	16
About twice a week (~ 104 times/year)	17	17	13
3 or more times a week (> 130 times)	19	18	32
Duration of typical visit			
1 hour or less	26	22	30
Between 1 and 2 hours	53	56	49
Between 2 and 3 hours	16	15	7
More than 3 hours	6	7	14
Mean (average)	1.94 hours	1.91 hours	1.66 hours
Median	2.00 hours	2.00 hours	1.50 hours

Onsite respondents in 2009 were not given the option to select 'this is my first visit,' so comparing responses for visitation in the past 12 months between 2009 and 2017 respondents is difficult. However, responses between the years are similar and suggest consistent visitation frequency among repeat visitors and likely an increase in new visitors (see use level estimates later in the report). ***Household* respondents visit the Forests more frequently than *onsite* respondents** (Table 14 above). Nearly a third of *household* respondents visit the Forests at least three times per week, compared to 18% of *onsite* respondents. More than 60% of *household* respondents visit at least once per week, compared to 51% of *onsite* respondents

Average visitation durations in the 2017 study were similar to that found in the 2009 study where the average visit duration was 1.9 hours. Most respondents (at least 75%) spend about 2 hours or less recreating at the Forests. However, the average duration of visits to the Forests among *household* respondents in 2017 was significantly shorter than among 2017 *onsite* respondents (t=2.25, p=.03). **A typical visit for *onsite* respondents lasts 1.91 hours and 1.66 hours for *household* respondents.**

Table 15 shows the average number of years people have been recreating at the Forests depending on which location they were surveyed. Mean comparison tests found significant differences across the locations (F=4.49, p<.001). Respondents at Oak Creek reported recreating at the Forests statistically significantly more years, on average, than respondents at Hwy 99, Dan's Trail, Lewisburg Saddle, and Peavy trailheads.

Table 15. Number of years respondents have been recreating at the Forests by survey type and location

	n	**Mean**	**SD**	**Median**	**Max # of years**
Onsite (all)	*1199*	13.26	11.71	10	60
Hwy 99	*186*	12.41	10.93	10	50
Dan's Trail	*151*	12.44	11.67	9	42
Lewisburg Saddle	*301*	12.16	11.76	8	51
Oak Creek	*297*	16.00	11.23	15	50
Peavy	*222*	11.82	12.03	8	55
Sulphur Springs	*28*	16.50	11.32	20	40
Gate 400	*14*	15.05	17.37	12	60
Household	*62*	18.90	13.19	18.5	60

Table 16 shows visitation frequency by survey location for *onsite* respondents. Noticeable differences are that respondents surveyed at Gate 400 and Sulphur Springs appear to visit more frequently than respondents surveyed at other sites, though those two sites had relatively small sample sizes so the distribution may not be representative of typical visitors there. Twelve percent of respondents at Dan's Trail and 14% at Peavy said this was their first visit, compared to fewer respondents at other sites. More than 20% of respondents surveyed at Oak Creek, Sulphur Springs, and Gate 400 visit at least 3 times per week, compared to fewer than 20% for respondents from other locations. Otherwise, responses by location were fairly similar to *onsite* respondents overall.

Table 16. Visitation frequency by survey site location (% of respondents)

	n	**This is my first visit**	**Less than once a month**	**About once a month**	**About 2 or 3 times a month**	**About once a week**	**About twice a week**	**Three or more times a week**
Onsite (all)	*1243*	8	15	11	16	16	17	18
Hwy 99	*198*	2	14	9	19	18	18	19
Dan's Trail	*154*	12	12	8	19	17	19	13
Lewisburg Saddle	*309*	10	18	10	13	16	17	16
Oak Creek	*304*	2	9	14	16	19	17	23
Peavy	*235*	14	18	13	15	12	13	16
Sulphur Springs	*29*	3	21	14	17	3	21	21
Gate 400	*14*	7	14	14	0	14	29	21
Household	*62*	0	16	11	11	16	13	32

We examined visitation characteristics among *onsite* visitors to see if there were any key differences between more recent (visitors who have been recreating at the Forests for less than 1 year) and longer-term visitors (who have been recreating at the Forests for more than 1 year) (Table 17). **Longer term visitors visit the Forests more frequently than newer visitors.** However, the difference in average duration of a typical visit was not statistically significant (t=1.96, p=.052) between newer and longer-term visitors to the Forests. The median duration for both groups was 2 hours.

Table 17. Frequency and duration of visitation of 2017 ***ONSITE*** respondents comparing newer and longer-term visitors

	Percent (%) or mean	
	Onsite respondents recreating at the Forests **1 year or less**	*Onsite* respondents recreating at the Forests **more than 1 year**
Visitation in the past 12 months	*n=196*	*n=1,060*
This is my first visit	36	2
Less than once a month (< 12 times/year)	19	14
About once a month (`20 times/year)	9	12
About 2-3 times/month (~ 40 times/year)	11	17
About once a week (52 times/year)	10	17
About twice a week (~ 104 times/year)	9	18
3 or more times a week (> 130 times)	7	20
Duration of typical visit	*n=196*	*n=1,047*
1 hour or less	23	21
Between 1 and 2 hours	48	58
Between 2 and 3 hours	16	14
More than 3 hours	13	6
Mean (average)	2.04 hours	1.89 hours
Median	2 hours	2 hours

Table 18 shows the average number of hours spent recreating at the Forests by location. There were significant differences in average duration between locations ($F=7.43$, $p<.001$). The average duration of visits to the Forests was significantly longer among respondents at Dan's Trail compared to Hwy 99, Lewisburg Saddle, Oak Creek, and Peavy trailheads. The average visit duration was significantly longer among respondents at Sulphur Springs compared to Oak Creek and Hwy 99. Visitors spend the most time at Sulphur Springs, Gate 400, and Dan's Trail and the least time at Hwy 99, Oak Creek, and Lewisburg Saddle.

Table 18. Number of hours spend recreating at the Forests on a typical visit by survey location

	n	**Mean**	**SD**	**Median**	**Maximum # of hours**
Onsite (all)	*1229*	1.91	0.88	2.00	12.50
Hwy 99	*198*	1.76	0.74	1.50	4.50
Dan's Trail	*152*	2.26	1.04	2.00	6.50
Lewisburg Saddle	*303*	1.88	0.81	2.00	8.00
Oak Creek	*301*	1.82	0.92	2.00	12.50
Peavy	*233*	1.90	0.76	2.00	6.00
Sulphur Springs	*29*	2.34	1.22	2.00	6.00
Gate 400	*13*	2.35	1.23	2.00	5
Household	*61*	1.66	0.65	1.50	4

The average number of hours on a typical visit to the Forests was examined for *onsite* and *household* respondents based on primary typical activity type (Tables 19 and 20). Among *onsite* respondents, visitors riding horses and mountain biking stayed the longest, at least 2 hours on average. *Onsite* visitors walking dogs and trail running stayed less than 2 hours and other visitors on foot stayed about 2 hours on average. The average time spent recreating did vary significantly depending on the primary typical activity type for *onsite* respondents ($F=13.32$, $p<.001$). *Onsite* respondents who were horseback riders stayed longer than any other group. Mountain bikers stayed longer than runners/joggers and dog walkers. People on foot with no dog stayed longer than dog walkers. The larger maximum number of hours spent recreating at the Forests (i.e., 12.50 hours for trail runners) may reflect a rather small number of visitors who participate in long-distance running events or training at the Forests.

Table 19. Number of hours on a typical visit spend recreating at the Forests by primary activity type for ***ONSITE*** respondents

	n	**Mean**	**SD**	**Median**	**Maximum # of hours**
Other visitors on foot	*635*	1.97	0.85	2.00	6.00
Dog walking	*229*	1.65	0.72	1.50	8.00
Trail running or jogging	*197*	1.82	1.12	2.00	12.50
Mountain biking	*143*	2.14	0.68	2.00	6.00
Horseback riding	*9*	3.11	1.39	3.00	6.00

Table 20 shows the average number of hours spent on a typical visit to the Forests at different survey locations organized by primary activity type. Mountain bikers and horseback riders spent the most time at the Forests. Trail runners and dog walkers tended to spend the least amount of time there. Visitors spent more time at Dan's trail, on average, across all groups.

Table 20. Average (mean) number of hours on a typical visit spend recreating at the Forests by primary activity type and survey location for ***ONSITE*** respondents

	Hwy 99	**Dan's Trail**	**Lewisburg Saddle**	**Oak Creek**	**Peavy**	**Sulphur Springs**	**Gate 400**
Other visitors on foot	1.83	2.53	1.89	1.84	1.97	1.86	3.10
Dog walking	1.55	2.02	1.85	1.41	1.67	1.75	1.90
Trail running or jogging	1.62	2.07	1.74	1.96	1.78	1.50	1.75
Mountain biking	2.17	2.00	2.10	2.12	2.44	3.00	1.80
Horseback riding	n/a	2.50	2.50	n/a	1.50	3.80	n/a

Among *household* respondents, horseback riders also had the longest average visitation duration, with an average of 2.5 hours (Table 21). *Household* respondents who primarily walk had the shortest average duration of 1.35 hours/visit. However, the average visitation duration did not vary significantly by primary typical activity among *household* respondents (F=2.02, p=.11).

Table 21. Number of hours on a typical visit spend recreating at the Forests by primary activity type for ***HOUSEHOLD*** respondents

	n	**Mean**	**SD**	**Median**	**Maximum # of hours**
Other visitors on foot	*39*	1.65	0.67	1.50	4.00
Dog walking	*10*	1.35	0.53	1.00	2.50
Trail running or jogging	*4*	1.63	0.40	1.75	2.00
Mountain biking	*5*	1.80	0.27	2.00	2.00
Horseback riding	*3*	2.50	0.87	3.00	3.00

Group size

Onsite respondents reported how many people, including themselves, accompanied them at the Forests on the day they were surveyed. *Household* respondents reported the number of people typically accompanying them at the Forests. Group size ranged from 1 to 15 people for *onsite*, and 1 to 5 people for *household* respondents (Table 22). Group sizes for *onsite* respondents were very similar to 2009 and 53% were alone, 29% groups of 2 people, 13% groups of 3 or 4 people and 5 percent groups of 5 people or more in 2009. Group size did not vary significantly between *onsite* and *household* respondents (*t*=-0.07, p=0.94).

Table 22. Group size of respondents (% of respondents)

	2009 *Onsite* respondents	**2017 *Onsite* respondents**	**2017 *Household* respondents**
n	*1,049*	*1,226*	*69*
1 person (alone)	53	53	49
2 people	29	31	36
3-4 people	13	12	12
5 or more people	5	3	3
Average	1.87	1.78	1.77
Standard deviation	1.39	1.29	1.00
Median	1.00	1.00	2.00
Max group size	12	15	5

Group size did vary significantly between survey locations (F=2.47, p=.02) (Table 23). However, the only significant difference was between Oak Creek and Peavy, where the group size was statistically larger, on average, for respondents at Peavy compared to Oak Creek.

Table 23. Group size of respondents for ***ONSITE*** respondents by location (% of respondents)

	Hwy 99	Dan's Trail	Lewisburg Saddle	Oak Creek	Peavy	Sulphur Springs	Gate 400
n	*192*	*151*	*302*	*305*	*233*	*29*	*14*
1 person (alone)	55	58	53	55	47	55	50
2 people	32	29	32	32	31	38	43
3-4 people	10	12	11	12	16	0	7
5 or more people	2	2	4	2	6	7	0
Average	1.68	1.65	1.80	1.69	2.05	1.76	1.57
Standard Deviation	1.08	0.98	1.39	1.00	1.72	1.41	0.64
Median	1	1	1	1	2	1	1.50
Max group size	9	7	15	8	15	7	3

Group sizes did vary significantly between primary typical activity groups for *onsite* respondents (F=8.81, p<.001; see Table 24). The difference was that other on foot visitors reported larger group sizes than trail runners/joggers, dog walkers, and mountain bikers. Horseback riders appear to have the smallest group size and other people on foot have the largest group size on average.

Table 24. Group size of ***ONSITE*** respondents by activity group (% of respondents)

	Other visitors on foot	Trail running or jogging	Dog walking	Mountain biking	Horseback riding
n	628	192	227	138	9
1 person (alone)	45	64	63	60	56
2 people	35	25	28	30	44
3-4 people	15	9	8	7	0
5 or more people	5	2	2	3	0
Average	1.99	1.56	1.52	1.61	1.44
SD	1.53	0.97	0.83	1.06	0.53
Median	2.00	1.00	1.00	1.00	1.00
Max group size	15	6	6	7	2

Group sizes did not vary by primary typical activity type for *household* respondents (F=1.32, p=.27) (Table 25).

Table 25. Group size of ***HOUSEHOLD*** respondents by activity group (% of respondents)

	Other visitors on foot	Trail running or jogging	Dog walking	Mountain biking	Horseback riding
n	*40*	*4*	*10*	*5*	*3*
1 person (alone)	45	0	60	20	67
2 people	40	50	30	60	33
3-4 people	10	50	10	20	0
5 or more people	5	0	0	0	0
Average	1.88	2.75	1.50	2.00	1.33
SD	1.11	0.96	0.71	0.71	0.58
Median	2.00	2.50	1.00	2.00	1.00
Max group size	5	4	3	3	2

Respondents were also asked how many people in their group on the day they were surveyed (or typically for *household* respondents) were under 16 years of age (Table 26). Responses for *onsite* respondents were similar in 2017 to 2009. Ninety-two percent of 2017 *onsite* respondents and 83% of *household* respondents were reported 0 people in their group under the age of 16 years. Overall, most Forest visitors do not have children with them.

Table 26. Number of people under the age of 16 years in group (% of respondents)

	2009 *Onsite* respondents	2017 *Onsite* respondents	2017 *Household* respondents
n	*1,042*	*1,212*	*66*
0 (no children)	93	92	83
1 child	4	4	9
2 children	3	3	2
3 or more children	1	2	6
Max # of children	9	10	3

Transportation to the Forests

Onsite respondents were asked about their modes of transportation to the Forests on the survey day (Table 27). *Household* respondents were asked how they typically access the Forests (Table 27). Most *onsite* respondents (88%) indicated that they drive motor vehicles to the site. Most *household* respondents (69%) indicated that they typically walk or jog to the Forests. Transportation modes for *onsite* respondents in 2017 were very similar to the 2009 study, which found that 86% of respondents drove a motorized vehicle, 8% walked/jogged there, 6% rode bicycles there and 1% rode horses there.

Table 27. Transportation to the Forests (% of respondents)

	2009 *Onsite* Respondents	2017 *Onsite* respondents	2017 *Household* respondents
n	*1,045*	*1,218*	*65*
Drove motorized vehicle	86	88	15
Rode bicycle	6	5	11
Rode horse	1	<1	5
Walked/jogged	8	7	69

We also examined mode of transportation to the Forests depending on how far away from the Forests the respondents lived. Table 28 shows that, among *onsite* respondents, people who lived adjacent to or within a ½ mile of the Forests were more likely to walk or jog to the Forests than people who lived farther away. The majority (at least 91%) of *onsite* respondents who lived at least a mile away drove to the Forests. Ten percent of respondents who lived within a mile of the Forests rode their bikes to the Forests, more respondents than from any other distance.

Table 28. Transportation to the Forests for 2017 ***ONSITE*** respondents based on how far away they live from the Forests' boundaries

	n	Drove motorized vehicle	Rode bicycle	Rode horse	Walked or jogged
Adjacent to Forest boundaries	*32*	28	6	0	66
Within a ½ mile of Forest boundaries	*67*	48	8	0	45
Within 1 mile of Forest boundaries	*95*	85	10	0	5
1-5 miles from Forest boundaries	*564*	91	6	1	2
More than 5 miles from Forest boundaries	*415*	96	2	0	2

At least 60% of *household* respondents walked or jogged to the Forests (Table 29). Fewer than 10% of *household* respondents ride horses to the Forest, but more *household* respondents ride horses there than *onsite* respondents.

Table 29. Transportation to the Forests for 2017 ***HOUSEHOLD*** respondents based on how far away they live from the Forests' boundaries (% of respondents)

	n	Drove motorized vehicle	Rode bicycle	Rode horse	Walked or jogged
Adjacent to Forest boundaries	*35*	9	9	6	77
Within a ½ mile of Forest boundaries	*29*	21	14	3	62

Table 30 shows the transportation mode for *onsite* respondents based on the location where they were surveyed. More than 90% of respondents for every survey location, except Dan's Trail, indicated that they typically drive a motorized vehicle to the site. Nearly 30% of Dan's Trail respondents said they walked/jogged to that site.

Table 30. Transportation to the Forests by site among ***ONSITE*** respondents (% of respondents)

	Hwy 99	**Dan's Trail**	**Lewisburg Saddle**	**Oak Creek**	**Peavy**	**Sulphur Springs**	**Gate 400**
n	*192*	*151*	*299*	*303*	*230*	*29*	*14*
Drove motorized vehicle	92	55	94	91	93	97	100
Rode bicycle	1	16	5	6	2	0	0
Rode horse	0	1	0	0	<1	0	0
Walked/jogged	7	28	1	3	5	3	0

We examined the transportation mode to the Forests for *onsite* and *household* respondents based on whether they were newer (visiting less than 1 year) or longer-term (visiting more than 1 year) visitors (Table 31). Among ***onsite* respondents, newer visitors appear more likely to drive and less likely to walk or ride bicycles to the Forests than longer-term visitors**. Though, most *onsite* visitors still drove vehicles to the Forests regardless of how long they had been visiting. Among *household* respondents, newer visitors appear more likely to ride a bicycle and less likely to drive a vehicle or walk to the Forests. However, the small sample size for *household* visitors, especially newer visitors (n=5), makes these insights less confident when generalizing to all Forest-adjacent *household* visitors.

Table 31. Transportation to the Forests comparing newer and longer-term visitors (% of respondents)

	2017 *Onsite* respondents		**2017 *Household* respondents**	
	Newer visitors	**Longer-term visitors**	**Newer visitors**	**Longer-term visitors**
n	*192*	*1,025*	*5*	*60*
Drove motorized vehicle	94	87	0	17
Rode bicycle	2	5	40	8
Rode horse	0	<1	0	5
Walked/jogged	4	7	60	70

Bringing dogs to the Forests

Both *onsite* and *household* respondents were asked (a) if they typically bring dogs with them when visiting the Forests, and if yes, (b) how many dogs they bring with them on a typical visit, and (c) how they recreate with their dog. Table 32 shows **that fewer respondents in 2017 (43%) bring dogs with them compared to in 2009 (51%).** Slightly more *household* respondents reported bringing dogs with them compared to *onsite* respondents.

Table 32. The percent of visitors who do (yes) or do not (no) typically bring dogs when recreating at the Forests (% of respondents)

	2009 *Onsite* respondents	**2017 *Onsite* respondents**	**2017 *Household* respondents**
n	*1,028*	*1,245*	*62*
No	49	57	56
Yes	51	43	44

We examined the portion of *onsite* visitors who bring dogs with them according to the survey site location (Table 33). The most common sites where respondents typically bring dogs were Gate 400 (57%), Oak Creek (49%), and Hwy 99 (48%). Dan's Trail had the lowest percent of respondents who bring a dog there (33%).

Table 33. The percent of ***ONSITE*** visitors who do (yes) or do not (no) typically bring dogs when recreating at the Forests (% of respondents) by survey location

	Hwy 99	**Dan's Trail**	**Lewisburg Saddle**	**Oak Creek**	**Peavy**	**Sulphur Springs**	**Gate 400**
n	*199*	*154*	*309*	*304*	*236*	*26*	*14*
No	52	67	63	51	55	59	43
Yes	48	33	37	49	45	41	57

Table 34 shows the number of dogs that visitors bring with them to the Forests for *onsite* respondents (overall and by location) and *household* respondents. Among those respondents who do bring dogs with them to the Forests, the average number of dogs was typically between 1 and 2 regardless of the site or *household* vs *onsite* respondent. For every *onsite* location except Gate 400, at least 70% of respondents who bring dogs said they usually bring 1 dog. At Gate 400, 63% of people who completed and returned the survey who bring dogs with them usually bring 2 dogs. For *household* respondents, 52% usually bring 1 dog and 48% usually bring 2 dogs.

The number of dogs brought by respondents to the Forests did NOT vary significantly between *onsite* and *household* respondents (t=-1.77, p=.08). However, there were significant differences in the average number of dogs typically brought between sites among *onsite* respondents (F=4.96, p<001). These differences were that visitors at Gate 400, on average, brought significantly more dogs with them compared to all other survey locations.

Table 34. Number and average number of dogs that visitors with dogs typically bring when recreating at the Forests (% of respondents for the number of dogs)

	***Onsite* (all)**	**Hwy 99**	**Dan's Trail**	**Lewisburg Saddle**	**Oak Creek**	**Peavy**	**Sulphur Springs**	**Gate 400**	***Household***
n	*512*	*95*	*46*	*108*	*142*	*102*	*11*	*8*	*27*
1 dog	76	78	87	74	71	79	82	25	52
2 dogs	21	19	13	22	26	18	9	63	48
3 dogs	3	3	0	4	2	2	9	12	0
4 dogs	<1	0	0	0	1	1	0	0	0
5 dogs	<1	0	0	0	0	0	0	0	0
6 dogs	0	0	0	0	0	0	0	0	0
Mean	1.29	1.25	1.13	1.30	1.32	1.25	1.27	2.25	1.48
SD	0.56	0.51	0.34	0.53	0.55	0.54	0.65	1.58	0.51
Median	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	1.00

Estimating the total number of dogs at the Forests may be of interest to managers. The most effective way to do this would be through counts and observations similar to the exit count data collected to estimate visitation levels. A less reliable estimate is to use the estimated number of separate visitors to the Forests in 2017 (discussed later), which was 17,271, combined with the percent of visitors who bring dogs (43%) then multiply that number of visitors (7,310) by 1.29 dogs/person for a total of approximately 9,430 dogs at the Forests in 2017. It was estimated that there were 11,702 individual or separate visitors in 2009, and 51% of respondents in 2009 said they bring dogs with them to the Forests. If visitors who brought dogs with them to the Forest in 2009 brought an average of 1.29 dogs (note that the number of dogs/person was not measured in the 2009 survey), the approximate number of individual dogs at the Forests in 2009 was 7,699 dogs. Again, these estimates are not as reliable as those based on strategic monitoring activities or observations. However, the estimates do indicate that there are more individual dogs at the Forests in 2017 compared to 2009. The number of dogs at the Forests in 2017 is approximately 22% higher than the number of dogs at the Forests in 2009.

Table 35 shows the percent of *onsite* (all and separated by location) and *household* respondents who bring a dog to the Forests according to how they recreate with their dog at the Forests. Forty percent of all *onsite* respondents who bring a dog to the Forests restrain their dogs when encountering other visitors and 29% leash the dogs in busy areas. Nearly 20% of *onsite* respondents with dogs keep them off leash at all times and 14% keep them on leash at all times. There appears to be more off leash activity at Sulphur Springs, Gate 400, and Peavy. At least 30% of *onsite* respondents at all locations reported restraining their dogs when encountering other visitors. Thirty-seven percent of *household* respondents who bring dogs to the Forests reported that they keep dogs on leash all the time and the same percentage of *household* respondents restrain dogs when encountering other visitors.

Table 35. How visitors recreate with their dog at the Forests (% of respondents)

		Percent of respondents			
	n	**Keep dog(s) on leash all the time**	**Restrain dog(s) when encountering other visitors**	**Keep dog(s) off leash all the time**	**Leash dog(s) in busy areas**
Onsite (all)	*524*	14	40	18	29
Hwy 99	*96*	19	34	16	31
Dan's Trail	*49*	14	37	12	37
Lewisburg Saddle	*108*	19	42	19	21
Oak Creek	*146*	13	37	16	34
Peavy	*105*	7	44	24	26
Sulphur Springs	*12*	8	58	8	25
Gate 400	*8*	0	63	13	25
Household	*27*	37	37	11	15

Household **respondents' use of the Forests for recreation**

Household respondents were asked if they typically use the Forests for recreation (Table 36) and from where they typically access the Forests (Table 37). The majority (88%) of *household* respondents typically recreate at the Forests. Nearly half of the *household* respondents indicated that they typically access the Forests directly from their neighborhood, approximately a third access it from their house/property, and 20% access it from official trailheads. This aligns with managers' observations of many informal trails from private property leading to the Forests.

Table 36. Percent of ***HOUSEHOLD*** respondents who typically use the Forests for recreation (*n = 68*)

	Percent (%) of respondents
No	12
Yes	88

Table 37. Typical Forest access location for ***HOUSEHOLD*** respondents (*n=64*)

	Percent (%) of respondents
Directly from my house	31
Directly from my neighborhood	49
From the official trailhead	20

Household respondents were also asked about their main barrier to recreating at the Forests. The most common barriers mentioned by *household* respondents were time and weather/rain. Other common barriers mentioned by at least 2 respondents included motivation, logging closures, work, and poison oak (see Appendix I for all responses). Most barriers were not necessarily aspects that Forest managers can affect.

Section summary: Visitation characteristics

- Hiking/walking was by far the most common activity participated in at the Forests among all respondents. Dog walking, trail running or jogging, and mountain biking were the next most common primary typical activities. Many participants had and continue to participate in other activities, such as nature viewing and birdwatching, though these are not the main reasons for visiting among most respondents. The most common 'other' activities mentioned by respondents include photography, mushroom hunting, trail work, and picnicking.
- The distributions of activity groups were similar in the 2017 study compared to the 2009 study. The most notable difference is that 51% of *onsite* respondents in 2017 said their typical primary activity was hiking or walking, compared to 42% of respondents in 2009. Slightly more (2% more) respondents in 2017 indicated that their primary typical activity at the Forests was dog walking compared to 2009. Compared to 2009, slightly fewer respondents in 2017 reported that they had gone dog walking, trail running, mountain biking, horseback riding, and hunting ***ever*** in the Forests.
- Hiking was the most common primary typical activity at each site and the most popular at Peavy. Dog walking appears to be more popular at Gate 400, Oak Creek, and Hwy 99. Trail running was more popular at Oak Creek, Lewisburg Saddle, and Dan's Trail than other sites. Mountain biking appears to be more popular at Dan's Trail, Oak Creek, and

Sulphur Springs. Horseback riding is most popular as a primary typical activity at Sulphur Springs and Gate 400.

- Activity group distribution was similar for *household* respondents compared to *onsite* respondents. However, a higher percent of *household* respondents selected horseback riding, nature viewing, and hunting as their primary typical activity than did *onsite* respondents.
- Approximately 90% of all visitors rated their skill level for their primary typical activity as intermediate, advanced, or expert with higher percentages in intermediate and advanced categories. The distributions were similar across the *onsite* survey locations and primary activity type groups. Compared to 2009 *onsite* respondents, in 2017, slightly more *onsite* respondents indicated an advanced or expert skill level and slightly fewer respondents in 2017 indicated an intermediate level than in 2009. The percent of novice and beginners were the same across years.
- In 2017, *onsite* respondents reported having visited the Forests for about 3 more years on average than respondents in 2009.
- In 2017, *onsite* respondents have been recreating on the Forests for an average of 13 years compared to 19 years for *household* respondents. More than three quarters (78%) of *onsite* respondents visit at least once/month and 51% visit at least once/week. Nearly a third of *household* respondents visit 3 or more times/week and more than 60% visit at least once/week.
- The average visitation durations in the 2017 study were similar to the 2009 study where the average visit duration was 1.9 hours.
- The average duration for *onsite* respondents was 1.91 hours and *household* respondents reported that a typical visit lasts an average of 1.66 hours. Respondents at Gate 400, Sulphur Springs, and Dan's Trail trailheads spent the most time (> 2 hours per visit) recreating at the Forests. Respondents at Hwy 99, Oak Creek, Lewisburg Saddle, and Peavy reported spending less than 2 hours recreating at the Forest on average. Visitors riding horses and mountain biking stayed the longest, at least 2 hours on average.
- Longer term visitors visit the Forests more frequently than newer visitors (visitors who have been recreating at the Forests for less than one year), though the average duration of a typical visit was not significantly different between newer and longer-term visitors.
- The average group size for *onsite* and *household* respondents was approximately 2 people, which was similar to 2009 findings. Group size did not vary significantly between *onsite* and *household* respondents, nor was there a substantial difference between 2009 and 2017. Group sizes tended to be larger at Peavy than any other site.
- Most visitors did not have any children under the age of 16 years with them at the Forests.

- Most *onsite* respondents (88%) indicated that they typically drive motor vehicles to the site. Most *household* respondents (69%) typically walk or jog to the Forests. Transportation modes for *onsite* respondents in 2017 were similar to the 2009 study.
- Among *onsite* respondents, people who lived adjacent to or within a ½ mile of the Forests were more likely to walk or jog to the Forests than people who lived farther away. The majority of *onsite* respondents who lived at least a mile away drove to the Forests. Ten percent of respondents who lived within a mile of the Forests rode their bikes to the Forests, more than respondents from any other distance.
- Among *onsite* respondents, newer visitors appear more likely to drive and less likely to walk or ride bicycles to the Forests than longer-term visitors.
- Fewer respondents in 2017 (43%) bring dogs with them compared to in 2009 (51%).
- Slightly fewer than half of *onsite* respondents (43%) and *household* respondents (44%) typically bring a dog with them to the Forests. The most common sites where respondents typically bring dogs were Gate 400 (57%), Oak Creek (49%), and Hwy 99 (48%). Dan's Trail had the lowest percent of respondents who bring a dog there (33%).
- Among those respondents who indicated they do bring dogs with them to the Forests, the average number of dogs was typically between 1 and 2 regardless of the site.
- Using the estimated number of visitors in 2017 to the Forests and knowing that 43% of them bring dogs to the Forests, and on average they bring 1.29 dogs, we estimate that the total number of dogs at the Forests in 2017 was 9,340 dogs. The number of dogs at the Forests in 2017 is about 22% higher than the number of dogs at the Forests in 2009. However, these estimates are not highly reliable and should be estimated using formal monitoring and observational counts if desired.
- Forty percent of all *onsite* respondents who bring a dog to the Forests restrain their dogs when encountering other visitors and 29% leash the dogs in busy areas. Nearly 20% of *onsite* respondents with dogs keep them off leash at all times and 14% keep them on leash at all times. At least 30% of *onsite* respondents at all locations reported restraining their dogs when encountering other visitors.
- Thirty-seven percent of *household* respondents who bring dogs to the Forests reported that they keep dogs on leash at all times and the same portion of *household* respondents restrain dogs when encountering other visitors.
- The majority (88%) of *household* respondents reported that they typically use the Forests for recreation. Approximately half of the *household* respondents typically access the Forests from their neighborhood, 31% access the Forests from their property, and 20% use official trailheads. The most common barriers for *household* respondents to accessing the Forests were time and weather.

Additional observations from survey sessions

As mentioned earlier, surveyors collected additional observations about visitors as the visitors exited the survey site. A total of 1,089 groups (including single visitors) were observed over 51 survey sessions. Surveyors recorded the group size, the number of adults and children (who appeared under 16 years of age), activity type (biking, running, hiking/walking, or horseback riding), and the number of dogs in each group. These observations can add additional insight about visitor characteristics. However, direct comparisons are challenging because observation data was collected over 4 months compared to 12 months for the survey data.

Table 38 shows the percentage of individuals/groups observed according to primary activity type. The distribution of activity type is similar to that revealed in the questionnaire data. It is difficult to make direct comparisons because the questionnaire separated dog walkers from hiking/walking, whereas observations did not include a separate category for dog walkers. The observations also only occurred over a four-month period.

Table 38. Observed user activity type overall and at different survey locations (% of observed visitors)

	Overall	**Hwy 99**	**Dan's Trail**	**Lewisburg Saddle**	**Oak Creek**	**Peavy**
n	*1,088*	*155*	*149*	*282*	*345*	*157*
Activity type (%)						
Mountain biking	15%	6%	18%	15%	22%	8%
Running/jogging	18	23	30	17	14	12
Walking/hiking	66	71	49	66	64	80
Horseback riding	1	0	3	2	0	<1

Table 39 reports the percent of respondents observed doing different activities (note, they were only recorded as biking, running, walking, or horseback riding) compared to survey respondents' reported activity on the survey day. Based on the observations, 66% of the visitors were walking/hiking, 18% were running/jogging, 15% were on bikes, and 1% was on horseback. In the questionnaire data, 51% of respondents self-identified as hikers, compared to 66% observed hiking (Table 39). This discrepancy is likely accounted for by other activities not evident from the observer. For example, a visitor who hiked may have had a dog with them and identified their primary activity as dog walking. Furthermore, a person who appeared at the trailhead to be walking or hiking, could have been running inside the Forests.

Additionally, although inferences are limited because the observations occurred only over a four-month period, it appears that mountain bikers and runners may have been less likely to complete the survey than people walking/hiking (as noted earlier and shown in Table 39). It also indicates that horseback riders may not have been underrepresented in the survey.

Table 39. Observed user activity type compared to survey respondents' reported activity type on the day surveyed in 2017 (% of visitors)

	Recreators' activities observed by surveyors*	**Survey respondents' reported activity on the day surveyed in 2017***
n	*1,088*	*1,240*
Activity type (%)		
Mountain biking	15%	11%
Running/jogging	18	14
Walking/hiking	66	72
Horseback riding	1	1

**Dog walking is included in the percent for walking/hiking for both the observed activities and for the survey respondent's reported activity.*

Table 40 shows the observation results for group size, the number of adults/group, the number of children/group, and the number of dogs per group for all observations overall and separated by survey location. These results are similar to the questionnaire results for these variables reported earlier. One noteworthy finding from the observations is that 38% of observed groups had at least one dog, compared to 43% in the questionnaire who said they typically bring dogs. These numbers may have been more similar if the length of the period of data collection for the observation data was the same as the survey data collection, especially since the four months that observations were recorded were relatively rainy months in which visitors could be less inclined to bring dogs with them. It could also mean that there are slightly fewer dogs at the Forests than indicated in the questionnaire results, although it is difficult to make that claim confidently with the given data. It may also be an indication that people with dogs were more likely to take the survey than people without dogs, although we cannot be confident about that claim.

Table 40. *Onsite observations* of group size, number of adults and children, and number of dogs overall and by location

	Overall (n=1,088)	**Hwy 99 (n=155)**	**Dan's Trail (n=149)**	**Lewisburg Saddle (n=282)**	**Oak Creek (n=345)**	**Peavy (n=157)**
n	*1,088*	*155*	*149*	*282*	*345*	*157*
Average ($\bar{x}$) and median (M) group size	$\bar{x}$ = 1.55 M = 1	$\bar{x}$ = 1.51 M = 1	$\bar{x}$ = 1.52 M = 1	$\bar{x}$ = 1.61 M = 1	$\bar{x}$ = 1.47 M = 1	$\bar{x}$ = 1.61 M = 1
Group size (%)						
1 person	60%	59%	62%	56%	65%	59%
2 people	30	34	31	34	26	30
3 people	6	5	3	6	7	6
≥ 4 people	4	2	4	4	2	5
Average ($\bar{x}$) and median (M) number of adults	$\bar{x}$ = 1.44 M = 1	$\bar{x}$ = 1.44 M =1	$\bar{x}$ = 1.44 M = 1	$\bar{x}$ = 1.51 M = 1	$\bar{x}$ = 1.38 M = 1	$\bar{x}$ = 1.48 M = 1
Number of adults (%)						
1 adult	62%	63%	64%	56%	66%	61%
2 adults	32	34	30	38	29	29
3 adults	4	3	3	4	4	5
≥ 4 adults	2	<1	3	2	1	4
Average ($\bar{x}$) and median (M) number of children	$\bar{x}$ = .10 M = 0	$\bar{x}$ = .07 M = 0	$\bar{x}$ = .08 M = 0	$\bar{x}$ = .11 M = 0	$\bar{x}$ = .09 M = 0	$\bar{x}$ = .13 M = 0
Number of children (%)						
0 children	94%	95%	95%	94%	93%	92%
1 child	4	3	3	3	6	5
2 children	2	2	1	3	1	1
≥ 3 children	<1	0	1	<1	<1	2
Average ($\bar{x}$) and median (M) number of dogs	$\bar{x}$ = .49 M = 0	$\bar{x}$ = .45 M = 0	$\bar{x}$ = .34 M = 0	$\bar{x}$ = .43 M = 0	$\bar{x}$ = .60 M = 0	$\bar{x}$ = .52 M = 0
Number of dogs						
0 dogs	62%	67%	72%	66%	55%	60%
1 dog	28	23	24	27	32	30
2 dogs	8	9	4	7	10	10
≥ 3 dogs	2	1	<1	<1	3	<1

Table 41 shows the *onsite observations* of group size, the number of adults and children per group and the number of dogs per group overall and separated by observed activity type. Again, this data aligns with questionnaire data in this report. Specifically, 94% of observed visitors did not have any children with them, compared to 92% of survey respondents who indicated that they did not have any children with them. We are not able to assess whether these differences are statistically significant or if they indicate that visitors with children were more or less likely to complete the survey. However, the differences appear minimal and suggest that the survey was fairly representative of visitors with children.

Table 41. *Onsite* observations of group size, number of adults and children, and number of dogs overall and by *observed activity type*

	Overall	Mountain biking	Running or jogging	Walking or hiking	Horseback riding
n	*1,088*	*167*	*194*	*717*	*10*
Average ($\bar{x}$) and median (M) group size	$\bar{x}$ = 1.55 M = 1	$\bar{x}$ = 1.29 M = 1	$\bar{x}$ = 1.33 M = 1	$\bar{x}$ = 1.65 M = 1	$\bar{x}$ = 2.00 M = 2.00
Group size (%)					
1 person	60%	76%	73%	54%	40%
2 people	30	20	22	35	30
3 people	6	2	3	7	20
≥ 4 people	4	2	2	4	10
Average ($\bar{x}$) and median (M) number of adults	$\bar{x}$ = 1.44 M = 1	$\bar{x}$ = 1.23 M =1	$\bar{x}$ = 1.31 M = 1	$\bar{x}$ = 1.53 M = 1	$\bar{x}$ = 1.60 M = 1.50
Number of adults (%)					
1 adult	62%	80%	73%	55%	50%
2 adults	32	17	23	38	40
3 adults	4	2	3	4	0
≥ 4 adults	2	1	1	3	10
Average ($\bar{x}$) and median (M) number of children	$\bar{x}$ = .10 M = 0	$\bar{x}$ = .06 M = 0	$\bar{x}$ = .02 M = 0	$\bar{x}$ = .12 M = 0	$\bar{x}$ = .40 M = 0
Number of children (%)					
0 children	94%	95%	99%	92%	70%
1 child	4	5	1	5	20
2 children	2	<1	<1	2	10
≥ 3 children	<1	0	0	1	0
Average ($\bar{x}$) and median (M) number of dogs	$\bar{x}$ = .49 M = 0	$\bar{x}$ = .13 M = 0	$\bar{x}$ = .25 M = 0	$\bar{x}$ = .64 M = 0	$\bar{x}$ = .00 M = 0
Number of dogs					
0 dogs	62%	88%	77%	52%	0%
1 dog	28	11	20	35	0
2 dogs	8	1	3	11	0
≥ 3 dogs	2	0	0	2	0

Summary of additional visitor observations from survey sessions

- Additional observations about visitors that were made by surveyors during survey sessions showed visitor characteristics similar to the questionnaire data for *onsite* respondents.
- 60% of observed visitors were alone, 30% were in a group of two, and 10% were in groups of 3 or more people. 94% of groups observed did not have any children with them.
- 62% of observed visitors did not have a dog with them, 28% had 1 dog, 8% had 2 dogs, and 2% had 3 or more dogs.
- 66% of observed visitors were hiking or walking (including dog walking), 18% were running or jogging, 15% were mountain biking, and 1% were horseback riding.

Socio-demographic characteristics of respondents

Socio-demographic characteristics of respondents are reported for *onsite* and *household* respondents in Tables 42 and 43. We compare the characteristics to the 2009 respondents when similar questions and/or response categories were used in both 2009 and 2017 questionnaires. We discuss the socio-demographic characteristics of Benton County when applicable. Socio-demographic characteristics of Benton County were obtained from the U.S. Census Bureau using the most recently available data (from the 2016 American Community Survey or the 2017 Population Estimates Program).

More respondents in 2017 were females compared to 2009 (Table 42). More than half (55%) of *onsite* respondents and 47% of *household* respondents were females, compared to 51% of respondents in 2009. Nearly 50% of Benton County residents are female.

On average, respondents in 2017 were older than respondents in 2009 and older than the average age for Benton County residents. *Onsite* respondents in 2017 were older than respondents in 2009 with an average age of 49 years compared to 45 years in 2009. This could be associated with the long-term population aging, though it is difficult to comment on that with much certainty. *Onsite* respondents were significantly younger than *household* respondents (t=-8.66, $p<.001$) with an average age of 49 and 62, respectively. The median age of *onsite* respondents in 2009 was 46, compared to 52 for 2017 *onsite* respondents and 63 for 2017 *household* respondents. The median age in Benton County in 2016 was 33 years. Most (87%) of *household* respondents were at least 50 years of age and 48% of *onsite* respondents were younger than 50 years. Ages of *onsite* respondents ranged from 18-92 years and ages of *household* respondents ranged from 31 to 91 years. In Benton County, approximately 9% of the population is between 18 and 21 years old, 18% are older than 62, and 14% are older than 65 years. Overall, respondents in 2017 were older than the general population of Benton County.

Forest visitors have generally obtained higher levels of education compared to the general population in Benton County. The majority of *onsite* (80%) and *household* (85%) respondents in 2017 had at least a 4-year degree. In fact, 58% of *household* respondent and 47% of *onsite* respondents reported having an advanced degree. Similarly, 80% of respondents in 2009 had at least a 4-year degree and 43% had an advanced degree. In Benton County, 54% of residents 25 years or older have at least a 4-year degree.

Table 42. Sociodemographic characteristics of respondents (% of respondents)

	2009 *Onsite* respondents	**2017 *Onsite* respondents**	**2017 *Household* respondents**
Gender			
Female	51%	55%	47%
Male	49	43	49
Transgender	n/a[a]	1	4
Do not identify as male, female, transgender	n/a	1	0
Age			
Less than 20 years old	4	1	0
20-29 years	16	15	0
30-39 years	18	16	5
40-49 years	20	16	8
50-59 years	28	21	21
60-69 years	11	23	45
79+ years old	3	9	21
Average age (mean years)	45	49	62
Median age	46	52	63
Education			
Advanced degree (M.S., Ph.D., M.D., J.D.)	43	47	58
4-year college degree	37	33	27
Some college education	n/a	11	6
2-year associates degree or trade school	10	5	6
Highschool diploma or GED	8	3	3
Less than high school diploma	1	1	0
Median	n/a	4-yr	Adv. Deg.
Annual *household* income before taxes	n/a		
Under $15,000		9	0
$15,000 - $24,999		6	7
$25,000 - $34,999		5	5
$35,000 - $49,999		7	7
$50,000 - $74,999		18	10
$75,000 - $99,999		18	21
$100,000 - $149,999		21	19
$150,000 - $199,999		9	12
$200,000 and over		7	19
Median	$50-70k[a]	$75 100k	$100 -150k
Racial or ethnic identity (check all that apply)	n/a		
White/Caucasian		91	90
Hispanic/Latino/Spanish		2	0
Black/African American		<1	2
Asian/Asian American		2	0
American Indian/Alaska Native		<1	0
Native Hawaiian/Pacific Islander		0	0
Two or more races		4	8
Other[b]		2	3

[a] respondents were not asked the same questions, or the categories of response options varied between 2009 and 2017 responses

[b]No additional information was provided to identify 'other' by any respondents who selected 'other'

Visitors at the Forests tend to have higher annual *household* income compared to Benton County. The median annual income of *household* respondents was between $100,000 and $150,000 and between $75,000 and $100,000 for *onsite* survey respondents. Nearly 75% of *onsite* respondents and more than 80% of *household* respondents earn more than $50,000 per year. The median *household* income among respondents in 2009 was between $50,000 and $69,999 (though the categories of income levels in the surveys varied between years), and approximately 65% of the 2009 respondents earned at least $50,000 per year. The median *household* income in Benton County in 2016 was $52,015. Inflation since 2009, and 2016, could account to some extent for the higher median income of respondents in 2018.

The majority of 2017 respondents (91% of *onsite* and 90% of *household*) identified their racial/ethnic identify as white/Caucasian. Racial/ethnic identity of respondents was not collected in 2009. The largest Benton County racial/ethnic groups are White (87.3%), Hispanic (7.3%), Asian (6.5%), and two or more races (3.8%).

Table 43 shows the number of respondents who were students, in which town respondents reside, and the proximity of respondents' residence to the nearest boundary of the Forests. None of the *household* respondents were students and 14% of *onsite* respondents were students. Among the respondents who were students and who listed the name of their school, most of them were OSU students, followed by Linn-Benton Community College, Western Oregon University, Chemeketa Community College, University of Oregon, Portland State University, Corvallis Highschool, and Oregon Health and Science University (see Appendix R for the complete list of schools).

Approximately 70% of *onsite* and *household* respondents reported living in Corvallis. Fewer than 20% of *onsite* respondents and nearly 1/3rd of *household* respondents selected 'other.' The most common 'other' places for *onsite* respondents were Salem, Monmouth, Portland, Independence, Lebanon, Dallas, and Eugene (see Appendix S for the complete list). Among *household* respondents, 12 people said they live in rural Benton county, three said Soap Creek, two said Arboretum Road, and one said Vineyard Mountain area.

Nearly 50% of *onsite* respondents live within 1-5 miles of a Forest boundary and 34% live more than 5 miles away from a boundary. More than half of *household* respondents live adjacent to a Forest boundary and 46% live with ½ mile of a boundary.

Table 43. Socio-demographic characteristics of respondents, continued (% of respondents)

	2009 *Onsite* respondents	2017 *Onsite* respondents	2017 *Household* respondents
Currently a student[a]			
No	82%	86%	100%
Yes	18	14	0
City or town currently lived in			
Corvallis	71	69	71
Other[b]	16	17	28
Albany	9	10	0
Philomath	2	2	0
Adair Village	2	1	1
Proximity of residence to nearest boundary of McDonald and Dunn Forests			
Adjacent (next to)	4	3	54
Within ½ mile	6	6	46
Within 1 mile	11	8	0
1-5 miles	43	47	0
More than 5 miles	36	34	0
Unsure	n/a[c]	3	0

[a]see Appendix O for the complete list of schools that students attend
[b]see appendix P for the complete list of 'other' places where respondents live
[c]n/a means that respondents were not asked the same questions, or the categories of response option varied between 2009 and 2017 responses

Section summary: Sociodemographic characteristics of visitors

- 55% of *onsite* respondents and 47% of *household* respondents were females, compared to 51% of respondents in the 2009 study. Nearly 50% of Benton County residents are female.
- On average, *onsite* respondents were significantly younger than *household* respondents with an average age of 49 and 62, respectively. The median age of *onsite* respondents in 2009 was 46, compared to 52 years for 2017 *onsite* respondents and 63 years for 2017 *household* respondents. The median age in Benton County in 2016 was 33 years. Most (87%) of *household* respondents were at least 50 years of age and 48% of *onsite* respondents were younger than 50 years.
- Forest visitors have obtained higher levels of education compared to the general population in Benton County. Most respondents had at least a 4-year degree.
- Visitors at the Forests have higher annual *household* income compared to Benton County as a whole. The median annual income of *household* respondents was between $100,000 and $150,000 and between $75,000 and $100,000 for *onsite* respondents.

- The majority of respondents (90% of *household* and 91% of *onsite*) identified their racial/ethnic identify as white/Caucasian. The largest Benton County racial/ethnic groups are White (87.3%), Hispanic (7.3%), Asian (6.5%), and two or more races (3.8%).
- None of the *household* respondents were students and 14% of *onsite* respondents were students.
- Approximately 70% of both *household* and *onsite* respondents reported living in Corvallis. Nearly 1/3rd of *household* respondents and 17% of *onsite* respondents selected 'other.'
- Nearly 50% of *onsite* respondents live within 1-5 miles of a Forest boundary and 34% live more than 5 miles away from a boundary. More than half of *household* respondents live adjacent to a Forest boundary and 46% live with ½ mile of a boundary.

Recreation experiences at the Forests

Findings related to the following topics are presented in this section:

- Overall satisfaction with recreation experiences at the Forests
- Satisfaction with and importance of specific characteristics
- Perceptions of crowding and people/vehicles seen at trailheads and Forest trails and roads
- Conflict among visitors

Overall satisfaction with recreation experiences at the Forests

Respondents were asked how satisfied they were with their recreation experiences at the Forests overall. Similar to the 2009 study, the majority (>90%) of respondents were satisfied (Table 44). More *onsite* respondents were very satisfied in 2017 than in 2009 and slightly fewer respondents in 2017 were dissatisfied or neutral than in 2009. Among *onsite* respondents in 2017, 72% were very satisfied and 26% were satisfied. Among *household* respondents, 66% were very satisfied and 31% were satisfied.

Table 44. Overall visitor satisfaction at the Forests (% of respondents)

	2009 *Onsite* respondents	**2017 *Onsite* respondents**	**2017 *Household* respondents**
n	*1,056*	*1,240*	*62*
Very satisfied	66	72	66
Satisfied	30	26	31
Dissatisfied or neutral	4	3	3

Table 45 shows the percent of respondents for each response option for *household* respondents, all *onsite* respondents, and *onsite* respondents by location. The overall indication is that respondents reported high levels of satisfaction at each site, with at least 85% of respondents being satisfied with 98% overall of *onsite* respondents indicating they were satisfied. The finding that 16% of respondents at Gate 400 who said they were dissatisfied or neutral should be taken with caution because it only represents two respondents.

Table 45. Overall visitor satisfaction at the Forests (% of respondents) by ***ONSITE*** survey location

	Hwy 99	**Dan's Trail**	**Lewisburg Saddle**	**Oak Creek**	**Peavy**	**Sulphur Springs**	**Gate 400**
n=	*199*	*152*	*309*	*304*	*235*	*28*	*13*
Very satisfied	74	76	74	63	77	46	77
Satisfied	23	22	24	33	20	46	8
Dissatisfied or neutral	3	1	2	4	2	8	16

Examining the overall satisfaction among respondents based on their primary typical activity illustrated that Forest users of all activity types are also overall very satisfied with their recreation experience at the Forests (Tables 46 and 47). Among *onsite* respondents, slightly more respondents in the other visitors on foot category were dissatisfied or neutral with their experiences than other groups. Also, among *onsite* respondents, fewer mountain bikers were very satisfied with their experience compared to other activity groups.

The findings for *household* respondents compared by activity group (Table 47) should be taken with caution given the small sample size of each activity group for *household* respondents. For example, ten percent of *household* respondents who said their primary activity was dog walking reported being dissatisfied. However, this only represents 1 person since only 10 *household* respondents identified their primary typical activity as dog walking.

Table 46 User satisfaction at the Forests among ***ONSITE*** respondents compared by primary typical activity type (% of respondents)

	Other visitors on foot	**Dog walking**	**Trail running or jogging**	**Mountain biking**	**Horseback riding**
n	*637*	*232*	*196*	*144*	*8*
Very satisfied	71	77	76	60	75
Satisfied	25	21	22	39	25
Dissatisfied or neutral	4	2	2	1	0

Table 47. User satisfaction at the Forests among ***HOUSEHOLD*** respondents compared by primary typical activity type (% of respondents)

	Other visitors on foot	**Dog walking**	**Trail running or jogging**	**Mountain biking**	**Horseback riding**
n	*40*	*10*	*4*	*5*	*3*
Very satisfied	62	70	100	60	67
Satisfied	35	20	0	40	33
Dissatisfied or neutral	3	10	0	0	0

Open ended comments about visitor satisfaction

Respondents were also asked to briefly explain their overall level of satisfaction in an open-ended comment format. See Appendix J for all comments from *onsite* respondents regarding their level of satisfaction. Approximately 1/3rd of the comments from *onsite* respondents about their satisfaction level were expressing a general appreciation and gratitude for access to the resource, natural and scenic beauty there, and the ability to have enjoyable

experiences in a variety of ways there. Quite a few comments specifically mentioned an appreciation for the trails at the Forests in terms of having many different trail options and having well-maintained trails. Another set of comments specifically mentioned the proximity of the Forests and recreation opportunities to one's home, to Corvallis, and to other communities. It's clearly an appreciated and valued asset to many people in the area.

Approximately 1/5th of the comments from *onsite* respondents were categorized as 'things that could improve.' Many of these comments expressed negative attitudes about dogs, particularly that there are too many dogs, a large amount of dog waste, and owners who do not control their dogs around other users. The other prominent theme was the need for more or 'better' trails and 'better' signage throughout the trail system. Finally, there were several comments that expressed a dislike for logging on the Forests, apparently due to too many clear cuts, road/trail/Forest closures, or encounters with logging trucks.

See Appendix K for all comments from *household* respondents about satisfaction. *Household* respondents' comments about satisfaction levels reflected an appreciation for the proximity and access to the Forests, the natural beauty, the trails, and the ability to recreate there in a variety of ways (e.g., with dogs and horses). Several people mentioned conflict with mountain bikers and dogs or people with dogs (related to dogs not being under vocal control). Two people mentioned a dislike for logging and chemical applications for ecological reasons and the need for closures during these operations. Two people mentioned they would like more trails.

Satisfaction with and importance of specific characteristics

Previous research suggests that overall high levels of satisfaction do not necessarily mean that respondents are satisfied with every aspect of their recreation experience at a recreation area (Manning, 2010). Satisfaction levels are influenced by the extent to which different aspects or characteristics of recreation or the site is important to them. Therefore, the questionnaire asked respondents about their expectations of recreation experiences at the Forests by indicating how important different characteristics are to them at the Forests. Then, respondents were asked to indicate their level of satisfaction with those characteristics at the Forests as a way to measure performance of these characteristics. Table 48 shows the percent of respondents who rated a characteristic as either fairly important or extremely important. Table 49 shows the percent of respondents who indicated they were either satisfied or very satisfied with a characteristic. Table

49 shows the average level of importance and satisfaction for each characteristic. Taken together, these tables provide a good indication of visitor expectations and satisfaction level with different characteristics at the Forests and they provide the basis for the following summary.

The most important Forest or recreation characteristics among *onsite* respondents were the amount of litter seen, the quality of trail maintenance, and the amount of dog waste seen. The least important characteristics among *onsite* respondents were the availability of free brochures at trailheads, the amount of parking space available for vehicles, the amount of horse waste seen and the availability of trashcans at trailheads. *Onsite* respondents were most satisfied with the quality of trail maintenance, safety from Forest operations, and the amount of litter seen. *Onsite* respondents were least satisfied with the availability of free brochures at trailheads, the number of directional signs on trails/roads, and the amount of dog waste and horse waste seen.

Table 48. Percent of respondents who said different characteristics of the Forests are important*

	2009 *Onsite* respondents	**2017 *Onsite* respondents**	**2017 *Household* respondents**
Amount of parking space available for vehicles	60	31	23
Safety from logging/Forestry operations	71	50	48
Availability of trash-cans at trailheads	58	38	41
Availability of free brochures at trailheads	68	16	14
Number of directional signs on trails/roads	78	49	43
Quality of trail maintenance	88	64	62
Availability of single-track Forest trails	n/a	58	55
Amount of litter seen	94	75	68
Amount of dog waste seen	68	64	68
Amount of horse waste seen	55	38	34
Forest access directly from my house or neighborhood	n/a	n/a	74

*Cell are the % of users who rated the characteristic as 4 “fairly important” or 5 “extremely important”

The most important characteristics among *household* respondents included having Forest access directly from their house or neighborhood, the amount of dog waste seen, the amount of litter seen, the quality of trail maintenance, and safety from Forestry and logging operations. The least important characteristics for *household* respondents were the availability of free brochures at trailheads, the amount of parking space for vehicles, and the amount of horse waste see. *Household* respondents were most satisfied with the characteristics that include Forest access directly from their house or neighborhood, safety from logging/Forestry operations, the quality of trail maintenance, and the amount of litter seen. Satisfaction levels were the lowest for the

amount of parking space available for vehicles, availability of trash-cans at trailheads, the availability of free brochures at trailheads, and the number of directional signs on trails/roads.

Table 49. Percent of respondents who are satisfied with different characteristics of the Forests *

	2009 *Onsite* respondents	**2017 *Onsite* respondents**	**2017 *Household* respondents**
Amount of parking space available for vehicles	73	72	39
Safety from logging/Forestry operations	65	91	84
Availability of trash-cans at trailheads	53	72	44
Availability of free brochures at trailheads	62	69	53
Number of directional signs on trails/roads	57	71	77
Quality of trail maintenance	88	93	81
Availability of single-track Forest trails	n/a	75	65
Amount of litter seen	89	88	82
Amount of dog waste seen	57	69	55
Amount of horse waste seen	44	65	56
Forest access directly from my house or neighborhood	n/a	n/a	89

*Cells are the % of users who were 4 "satisfied" or 5 "very satisfied" with the characteristic.

Several trends emerged in the data from *onsite* respondents from 2009 compared to 2017. Every characteristic was rated as fairly or extremely important by fewer respondents in 2017 than in 2009. The biggest differences between the years were for the availability of free brochures at trailheads, the amount of parking space for vehicles, safety from logging/Forestry operations, and the availability of trash cans at trailheads. At least 20% fewer respondents in 2017 compared to 2009 rated these characteristics as important. The changes were less straightforward for satisfaction with the different characteristics between the two survey years.

In 2017, more respondents were satisfied with most characteristics than in 2009. Specifically, in 2017, compared to 2009, respondents were more satisfied with safety from logging/Forestry operations, the availability of trashcans at trailheads, the availability of free brochures at trailheads, the number of directional signs on trails/roads, the quality of trail maintenance, the amount of dog waste seen, and the amount of horse waste seen. These are characteristics where the Forests have improved in terms of affecting visitors' satisfaction levels since 2009. The most dramatic improvements in satisfaction levels between the years are for safety from logging/Forestry operations, the amount of horse waste seen, and the availability of trashcans at trailheads. The characteristics that visitors in 2017 were less satisfied with compared

to 2009 are the amount of parking space available for vehicles and the amount of litter seen. The percent of respondents less satisfied with the amount of parking and litter seen were only different by 1% between the years. These characteristics have remained consistent over the years in terms of visitor satisfaction level.

The average levels of importance and satisfaction of each characteristic for *onsite* and *household* respondents are shown in Table 50. Mean comparison tests for the average level of importance of different characteristics showed that the only significant difference between *onsite* and *household* respondents was for the amount of parking space available for vehicles (see Tables A.1 and A.2 in Appendix V for test statistics) where that characteristic was less important for *household* respondents than *onsite* respondents. However, average satisfaction levels for each characteristic were statistically significantly different between *household* and *onsite* respondents ($p<.05$) for every characteristic except the amount of horse waste seen. *Onsite* respondents were more satisfied with each characteristic compared to *household* respondents, though the difference was not statistically significant for the amount of horse waste seen.

Table 50. Average level of importance and satisfaction for different characteristics at the Forests

Characteristics	***Household* respondents**		***Onsite* respondents**	
	Mean Importance	Mean Satisfaction	Mean Importance	Mean Satisfaction
Amount of parking space available for vehicles	3.00	3.78	2.31	3.16
Safety from logging/Forestry operations	3.52	4.28	3.71	4.05
Availability of trash-cans at trailheads	3.07	3.80	2.97	3.40
Availability of free brochures at trailheads	2.31	3.84	2.27	3.49
Number of directional signs on trails/roads	3.39	3.71	3.31	3.34
Quality of trail maintenance	3.83	4.29	3.70	4.06
Availability of single-track Forest trails	3.62	3.92	3.56	3.66
Amount of litter seen	4.12	4.24	3.98	3.92
Amount of dog waste seen	3.74	3.75	3.77	3.35
Amount of horse waste seen	2.99	3.76	2.84	3.52

Scales: Importance: 1-Not important at all, 2=Slightly important, 3= Important, 4=Fairly important, 5=Extremely important; Satisfaction: 1=Very unsatisfied, 2= Unsatisfied, 3= Neither, 4= Satisfied, 5=Very satisfied

Table 51 (below) shows the percent of respondents who rated characteristics of the Forests as important and who were satisfied with that characteristic, for each different survey location. Table 52 (below) shows the average levels of importance and satisfaction with different

characteristics of the Forests across all survey locations. The **average level of importance of characteristics** at the Forests did vary significantly by location for *onsite* respondents (see Table 51 and Table A.3 in Appendix V for the test statistics). Post-hoc tests showed that the level of importance varied across sites for the amount of parking space for vehicles, the availability of free brochures at trailheads, the number of directional signs on trails/roads, quality of trail maintenance, and the amount of dog waste seen. The sites with significant differences between average level of importance were:

- Respondents at Dan's Trail rated the amount of parking space available as significantly less important than all other sites except Gate 400. *The amount of parking space available appears to be most important among respondents at Sulphur Springs and Hwy 99.* The small sample size for Sulphur Springs limits the validity of this finding, however parking could be an issue there due to horse trailers. Another potential explanation is that visitors there expect to see fewer vehicles there, so a small number of vehicles may still seem like a lot even if the parking area is not full.
- Respondents at the Peavy trailhead rated the availability of free brochures at trailheads as significantly more important than all other sites except Sulphur Springs and Gate 400. *Brochure availability appears to be most important at Peavy*, although only 26% of respondents there rated it as fairly or extremely important.
- Respondents at Oak Creek trailhead rated the importance of the number of directional signs on trails/roads significantly less important than respondents at all other sites except Sulphur Springs and Gate 400. *The number of directional signs on trails/roads appears to be most important for respondents at Peavy, Dan's Trail, and Gate 400*.
- Respondents at Sulphur Springs rated the quality of trail maintenance as significantly less important compared to respondents at Hwy 99, Dan's Trail, and Peavy trailheads. Respondents at Dan's Trail rated the importance of the quality of trail maintenance significantly higher than respondents at Gate 400. *Trail quality appears to be most important at Hwy 99 and Peavy, perhaps as well as Lewisburg Saddle and Dan's Trail*.
- Post-hoc tests did not reveal any statistically significant differences between sites in the importance of the amount of dog waste seen. However, *the amount of dog waste seen appears to be most important among respondents at Hwy 99 and least important among respondents at Sulphur Springs and Gate 400*.

The average level of satisfaction with different characteristics varied significantly across *onsite* locations for the amount of parking space for vehicles, safety from logging/Forestry operations, availability of trash cans at trailheads, availability of free brochures at trailheads, quality of trail maintenance, availability of single-track Forest trails, and amount of horse waste seen (see Table 52 below and see Table A.4 in Appendix V for the test statistics). The sites with significant differences between average level of satisfaction with different characteristics were:

- Respondents at the Peavy trailhead were the most satisfied with the amount of parking space for vehicles compared to any other site, and significantly more satisfied than respondents at Hwy 99, Lewisburg Saddle, and Oak Creek. *Focus on Hwy 99, Sulphur Springs, Oak Creek, and Lewisburg Saddle to provide adequate parking space for vehicles or for promoting alternate transportation options*.
- Respondents at Peavy were the most satisfied with safety from logging/Forestry operations, and they were significantly more satisfied with this characteristic than respondents at Oak Creek and Lewisburg Saddle. *Focus on Oak Creek, Lewisburg Saddle, and Gate 400 for ensuring visitor safety and communicating about logging and Forestry activities in those areas.*
- Respondents at Oak Creek were most satisfied with the availability of trash cans at trailheads, and statistically significantly more satisfied than respondents at Hwy 99 and Sulphur Springs. Respondents at Peavy were also statistically significantly more satisfied with this characteristic than respondents at Hwy 99. *Focus on Hwy 99, Sulphur Springs, and Gate 400 to increase satisfaction with the availability of trash cans at trailheads.*
- Respondents at the Hwy 99 trailhead were significantly less satisfied with the availability of free brochures at trailheads than respondents at Oak Creek and Peavy. *Focus on the Hwy 99 trailhead for providing free brochures at the trailhead.*
- Respondents at Oak Creek were significantly less satisfied with the quality of trail maintenance compared to respondents at Hwy 99, Dan's Trail, and Peavy. *Focus on Oak Creek, Sulphur Springs, and Gate 400 for improving trail maintenance.*
- Respondents at Oak Creek were significantly less satisfied with the availability of single track Forest trails compared to respondents at Hwy 99, Lewisburg Saddle, and Peavy. Respondents at Sulphur Springs were also significantly less satisfied with the availability

of single-track Forest trails compared to respondents at Peavy. *Focus on Oak Creek and Sulphur Springs for areas to provide more single-track trails.*

- Respondents at Dan's Trail were significantly less satisfied with the amount of horse waste seen compared to respondents at Hwy 99 and Peavy. *Focus on Dan's Trail and Gate 400 for controlling the amount of horse waste seen.*

Table 51. Percent of 2017 ***ONSITE*** respondents who rated characteristics of the Forests as important (Imp) and who were satisfied (Sat) with the different characteristics by survey location

Characteristics	Imp/Sat	*Onsite* All	Hwy 99	Dan's Trail	Lewisburg Saddle	Oak Creek	Peavy	Sulphur Springs	Gate 400
Amount of parking space available for vehicles	**Imp**	31	37	24	33	27	33	43	31
	Sat	72	70	72	67	69	86	72	71
Safety from logging/Forestry operations	**Imp**	50	50	47	50	51	53	52	50
	Sat	91	90	89	89	92	94	86	79
Availability of trash-cans at trailheads	**Imp**	38	37	34	35	37	42	32	29
	Sat	72	63	68	71	80	72	54	57
Availability of free brochures at trailheads	**Imp**	16	16	16	16	9	26	14	7
	Sat	69	57	68	68	73	74	76	71
Number of directional signs on trails/roads	**Imp**	49	48	54	49	37	59	48	64
	Sat	71	69	72	72	68	71	59	71
Quality of trail maintenance	**Imp**	64	68	68	67	58	66	35	43
	Sat	93	96	94	93	88	97	79	79
Availability of single-track Forest trails	**Imp**	58	51	60	56	60	61	69	72
	Sat	75	77	78	78	68	79	55	86
Amount of litter seen	**Imp**	75	76	77	73	74	74	64	86
	Sat	88	85	92	88	87	90	69	86
Amount of dog waste seen	**Imp**	64	68	65	59	63	65	50	50
	Sat	69	70	66	68	67	73	83	64
Amount of horse waste seen	**Imp**	38	44	38	36	39	37	21	21
	Sat	65	68	56	63	67	70	69	50
Forest access directly from my house or neighborhood	**Imp**	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sat	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

**Scale: Importance: 1 = not important at all, 2 = slightly important, 3 = important, 4 = fairly important, 5 = extremely important.*
Scale: Satisfaction:1 = very unsatisfied, 2 = unsatisfied, 3 = neither, 4 = satisfied, 5 = very satisfied

Table 52. Average level of importance (Imp) and satisfaction (Sat) with different characteristics of the Forests by survey location among ***ONSITE*** respondents

Characteristics	Imp/Sat	*Onsite* All	Hwy 99	Dan's Trail	Lewisburg Saddle	Oak Creek	Peavy	Sulphur Springs	Gate 400
Amount of parking space available for vehicles	Imp	3.00	3.17	2.56	3.06	2.96	3.07	3.39	3.15
	Sat	3.78	3.73	3.86	3.67	3.64	4.11	3.76	3.64
Safety from logging/Forestry operations	Imp	3.52	3.41	3.38	3.56	3.59	3.57	3.55	3.29
	Sat	4.28	4.25	4.31	4.23	4.21	4.43	4.34	4.07
Availability of trash-cans at trailheads	Imp	3.07	3.11	2.99	3.02	3.12	3.20	2.54	2.64
	Sat	3.80	3.60	3.81	3.77	3.94	3.88	3.39	3.50
Availability of free brochures at trailheads	Imp	2.31	2.22	2.31	2.30	2.14	2.66	2.11	1.79
	Sat	3.84	3.62	3.86	3.80	3.88	3.98	4.00	3.79
Number of directional signs on trails/roads	Imp	3.39	3.49	3.50	3.42	3.07	3.67	3.10	3.29
	Sat	3.71	3.67	3.73	3.77	3.64	3.78	3.59	3.79
Quality of trail maintenance	Imp	3.83	3.91	3.94	3.88	3.69	3.91	3.34	3.14
	Sat	4.29	4.40	4.32	4.28	4.12	4.41	4.07	4.21
Availability of single-track Forest trails	Imp	3.62	3.39	3.76	3.58	3.68	3.70	3.62	3.71
	Sat	3.92	3.98	3.94	3.96	3.73	4.08	3.48	3.93
Amount of litter seen	Imp	4.12	4.13	4.20	4.10	4.14	4.06	3.86	4.43
	Sat	4.24	4.21	4.34	4.23	4.19	4.30	4.14	3.93
Amount of dog waste seen	Imp	3.74	3.90	3.82	3.60	3.76	3.79	3.25	3.36
	Sat	3.75	3.78	3.66	3.75	3.66	3.86	3.97	3.64
Amount of horse waste seen	Imp	2.99	3.18	3.01	2.92	3.06	2.91	2.59	2.43
	Sat	3.76	3.86	3.50	3.76	3.77	3.84	3.86	3.50
Forest access directly from my house or neighborhood	Imp	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	Sat	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

**Scale: Importance: 1 = not important at all, 2 = slightly important, 3 = important, 4 = fairly important, 5 = extremely important.*
Scale: Satisfaction:1 = very unsatisfied, 2 = unsatisfied, 3 = neither, 4 = satisfied, 5 = very satisfied

Importance-performance matrices

An Importance-Performance (I-P) analysis helps visualize the relationship between expectations (i.e., importance of attributes) and satisfaction (i.e. performance of these attributes). The importance of attributes is represented as averages on the vertical axis (i.e., y-axis) and average performance or satisfaction are measured on the horizontal axis (i.e. x-axis). The axes intersect and show four quadrants than can be interpreted as "concentrate here" (high importance or expectation and low satisfaction; Quadrant A), "keep up the good work" (high importance and high satisfaction; Quadrant B), "low priority" (low importance and low satisfaction; Quadrant C), and "possible overkill" (low importance and high satisfaction; Quadrant D). Figure 2 illustrates the matrix. This visualization can help managers make decisions about where to focus their attention regarding different attributes or characteristics of a recreation setting.

Figure 2. Importance-performance (I-P) analysis matrix

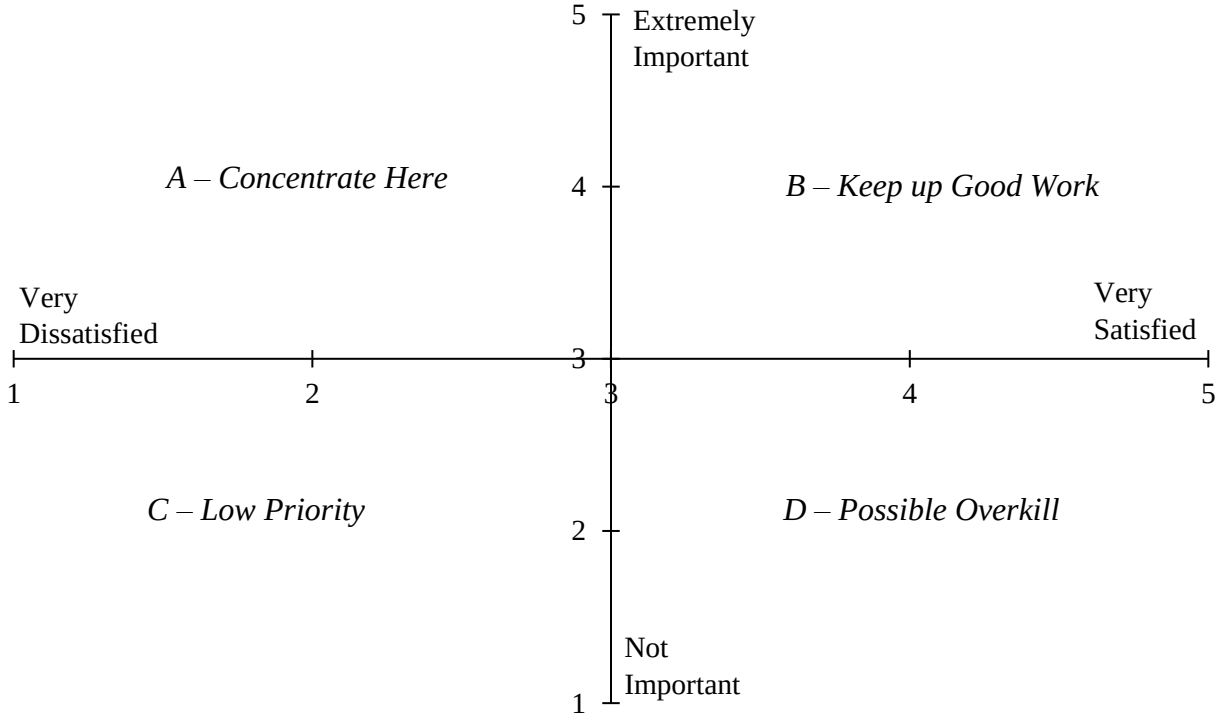
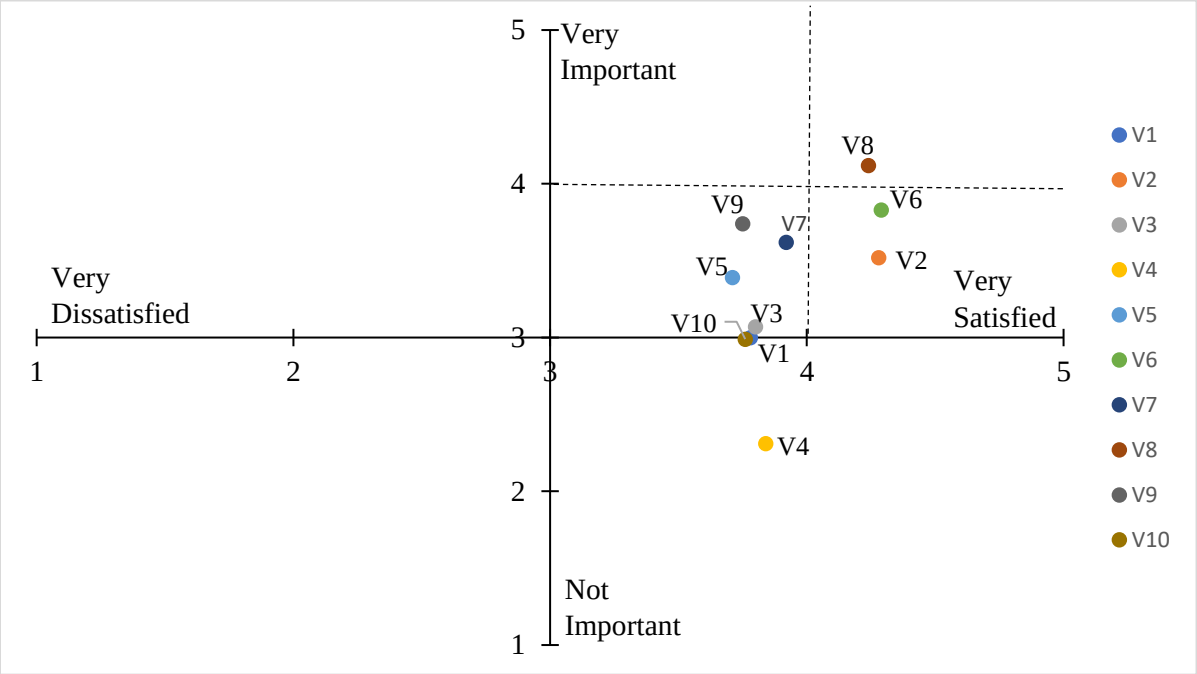


Figure 3 shows the I-P analysis matrix for *onsite* respondents. Most variables fall into the "keep up the good work" category. For *onsite* respondents, attention could be paid to the amount of dog waste seen, the availability of single-track trails and the number of directional signs on trails/roads given the higher importance and relatively lower satisfaction. In the 2009 study,

these same attributes fell into the 'concentrate here' category (in addition to safety from logging and forestry operations).

Figure 3. Importance-performance analysis matrix for ***ONSITE*** respondents

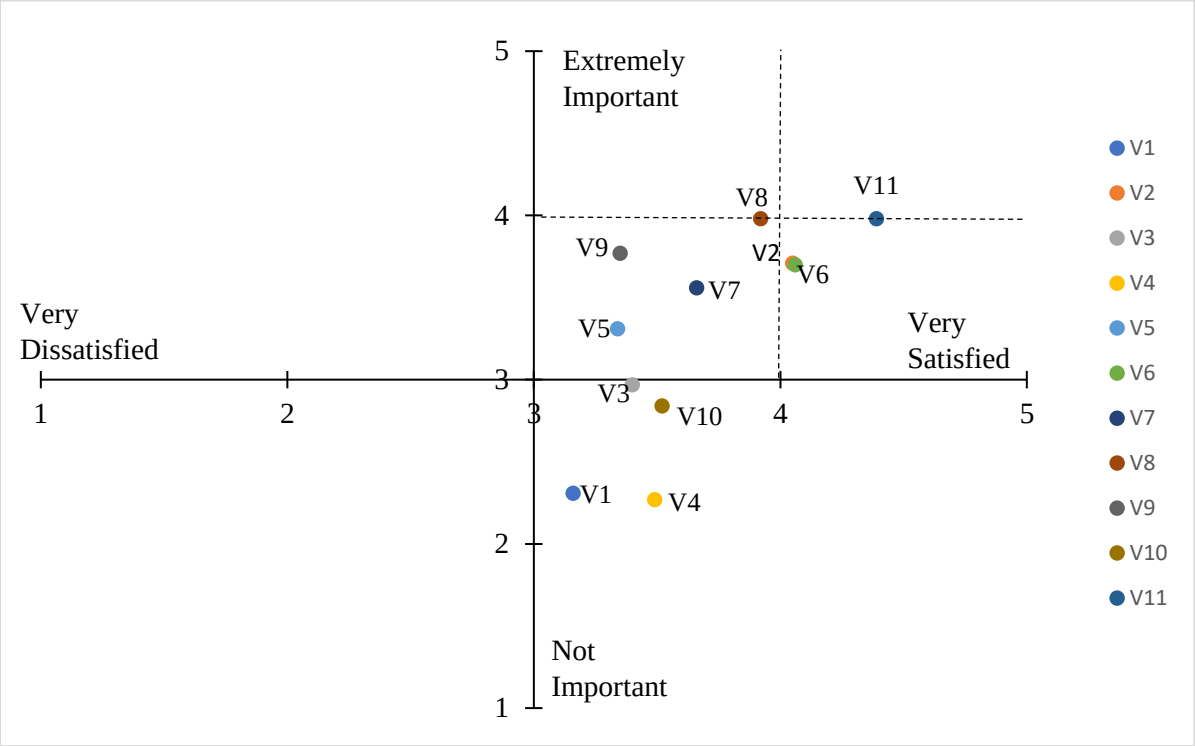


V1 Amount of parking space available for vehicles
V2 Safety from logging/Forestry operations
V3 Availability of trash-cans at trailheads
V4 Availability of free brochures at trailheads
V5 Number of directional signs on trails/roads
V6 Quality of trail maintenance
V7 Availability of single-track Forest trails
V8 Amount of litter seen
V9 Amount of dog waste seen
V10 Amount of horse waste seen
V11 Forest access directly from my house or neighborhood

Figure 4 shows that most attributes were in the "keep up the good work" quadrant for *household* respondents. The amount of parking space for vehicles, the availability of trash cans at trailheads, the availability of free brochures at trailheads, and the amount of horse waste seen fall into the "overkill" quadrant. For *household* respondents, it may make the most sense to focus efforts on attributes that were more important but had relatively low satisfaction, such as the

amount of dog waste seen, the availability of single-track trails, the number of directional signs on trails/roads, and perhaps the amount of litter seen.

Figure 4. Importance-performance analysis matrix for ***HOUSEHOLD*** respondents



V1 Amount of parking space available for vehicles
V2 Safety from logging/Forestry operations
V3 Availability of trash-cans at trailheads
V4 Availability of free brochures at trailheads
V5 Number of directional signs on trails/roads
V6 Quality of trail maintenance
V7 Availability of single-track Forest trails
V8 Amount of litter seen
V9 Amount of dog waste seen
V10 Amount of horse waste seen
V11 Forest access directly from my house or neighborhood

It appears that efforts by Forest managers to increase the satisfaction among *onsite* and *household* respondents regarding characteristics that are important to them yet may not be achieved at the desired level by visitors, are the amount of dog waste seen, the availability of single-track trails, and the number of directional signs on trails/roads.

Perceptions of crowding at the Forests

Several questions were used to assess visitor's perceptions of crowding at the McDonald and Dunn Forests. The first set of questions asked respondents to rate the level of crowding on a 5-point scale based on people seen on the survey day (or typically for *household* respondents) at trailheads, vehicles seen at trailheads, people seen on Forest trails, and people seen on Forest roads. Table 53 shows the percent of respondents who rated crowding at different places or areas at the Forests as either moderately or extremely crowded, broken up by survey location. Table 54 shows the percent of respondents who rated areas at the Forests as not being crowded at all.

Overall, *onsite* respondents appear to perceive less crowding than *household* respondents regarding the number of people seen at trailheads and slightly more regarding the number of vehicles seen at trailheads. *Onsite* respondents perceived slightly more crowding regarding the number of people seen on Forest trails than *household* respondents and similar levels of crowding in terms of people seen on Forest roads.

Table 53. The percent of respondents rating crowding at different locations as either **moderately or extremely crowded** compared by survey location

	People seen at trailheads	**Vehicles seen at trailheads**	**People seen on Forest trails**	**People seen on Forest roads**
Onsite (all)	10	29	5	6
Hwy 99	6	29	8	6
Dan's Trail	11	21	7	6
Lewisburg Saddle	10	44	2	11
Oak Creek	12	34	6	7
Peavy	15	28	4	7
Sulphur Springs	18	36	0	7
Gate 400	0	0	7	0
Household	17	30	2	5

Table 54. Percent of respondents rating crowding at different locations as **not being crowded at all**

	People seen at trailheads	**Vehicles seen at trailheads**	**People seen on Forest trails**	**People seen on Forest roads**
Onsite (all)	59	34	70	68
Hwy 99	62	31	64	68
Dan's Trail	61	51	59	68
Lewisburg Saddle	54	25	75	71
Oak Creek	56	32	72	62
Peavy	65	40	73	72
Sulphur Springs	54	29	78	63
Gate 400	86	71	86	86
Household	40	23	68	60

The number of people seen at trailheads was perceived as being moderately or extremely crowded by only 10% of *onsite* respondents and 17% of *household* respondents. The sites perceived as being crowded based on the number of people at the trailhead by the highest percent of respondents were Sulphur Springs and Peavy (though crowding is minimal). Fifty-nine percent of *onsite* respondents and 40% of *household* respondents indicated they did not feel crowded at all based on the number of people seen at trailheads. Locations on the Forests where perceptions of crowding based on the number of people seen at trailheads appears to be minimal include Gate 400, Peavy, highway 99, and Dan's Trail. However, at least 50% of respondents at every survey location said they did not feel crowded based on the number of people seen at the trailhead. Among all *onsite* respondents, 7% of those surveyed on weekdays rated crowding in terms of people at trailheads as either moderately or extremely crowded, compared to 13% on weekends.

Nearly 1/3rd of *onsite* and *household* respondents reported feeling moderately or extremely crowded based on the number of vehicles seen at trailheads, while 34% of *onsite* respondents and 23% of *household* respondents reported not feeling crowded at all based on the number of vehicles at trailheads. Forty-four percent of *onsite* respondents at Lewisburg Saddle felt moderately or extremely crowded based on vehicles seen at the trailhead, followed by 36% of Sulphur Springs respondents and 34% of Oak Creek respondents. At least 40% of *onsite* respondents at Gate 400, Dan's Trail, and Peavy rated crowding based on the number of vehicles seen at trailheads as not crowded at all. Among *onsite* respondents, 26% of those surveyed on a weekday rated crowding based on vehicles at the trailheads as moderately or extremely crowded compared to 40% of respondents surveyed on weekends (note, data not shown in tables). Approximately 28% of *onsite* respondents surveyed in the mornings rated crowding based on the number of vehicles seen at the trailheads as moderately or extremely crowded compared to 36% of respondents surveyed in the afternoon. Therefore, it appears that the number of vehicles seen at trailheads is perceived as being crowded more on weekends and afternoons.

Perceptions of crowding along Forest trails and Forest roads was minimal compared to people and vehicles at trailheads. Approximately 60% of *onsite* respondents said they did not feel crowded at all in terms of people seen on Forest trails and people seen on Forest roads. The highest percent of respondents who rated people seen on trails or roads as being moderately or

extremely crowded was 11% from respondents at Lewisburg Saddle for the number of people see on Forest roads.

Tables 55-58 show the percent of *onsite* and *household* respondents who rated crowding as not at all or moderate/extreme based on the respondents' primary typical activity type. More visitors whose primary typical activity was either dog walking or horseback riding reported not being crowded at all compared to any other activity group for both *onsite* and *household* respondents. The only exception is that fewer *household* horseback riders reported not feeling crowded at all based on the number of people seen on Forest roads than any other activity group among *household* respondents. Indeed, more *onsite* respondents who are horseback riders reported being crowded in terms of the number of people seen on Forest roads than other activity groups for *onsite* respondents, though still only 12% of them felt crowded in those regards. Aside from those inferences, there are limited noticeable trends in perceptions of crowding by different activity groups compared to crowding perceptions by all respondent overall. This information should still be useful to monitor any site-specific changes in crowding perceptions over time.

Table 55. The percent of ***ONSITE*** respondents who rated crowding at different areas in the Forests as **not being crowded at all**, organized by primary typical activity

	People seen at trailheads	**Vehicles seen at trailheads**	**People seen on Forest trails**	**People seen on Forest roads**
Other visitors on foot	60	33	68	68
Dog walking	61	36	73	70
Trail running/jogging	57	33	71	66
Mountain biking	55	33	71	65
Horseback riding	56	56	88	75

Table 56. The percent of ***ONSITE*** respondents who rated crowding at different areas in the Forests as **moderately or extremely crowded**, organized by primary typical activity

	People seen at trailheads	**Vehicles seen at trailheads**	**People seen on Forest trails**	**People seen on Forest roads**
Other visitors on foot	10	34	6	5
Dog walking	8	33	3	5
Trail running/jogging	8	33	5	7
Mountain biking	14	27	4	8
Horseback riding	11	22	0	12

Table 57. The percent of ***HOUSEHOLD*** respondents who rated crowding at different areas in the Forests as **not being crowded at all**, organized by primary typical activity

	People seen at trailheads	Vehicles seen at trailheads	People seen on Forest trails	People seen on Forest roads
Other visitors on foot	42	21	66	61
Dog walking	50	40	70	70
Trail running/jogging	25	25	100	50
Mountain biking	20	20	80	60
Horseback riding	33	67	33	33

Table 58. The percent of ***HOUSEHOLD*** respondents who rated crowding at different areas in the Forests as **moderately or extremely crowded**, organized by primary typical activity group

	People seen at trailheads	Vehicles seen at trailheads	People seen on Forest trails	People seen on Forest roads
Other visitors on foot	34	32	0	3
Dog walking	20	21	0	0
Trail running/jogging	50	75	0	25
Mountain biking	0	0	20	20
Horseback riding	0	0	0	0

Overall, visitors feeling crowded while they recreate at the OSU Forests does not seem to be a major issue of concern based on the number of people seen at trailheads and along trails and roads at the Forests. Respondents tended to indicate more crowding on the weekends compared to the weekdays. However, crowding based on the number of people seen at trailheads, on trails, and on roads at the Forests appears to only be an issue of concern for fewer than 20% of respondents and usually less than 10% of respondents for people seen on Forest trails and on Forest roads. Overall, *household* respondents appear to perceive more crowding regarding the number of people seen at trailheads and slightly more regarding the number of vehicles seen at trailheads. *Household* respondents perceived slightly less crowding regarding the number of people seen on Forest trails than *onsite* respondents and similar levels of crowding in terms of people seen on Forest roads. Managers may consider monitoring the number of people at trailheads in the future, but that should not be a priority at this time because at least 80% of visitors do not feel crowded based on the number of people at trailheads and especially based on the number of people seen on trails and roads inside the Forests.

However, perceptions of crowding are more pronounced at the trailheads in terms of the number of vehicles there. This is especially evident at Lewisburg Saddle, Sulphur Springs, and Oak Creek parking areas. Between 21-44% of respondents at all sites except Gate 400 rated the

number of vehicles seen at trailheads as moderately or extremely crowded. Although, anywhere from 29-71% of respondents did not feel crowded in terms of the number of vehicles at the different trailheads. We expect that perceptions of crowding at Sulphur Springs, a low use site, are higher mainly due to the small sample size and that only a few respondents felt crowded there. Visitors at Sulphur Springs may also have lower expectations and tolerance levels for the number of people there. The presence of horse trailers at that site could also increase perceptions of crowding there.

At this point, managers may consider developing a more frequent monitoring program to track vehicle capacity at the different trailheads (especially Lewisburg Saddle, Sulphur Springs, and Oak Creek), as well as visitor perceptions of crowding based on this metric at the different parking areas. These efforts could provide data to help indicate when the problem is at an unacceptable level and when taking action is needed.

Ultimately, whether crowding is a major issue of concern that requires management actions at the Forests is something that should be clarified and developed in a formal visitor use management plan. Overall, crowding does not seem to currently be a major issue at the Forests. However, crowding may be an issue in the future, especially in terms of the number of vehicles at trailheads (or, vehicle/parking capacity in general). This report provides baseline data that can be used to track the number of vehicles seen at trailheads and the number of people seen at trailheads, on trails, and on roads in the Forests. This data can be used to inform indicators and standards of when action may be required. For example, an indicator could be the number of occurrences in a period of time (e.g., a weekend, holiday, a season, or a year) when a parking lot is full. Another indicator could be the percent of visitors who report feeling crowded at a parking area based on the number of vehicles there. Then, a standard could be set for each indicator so that when that standard is reached, managers know they need to consider taking action. A standard for the first example could be that if a certain parking lot or multiple parking lots are completely full 3 times/day or 20 times per year, then there is a problem. Or, if at least 50% of visitors report being crowded based on the number of vehicles at a trailhead, then there is a problem. Setting these standards should be informed by current management objectives/goals (including the need to ensure positive visitor experiences and safety as well as associated resource impacts like vegetation damage and erosion caused by illegal parking) and regular

monitoring procedures that keep track of the levels of selected indicators (e.g., the percent of visitors who feel crowded or how often a parking area is full).

Published research in other urban proximate Forests and recreation areas about crowding is somewhat limited compared to similar research in more rural and wilderness settings. This makes it difficult to say confidently if crowding at the Forests is a problem compared to other urban proximate sites. However, some key insights can be gained from a few studies. A consistent finding is that, at urban proximate sites, visitors are more likely to feel crowded the longer they have been recreating there (i.e., the number of years), the more frequently they visit, if they generally perceive an increase in overall visitation at the site, and if they are seeking more natural experiences there (i.e., less social experiences) (Andereck & Knopf, 2007; Arnberger, 2012; Eder & Arnberger, 2012). We know that many visitors at the Forests are longer term visitors who visit frequently and enjoy natural experiences at the Forests. Therefore, given the likelihood of visitation at the Forests to increase in the future, it is likely that perceptions of crowding, and other capacity issues like lack of parking spaces, could be an issue of greater concern in the future.

Also, Arnberger (2012) found that 51% of respondents felt crowded on Sundays and holidays at an urban green area and the author used that figure to report that the majority of visitors felt crowded on Sundays or holidays. It is unclear if managers of that area considered 51% to be a majority or if 51% of visitors feeling crowded was an indication of a problem that required action. There are also many different social (e.g., demographics, activity types, behavioral norms and tolerances), environmental, and managerial differences between recreation areas across the U.S. and world, so it is challenging to compare perceptions of crowding at one recreation area to another. The point here is that managers should consider developing monitoring programs and setting indicators and standards based on their overall objectives defined in a visitor use management plan, which should be informed by this baseline data and the expectation that visitation is likely to continue increasing in the future. Such a program on the Forests would likely include monitoring vehicle capacity at trailheads on the Forests and visitor perceptions of crowding at trailheads based on the number of vehicles. Monitoring the number of people and perceptions of crowding on the trails and roads does not seem like it should be a priority at this time.

Finally, *household* respondents tended to perceive more crowding at the trailheads in terms of people and vehicles there. This is not uncommon. For example, one study of an urban national park found that more than 50% of park-adjacent *household*s considered the park to be crowded compared to 19% of other visitors who felt the park was crowded. They also noted that people with more *onsite* experience perceived more crowding at the park than visitors with less experience there. Indeed, *household* respondents in our study tended to have more *onsite* experiences than other respondents, which likely correlates to increased perceptions of crowding.

The number of people and vehicles seen on Forest trails, roads, and trailheads

The other set of questions related to crowding asked respondents to estimate the number of people they saw on the survey day (or typically for *household* respondents) on trails and roads inside the Forests. *Household* respondents were also asked how many vehicles they typically see on roads inside the Forests. *Onsite* respondents were also asked how many people they saw at the trailhead on the survey day and how many vehicles they saw at the trailhead on the survey day.

The number of people seen on Forest trails

Table 59 shows the percent of respondents who reported seeing different amounts of people on trails on the day they were surveyed. Among *onsite* respondents, 40% saw two other people or less on the trails and 20% saw 10 or more people on the trails. More respondents at Gate 400 and Lewisburg saddle reported seeing no other people on the trails than respondents at other trailheads. Table 60 shows the average number of people seen on trails on the survey day (or typically for *household* respondents). On average, *onsite* and *household* respondents reported seeing about 5 other people on the trails. T-test showed that the average number of people did not vary significantly between *household* and *onsite* respondents (t=1.12, p=-.264). The highest average number of people seen was reported by respondents at Dan's Trail (approximately 10 people) and the lowest was at Gate 400 and Sulphur Springs with 1 and 2 people seen on average at those sites, respectively. The maximum number of people seen on trails was highest at Dan's Trail with 70 people reported and the lowest at Gate 400 and Sulphur Springs with fewer than 10 people.

ANOVA tests did reveal significant differences in average number of people seen on the trails between survey locations (F=32.02, p<.001). Respondents at Dan's Trail reported seeing significantly more people on trails than respondents at any other survey location, although this finding was affected by a respondent who reported seeing 70 other people. Respondents at Hwy

99 reported seeing more people than respondents at Lewisburg Saddle, Oak Creek, Sulphur Springs, and Gate 400. Respondents at Peavy reported seeing more people on trails than respondents at Lewisburg Saddle, Oak Creek, and Sulphur Springs.

Table 59. The number of people seen on Forest trails today (typically for *household*) (% of respondents)

	n	**0 people**	**1-2 people**	**3-4 people**	**5-9 people**	**10 or more people**
Onsite (all)	*1,256*	19	21	18	23	20
Hwy 99	*200*	12	16	20	30	22
Dan's Trail	*155*	5	14	16	27	39
Lewisburg Saddle	*312*	31	23	15	17	15
Oak Creek	*308*	21	26	20	19	15
Peavy	*238*	13	16	17	30	24
Sulphur Springs	*20*	28	41	21	10	0
Gate 400	*14*	57	29	14	0	0
Household	*69*	1	26	29	23	20

Table 60. Average number of people seen on Forest trails today (typically for *household*)

	n	**Mean**	**SD**	**Median**	**Max**
Onsite (all)	*1,205*	5.06	6.34	4	70
Hwy 99	*197*	6.00	6.10	5	40
Dan's Trail	*153*	10.39	11.41	6	70
Lewisburg Saddle	*295*	3.17	3.97	2	25
Oak Creek	*293*	3.70	3.75	3	20
Peavy	*224*	5.51	5.05	5	30
Sulphur Springs	*29*	1.97	2.06	1	8
Gate 400	*14*	0.93	1.21	0	3
Household	*62*	4.51	3.57	4	20

The number of people seen of Forest roads

Among *onsite* respondents, 45% reported seeing 2 or fewer people on roads at the Forests and 18% reported seeing 10 or more people on the roads (Table 61). At least 30% of respondents at Dan's Trail, Hwy 99, Sulphur Springs, and Gate 400 reported seeing no other people on roads, whereas fewer respondents at other trailheads reported seeing no people on the roads. More than 20% of respondents at Peavy and Oak Creek trailheads reported seeing 10 or more people on the roads at the Forests, which was more respondents than at other trailheads who reported seeing at least 10 people on the roads.

Table 61. The number of people seen on roads inside the Forests today (typically for *household*) (% of respondents)

	n	**0 people**	**1-2 people**	**3-4 people**	**5-9 people**	**10 or more people**
Onsite (all)	*1,257*	22	23	16	20	18
Hwy 99	*200*	31	29	16	15	10
Dan's Trail	*155*	31	26	11	12	20
Lewisburg Saddle	*312*	19	25	15	25	16
Oak Creek	*309*	12	18	22	25	23
Peavy	*237*	24	22	13	19	22
Sulphur Springs	*29*	41	17	17	17	7
Gate 400	*14*	57	14	21	7	0
Household	*70*	9	17	23	27	24

Table 62 shows the average number of people seen on roads inside the Forests on the survey day (or typically for *household* respondents). *Household* respondents reported typically seeing about 5 other people on the roads inside the Forests and *onsite* respondents reported seeing about 4 other people. The average number of people seen on roads inside the Forests did not vary statistically significantly between *onsite* and *household* respondents (t=-1.13, p=.26). However, it did vary location for *onsite* respondents (F=7.52, p<.001). On average, visitors reported seeing significantly more people on Forest roads at Oak creek than Hwy 99, Dan's Trail, Lewisburg Saddle, Sulphur Springs, and Gate 400. The other significant difference was that more vehicles were seen on roads inside the Forests by Peavy respondents than Dan's Trail respondents. The highest average number of people seen on roads was reported by Oak Creek (approximately 5 people) and the lowest was at Gate 400 and Sulphur Springs.

Table 62. Average number of people seen on roads inside the Forests today (typically for *household*)

	n	**Mean**	**SD**	**Median**	**Max**
Onsite (all)	*1,191*	4.17	5.13	3	50
Hwy 99	*192*	2.84	4.63	2	50
Dan's Trail	*141*	3.41	5.73	2	50
Lewisburg Saddle	*300*	4.13	4.12	3	20
Oak Creek	*296*	5.42	5.48	4	50
Peavy	*220*	4.60	5.78	3	35
Sulphur Springs	*28*	2.29	2.85	1	11
Gate 400	*14*	1.14	1.66	0	5
Household	*62*	4.92	4.20	4	20

The number of people seen at trailheads at the Forests

Onsite respondents were asked how many people they saw at the trailhead they used on the day they were surveyed (Tables 63 and 64). Forty percent of all *onsite* respondents reported seeing 2 or fewer people at the trailheads and 14% reported seeing 10 or more people there (Table 63). More respondents reported seeing no people at the Gate 400, Sulphur Springs, and Dan's Trail trailhead than respondents at other locations. More respondents reported seeing 10 or more people at the Lewisburg Saddle, Oak Creek, and Peavy trailheads than any other site. Overall, *onsite* respondents saw an average of 4 people at the trailhead. Respondents at Gate 400 saw 0-1 people at the trailhead on average, while they saw approximately 5 people at Oak Creek and Lewisburg Saddle (Table 64). The average number of people seen at trailheads did vary significantly by survey location ($F=9.57$, $p<.001$). Significantly fewer people were seen at the Hwy 99 trailhead than at Lewisburg Saddle, Oak Creek, and Peavy. Significantly fewer people were seen at Dan's Trail trailhead than Lewisburg Saddle and Peavy. Significantly fewer people were seen at the Gate 400 trail than Lewisburg Saddle, Oak Creek, and Peavy.

Table 63. The number of people seen at trailheads at the Forests on the survey day (% of respondents)

	n	**0 people**	**1-2 people**	**3-4 people**	**5-9 people**	**10 or more people**
Onsite (all)	*1,256*	15	25	23	23	14
Hwy 99	*200*	21	35	22	18	6
Dan's Trail	*154*	34	23	18	14	12
Lewisburg Saddle	*312*	6	25	27	26	17
Oak Creek	*309*	7	25	27	26	16
Peavy	*238*	14	23	21	28	15
Sulphur Springs	*29*	28	14	24	28	7
Gate 400	*14*	71	21	7	0	0

Table 64. Average number of people seen at the trailhead used on the survey day at the Forests by location (for ***ONSITE*** respondents only)

	n	**Mean**	**SD**	**Median**	**Max**
Onsite (all)	*1,231*	4.13	4.14	3	45
Hwy 99	*197*	2.96	2.96	2	20
Dan's Trail	*150*	3.07	4.02	2	20
Lewisburg Saddle	*307*	4.73	3.94	4	30
Oak Creek	*304*	4.91	4.90	4	45
Peavy	*230*	4.31	4.01	4	30
Sulphur Springs	*29*	3.31	3.05	3	12
Gate 400	*14*	0.50	0.94	0	3

The number of vehicles seen at trailheads at the Forests

Onsite respondents were also asked how many vehicles they saw at the trailhead on the day they were surveyed (Tables 65 and 66). Slightly more than 20% of respondents reported seeing 2 or fewer vehicles at the trailhead and nearly 70% of respondents reported seeing at least 5 vehicles at trailheads (39% saw 10 or more vehicles). More respondents reported seeing no vehicles at the Dan's Trail and Gate 400 trailheads than any other site. More respondents reported seeing 10 or more vehicles at the Lewisburg Saddle, Oak Creek, and Peavy trailheads than any other site. On average, *onsite* respondents reported seeing approximately eight vehicles at the trailhead they used on the survey day (Table 66). Respondents at Lewisburg Saddle and Oak Creek reported seeing an average of 10 vehicles at the trailhead. Gate 400 respondents saw one other vehicle and at Dan's Trail, respondents saw approximately four people. Respondents at Hwy 99 and Sulphur Springs saw an average of five vehicles. The average did vary significantly by site ($F = 29.13$, $p < .001$). Respondents at Oak Creek saw significantly more vehicles at the trailhead than all sites except Lewisburg Saddle. Respondents at Lewisburg Saddle saw more vehicles at the trailhead than all other sites except Oak Creek. Significantly fewer vehicles were seen at Hwy 99 than Peavy, Oak Creek, and Lewisburg Saddle. Significantly fewer vehicles were seen at the Dan's Trail trailhead than Lewisburg Saddle, Oak Creek, and Peavy.

Table 65. The number of vehicles seen at trailheads on the survey day (% of ***ONSITE*** respondents)

	n	**0 vehicles**	**1-2 vehicles**	**3-4 vehicles**	**5-9 vehicles**	**10 or more vehicles**
Onsite (all)	*1,257*	11	10	11	30	39
Hwy 99	*200*	7	16	22	37	19
Dan's Trail	*155*	29	23	10	14	23
Lewisburg Saddle	*312*	10	2	5	30	54
Oak Creek	*309*	5	6	7	31	52
Peavy	*238*	11	5	15	33	35
Sulphur Springs	*29*	3	31	28	28	10
Gate 400	*14*	21	57	21	0	0

Table 66. Number of vehicles seen at the trailhead used today at the Forests by location (for ***ONSITE*** respondents only)

	n	**Mean**	**SD**	**Median**	**Max**
Onsite (all)	*1,217*	8.04	6.68	7	50
Hwy 99	*194*	5.53	4.52	5	25
Dan's Trail	*145*	4.36	5.67	2	30
Lewisburg Saddle	*3057*	10.01	6.64	10	35
Oak Creek	*302*	10.31	7.22	10	50
Peavy	*228*	7.62	6.24	7	35
Sulphur Springs	*29*	5.10	5.51	4	25
Gate 400	*14*	1.43	1.22	1	4

The number of vehicles seen on roads inside the Forests

Lastly, *household* respondents were asked how many vehicles they typically see on Forest roads inside the McDonald and Dunn Forests (Tables 67 and 68). More than half of *household* respondents reported seeing no vehicles on Forest roads, and 25% of *household* respondents reported seeing at least 5 vehicles on Forest roads. Overall, they reported seeing an average of 1.68 vehicles and one respondent reported seeing as many as 30 vehicles (Table 68). Onsite respondents were not asked about the number of vehicles seen on roads inside the Forests.

Table 67 The number of vehicles seen on Forest roads by ***HOUSEHOLD*** respondents (% of respondents)

	n	**0 vehicles**	**1-2 vehicles**	**3-4 vehicles**	**5-9 vehicles**	**10 or more vehicles**
Household	*70*	54	19	3	6	19

Table 68. Average number of vehicles typically seen on Forest roads inside the Forests by ***HOUSEHOLD*** respondents

	n	**Mean**	**SD**	**Median**	**Max**
Household	*60*	1.68	4.62	0	30

Given these findings about the number of people and vehicles seen at the Forests by visitors, along with the previous discussion about perceptions of crowding, several trends and insights emerge. First, as reported earlier, visitors do not appear to feel crowded based on the number of people they see on trails or roads inside the Forests. Perceptions of crowding based on the number of people at trailheads also seems minimal, though perhaps slightly more pronounced than perceptions of crowding based on the number of people on trails and roads. Therefore,

managers can use the numbers of vehicles and people seen at different places on the Forests, as reported above, to inform future monitoring programs and management plans. The numbers reported here can be used as baseline data, along with the understanding that these numbers of people and vehicles seen on trails and roads are not currently leading to visitors feeling crowded.

At this time, the number of people reported being seen on trails appears to be higher at Dan's Trail, Hwy 99, and Peavy. The number of people seen on roads in the Forests is higher at Peavy, Oak Creek, and Lewisburg Saddle. The number of people seen at trailheads is highest at Lewisburg Saddle, Oak Creek, and Peavy. Monitoring the numbers of people and vehicles seen, as well as perceptions of crowding, in the future will allow managers to track changes in the relationship between the number of people/vehicles seen and perceptions of crowding. As mentioned earlier, it may not make sense for managers to focus monitoring efforts on the number of people and vehicles seen on trails and roads, and probably not for the number of people seen at trailheads, because of limited staffing resources and these areas were not of great concern to visitors in terms of their perceptions of crowding at the Forests.

However, perceptions of crowding at trailheads based on the number of vehicles seen there was identified as a potential source of crowding for a more substantial portion of visitors, especially at Lewisburg Saddle, Sulphur Springs, and Oak Creek parking areas. Indeed, visitors reported seeing more vehicles at Lewisburg Saddle, Oak Creek, and to a lesser extent, Peavy trailheads. Therefore, we suggest that if monitoring vehicle capacity issues is a priority for Forest managers, then they should initially focus monitoring efforts at Lewisburg Saddle and Oak Creek trailheads, and perhaps Peavy and Sulphur Springs trailheads. Respondents at these sites, especially Lewisburg Saddle and Oak Creek, tended to see more vehicles at the trailheads and feel more crowded based on the number of vehicles there than other sites.

Monitoring efforts at one or more of these sites could include systematically observing and recording the number of vehicles at trailheads at different times of the day, week, season, and year to get a clear sense of when the parking lots reach and exceed current capacity and how vehicle turnover rates affect parking availability at each site. This type of monitoring could be through in-person observations by Forest staff, students, or volunteers. Other options include traffic counting devices that use magnetic, pneumatic, or infrared technology to keep track of how many vehicles come and go through different sites. Monitoring efforts would also likely include some gauge of visitor perceptions of crowding based on the number of vehicles seen at

trailheads. A more detailed monitoring plan would direct this process, and ideally link to a set of management guidelines that instructs managers when to take action and which actions would be most appropriate if vehicle capacity and crowding issues surpasses tolerable standards and becomes a more significant problem.

Conflict among visitors

Conflict between visitors at the Forests was measured by asking respondents how often they have seen a variety of potential conflict-related events and the degree to which they perceive those events as a problem at the Forests. In the tables below, the percent of respondents who observed a conflict event includes respondents who observed an event either once or twice, sometimes, or many times. The percent of respondents who considered the event a problem include respondents who said the event was either a slight problem, a moderate problem, or an extreme problem. Table 69 below shows the results for all *onsite* respondents in 2009 and 2017.

Table 69. Observed and problem conflict events reported by ***ONSITE*** respondents in 2009 and 2017 (% of respondents)

	2009 *Onsite* respondents		2017 *Onsite* respondents	
	Observed	**Considered a problem**	**Observed**	**Considered a problem**
Mountain bikers riding too fast	52	33	61	31
Mountain bikers being rude or discourteous	28	20	32	15
Mountain bikers not yielding the right of way	39	26	43	25
Mountain bikers failing to give verbal warning upon approach	50	30	59	30
Horseback riders riding too fast	6	6	4	3
Horseback riders being rude or discourteous	14	8	12	7
Horseback riders failing to give verbal warning upon approach	20	10	18	8
People on foot (w/no dog) being rude or discourteous	24	10	24	8
People on foot (w/no dog) not yielding the right of way	19	9	23	8
People on foot (w/no dog) failing to give verbal warning upon approach	28	9	33	9
People with dogs not under vocal control	n/a	n/a	66	41
People with dogs being rude or discourteous	n/a	n/a	43	23
People with dogs not yielding right of way	n/a	n/a	42	22
People with dogs failing to give verbal warning upon approach			53	26

Cell entries for observed are percentages of respondents who selected 1 = once or twice, 2=sometimes, or 3 = many times. The percent of respondents who indicated a problem represent respondents who selected 2=slight problem, 4 = moderate problem, or 5 = extreme problem

Among *onsite* respondents in 2017, overall, the most observed conflict events were related to people with dogs not under vocal control, mountain bikers riding too fast, mountain bikers failing to give warning upon approach and people with dogs failing to give warning upon approach. Specifically, 66% of *onsite* respondents had observed people with dogs not under vocal control, 61% observed mountain bikers riding too fast, 59% observed mountain bikers failing to give verbal warning upon approach, and 53% observed people with dogs failing to give warning upon approach. The least observed events were any events involving horseback riders, and fewer than 1/3rd of *onsite* respondents observed any of the events with other people on foot. People with dogs not under vocal control were considered a problem by 41% of *onsite* respondents. Approximately 30% of *onsite* respondents considered mountain bikers riding too fast and mountain bikers failing to give warning upon approach a problem. Approximately 1/4th of *onsite* respondents considered mountain bikers not yielding the right of way, people with dogs being rude, people with dogs not yielding the right of way, and people with dogs not giving warning upon approach a problem. Fewer than 10% of *onsite* respondents considered any event with horseback riders or people on foot with no dog a problem.

Several trends emerge when comparing reported conflict between the 2009 and 2017 respondents. More respondents in 2017 observed each of the four issues or events associated with mountain bikers than in 2009, though fewer respondents in 2017 considered each of these events a problem compared to 2009 respondents. The change between the two survey years was not very large (generally less than a difference of 5% between the years). However, nearly 10% more respondents in 2017 observed mountain bikers riding too fast than in 2009, so this appears to be an issue of increasing concern more so than other events with mountain bikers.

Each of the three events related to horseback riders on the Forests were observed by fewer respondents and considered a problem by fewer respondents in 2017 compared to 2009. Although, the differences were not very substantial and indicate minimal change in these regards. Similar to 2009, relatively minimal conflict events were reported by visitors related to horseback riders' behavior and etiquette. If anything, encouraging horseback riders to give verbal warning upon approach could ensure continued improvement in reducing conflict events related to horseback riders.

There was also minimal change in conflict events observed and reported as a problem concerning people on foot (without dogs) between the two survey years. Slightly more

respondents in 2017 observed people on foot not yielding the right of way or failing to give verbal warning upon approach compared to 2009. However, fewer than 10% of respondents considered either event a problem at the Forests in both years. It should be noted that the 2009 questionnaire did not include questions about conflict events regarding people with dogs. Given the prevalence of events associated with people with dogs, future survey and monitoring efforts should include these items about that activity group.

To summarize, overall at the Forests, the most commonly observed events were people with dogs not under vocal control, mountain bikers failing to give verbal warning upon approach, mountain bikers riding too fast, and people with dogs failing to give verbal warning upon approach. These events were observed by at least 50% of respondents and reported a problem by at least 25% of respondents. More than 40% of respondents considered people with dogs not under vocal control to be a problem. There were also no substantial changes in conflict events observed and considered a problem between 2009 and 2017, except perhaps for the number of visitors who observed mountain bikers riding too fast.

Conflict by location for ONSITE respondents

Tables 70 and 71 show the percent of respondents who observed an event and the percent of respondents who considered an event a problem, respectively, separated by survey location for *onsite* respondents. Examining reported conflict at each survey location can be useful to identify which events may be more of an issue at different areas of the Forests. However, some caution should be taken in interpreting these two tables because the questions about conflict in the questionnaire did not specifically ask respondents to comment on conflict events at a specific trail or area. Therefore, in these two tables, we are assuming that respondents are referring to the site where they were surveyed. However, it is likely that respondents were considering their collective experiences at the Forests at multiple sites over the years. Furthermore, the small sample sizes for Sulphur Springs and Gate 400 mean that those numbers do not necessarily represent the larger population of visitors at those sites and numbers are relatively inflated compared to other locations. Lastly, aside from some of the differences between sites related to events with mountain bikers, many of the differences in the percent of respondents who reported observing an event or considering it a problem were often not substantially different between sites. However, examining these issues by site can be helpful for targeting communication and other management and monitoring strategies.

Table 70. Observed conflict events reported by ***ONSITE*** respondents according to survey location (% of respondents) *

	Hwy 99	Dan's Trail	Lewisburg Saddle	Oak Creek	Peavy	Sulphur Springs	Gate 400
Mountain bikers riding too fast	59	72	58	69	48	58	69
Mountain bikers being rude or discourteous	24	38	32	38	25	35	46
Mountain bikers not yielding the right of way	36	55	40	49	37	50	46
Mountain bikers failing to give verbal warning upon approach	53	73	54	69	47	67	62
Horseback riders riding too fast	2	3	4	5	5	12	15
Horseback riders being rude or discourteous	5	18	11	15	10	39	23
Horseback riders failing to give verbal warning upon approach	12	27	17	22	16	19	15
People on foot (w/no dog) being rude or discourteous	20	28	22	28	19	26	62
People on foot (w/no dog) not yielding the right of way	20	26	21	28	20	19	39
People on foot (w/no dog) failing to give verbal warning upon approach	37	36	29	36	27	35	31
People with dogs not under vocal control	67	66	63	74	55	70	79
People with dogs being rude or discourteous	38	44	41	53	36	46	43
People with dogs not yielding right of way	39	42	40	52	33	35	33
People with dogs failing to give verbal warning upon approach	53	55	48	62	47	50	31

*Cell entries for observed are percentages of respondents who selected 1 = once or twice, 2=sometimes, or 3 = many times.

Table 71. Problem conflict events reported by ***ONSITE*** respondents according to survey location (% of respondents) *

	Hwy 99	Dan's Trail	Lewisburg Saddle	Oak Creek	Peavy	Sulphur Springs	Gate 400
Mountain bikers riding too fast	24	44	31	33	27	31	39
Mountain bikers being rude or discourteous	10	21	15	17	13	27	23
Mountain bikers not yielding the right of way	15	33	25	28	19	31	31
Mountain bikers failing to give verbal warning upon approach	23	38	31	34	23	31	39
Horseback riders riding too fast	2	3	3	3	4	4	15
Horseback riders being rude or discourteous	3	10	6	6	6	15	15
Horseback riders failing to give verbal warning upon approach	4	12	9	8	7	8	8
People on foot (w/no dog) being rude or discourteous	8	9	8	7	7	12	15
People on foot (w/no dog) not yielding the right of way	9	7	8	6	7	8	8
People on foot (w/no dog) failing to give verbal warning upon approach	11	9	8	6	11	8	8
People with dogs not under vocal control	37	43	43	44	35	44	36
People with dogs being rude or discourteous	19	24	26	24	20	19	29
People with dogs not yielding right of way	17	27	25	20	21	15	8
People with dogs failing to give verbal warning upon approach	26	23	28	26	23	31	15

*Cell entries for the percent of respondents who indicated a problem represent respondents who selected 2=slight problem, 4 = moderate problem, or 5 = extreme problem

The conflict event of mountain bikers riding too fast was observed and considered a problem by the most respondents at Dan's Trail, Oak Creek, and Gate 400. Mountain bikers being rude or discourteous was observed by the most respondents at Gate 400, Oak Creek, and Dan's Trail, and considered a problem by more respondents at Sulphur Springs and Dan's Trail than other sites. Mountain bikers not yielding the right of way was observed and considered a problem by more respondents at Dan's Trail than any other sites. Mountain bikers failing to give warning upon approach was observed and considered a problem by more respondents at Dan's Trail than all other sites except Sulphur Springs where a slightly higher percent of respondents considered this event a problem there (although small sample size at that site limit the validity of this observation). Therefore, the site on the Forests with greatest potential for conflict involving mountain bikes appears to be at Dan's Trail. This is likely due in part to the popularity of mountain biking at Dan's Trail. Peavy and Hwy 99 were generally the sites with the least potential for conflict events with mountain bikers.

The three conflict events involving horseback riders appear to be more prevalent at Dan's Trail, Sulphur Springs, and Gate 400, although approximately no more than 10% of respondents considered any of these events to be a problem at any site. Conflict events involving people on foot (without a dog) being rude or discourteous and not yielding the right of way were observed by more respondents at Dan's Trail, Oak Creek, and Gate 400 than any other site. People on foot (without a dog) failing to give verbal warning upon approach were observed by more people at Hwy 99, Dan's Trail, and Oak Creek than any other site. Approximately fewer than 10% of respondents considered any of these events a problem at any site. Therefore, issues surrounding conflict evens with horseback riders and people on foot are generally minimal, though slightly more of an issue at Dan's Trail, Oak Creek, and perhaps Hwy 99 and Gate 400.

People with dogs not under vocal control were observed by the most respondents at Gate 400, Sulphur Springs, Oak Creek, and Hwy 99. It was considered a problem by the highest percent of respondents at Oak Creek, Sulphur Springs, Lewisburg Saddle, and Dan's Trail than other sites. People with dogs being rude or discourteous were observed by the most respondents at Oak Creek and considered a problem by more respondents at Gate 400, Lewisburg Saddle, Oak Creek, and Dan's Trail. People with dogs not yielding the right of way were observed by the most respondents at Oak Creek and considered a problem by the most respondents at Dan's Trail and Lewisburg Saddle. People with dogs failing to give verbal warning upon approach were

observed by the most respondents at Oak Creek and considered a problem by the most respondents at Sulphur Springs, Lewisburg Saddle, Hwy 99, and Oak Creek. Therefore, conflict events surrounding events with people with dogs appear to be of greatest concern at Oak Creek, and perhaps Dan's Trail, Lewisburg Saddle, and Hwy 99.

Conflict events by activity group for ONSITE respondents

Tables 72 and 73 (below) summarize the observed and problem conflict events reported by *onsite* respondents according to their primary typical activity. These issues were not examined by activity group for *household* respondents due to the small sample size of *household* respondents. Similarly, inferences from the perspective of horseback riders among *onsite* respondents should be considered with caution because of the small number of respondents who indicated that was their primary typical activity. It is also important to note that many visitors participate in multiple activity types at the Forest in addition to their selected primary typical activity. Therefore, we are assuming in Tables 72 and 73 that respondents' perspectives about conflict on the Forests are being considered through their experiences doing their primary typical activity. We first present overall findings based on conflict events from the perspective of activity groups, followed by a slightly more detailed discussion of the perspective from each activity group.

A higher percent of horseback riders observed all conflict events involving all other activity groups compared to the percent of respondents from the other four activity groups, except for horseback riders failing to give verbal warning upon approach and people with dogs not yielding the right of way. A higher percent of horseback riders also considered most conflict events a problem compared to respondents from other activity groups, except for horseback riders riding too fast or being rude or discourteous, and people on foot with no dog not yielding the right of way. The biggest differences between horseback riders and other groups were that a much higher percent of horseback riders observed conflict events with mountain bikers and considered those events a problem compared to any other activity group. Conflict between horseback riders and other groups is not uncommon in outdoor recreation settings (Manning, 2010). However, these findings should be considered with caution due to the small sample size of *onsite* respondents who indicated their primary typical activity at the Forests was horseback riding (~1% of respondents). Therefore, the remainder of this summary will focus on the

perspectives about conflict between user groups from the other four activity group types with the acknowledgement that horseback riders at the Forests generally perceived more conflict than other groups, but the sample size makes strong inferences difficult.

Generally, a higher percent of trail runners or joggers at the Forests observed the various conflict events with mountain bikers more than other activity groups, although the differences between groups were not very substantial (i.e., the difference in the percent of respondents from each activity type who observed conflict events with mountain bikers was no greater than 10%). However, more visitors in the 'other visitors on foot (no dog)' category reported all conflict events with mountain bikers as a problem than did any other activity group. Again, the percentages were not substantially different, but it does appear that other visitors on foot (no dog) reported more conflict with mountain bikers compared to other activity groups.

Conflict events with horseback riders were generally not observed or perceived as a problem across most respondents. The exception is that between 14-32% of other activity groups observed horseback riders failing to give verbal warning upon approach. A higher percent of mountain bikers, compared to any other group, observed all conflict events with horseback riders and considered those events a problem (except for horseback riders riding too fast which did not vary much by activity group and was not considered a problem by more than 4% of any activity group). Along with the finding noted above that horseback riders were more likely to observe and report a problem regarding events with mountain bikers, there is clearly two-way outgroup conflict occurring to some extent on the Forests.

A higher percent of mountain bikers, compared to other activity groups, also observed all conflict events with people on foot (with no dog) than any other activity group and were more likely to consider those events a problem. The exception is that the same percent of trail runners as mountain bikers observed people on foot with no dog failing to give verbal warning upon approach. One notable difference is that slightly more than 40% of mountain bikers observed people on foot (with no dog) not yielding the right of way, whereas between 16-27% of other activity groups observed this event.

A higher percent of mountain bikers, compared to other activity groups, also observed people with dogs not under vocal control, people with dogs being rude, and people with dogs not yielding the right of way. Mountain bikers were also slightly more likely to report these events as a problem, though between 43-45% of other visitors on foot, trail runners, and mountain bikers

considered people with dogs not under vocal control a problem as well. More trail runners observed people with dogs failing to give verbal warning upon approach than did other activity groups, and more of the other visitors on foot (no dog) group considered this event a problem compared to other activity groups. Dog walkers were least likely to observe conflict events with other dog walkers and report them as a problem. However, the difference in the percent of dog walkers who observed and reported events with other dog walkers does not appear to be significantly less than other activity groups who observed and reported events with dog walkers, except perhaps that dog walkers seem more tolerant of people with dogs not under vocal control compared to other groups.

As noted earlier with the overall trends, the conflict events observed and reported as a problem by the most respondents across activity groups are people with dogs not under vocal control, mountain bikers riding too fast, mountain bikers failing to give verbal warning upon approach, and people with dogs failing to give verbal warning upon approach. Conflict between horseback riders and mountain bikers was particularly evident, and to a lesser degree so was conflict between mountain bikers and visitors with dogs.

Next, we offer more insights about conflict events from the perspective of each activity group. These insights also come from the data presented in Tables 72 and 73 (below).

Observed and problem conflict events reported by other visitors on foot

The most noticeable conflict between this activity group (i.e. the 'other people on foot' group) and other groups was with mountain bikers (especially in terms of bikers riding too fast and failing to give warning) and people on foot with dogs (especially in terms of people with dogs not under vocal control and people with dogs failing to give warning upon approach). However, issues with mountain bikers were not considered a problem by more than a third of 'other people on foot' and 30% of the other people on foot group saw issues with people with dog as a problem. Nearly half (43%) of the other people on foot group considered people with dogs not under vocal control a problem. There was minimal out-group conflict reported by other people on foot with horseback riders, though 16% of other people on foot did observe horseback riders failing to give warning upon approach but only 7% said it's a problem. There was also some in-group conflict, though not much. The strongest evidence of in-group conflict was that

20% of other people on foot observed people with no dog failing to give verbal warning upon approach, but only 8% indicated that it is a problem.

Observed and problem conflict events reported by trail runners and joggers

There were similar trends with *onsite* respondents in the trail runner activity group as the other people on foot group. Approximately 2/3rd of trail runners observed bikers riding too fast and failing to give verbal warning upon approach. Half of the trail runners also observed mountain bikers not yielding the right of way and 1/3rd observed bikers being rude or discourteous. Fewer than 1/3rd of trail runners considered any issues with mountain bikers a problem. Most trail runners did not observe horseback riders riding too fast, though approximately 20% did notice horseback riders being rude or failing to give verbal warning upon approach. Nearly 40% of trail runners observed people with no dogs failing to give warning (in-group conflict) and approximately 25% of trail runners noticed people on foot with no dog being rude or not yielding the right of way. However, fewer than 10% of trail runners considered these events a problem. Nearly 75% of trail runners observed conflict with people with dogs not under vocal control and approximately 50% or more of trail runners observed people with dogs being rude, not yielding the right of way, or failing to give warning. Each of these three issues was considered a problem by approximately 25% of trail runners.

Table 72. Observed conflict events reported by ***ONSITE*** respondents according primary typical activity type (% of respondents) *

	Other visitors on foot	Trail runner and joggers	Dog walkers	Mountain bikers	Horseback riders
Mountain bikers riding too fast	60	66	65	58	86
Mountain bikers being rude or discourteous	31	33	33	32	71
Mountain bikers not yielding the right of way	41	51	43	47	86
Mountain bikers failing to give verbal warning upon approach	59	64	61	57	88
Horseback riders riding too fast	4	4	2	7	14
Horseback riders being rude or discourteous	8	19	9	26	29
Horseback riders failing to give verbal warning upon approach	16	22	14	32	0
People on foot (w/no dog) being rude or discourteous	20	23	29	32	50
People on foot (w/no dog) not yielding the right of way	20	27	16	42	43
People on foot (w/no dog) failing to give verbal warning upon approach	29	39	35	39	43
People with dogs not under vocal control	63	72	65	74	75
People with dogs being rude or discourteous	42	48	38	52	57
People with dogs not yielding right of way	38	52	36	54	43
People with dogs failing to give verbal warning upon approach	53	61	47	56	71

*Cell entries for observed are percentages of respondents who selected 1 = once or twice, 2=sometimes, or 3 = many times.

Table 73. Problem conflict events reported by ***ONSITE*** respondents according to primary typical activity type (% of respondents) *

	Other visitors on foot	Trail runner and joggers	Dog walkers	Mountain bikers	Horseback riders
Mountain bikers riding too fast	34	29	28	24	86
Mountain bikers being rude or discourteous	17	13	12	13	71
Mountain bikers not yielding the right of way	25	25	22	24	86
Mountain bikers failing to give verbal warning upon approach	33	23	30	25	86
Horseback riders riding too fast	3	2	4	3	0
Horseback riders being rude or discourteous	5	9	5	11	0
Horseback riders failing to give verbal warning upon approach	7	8	6	12	14
People on foot (w/no dog) being rude or discourteous	6	7	8	12	29
People on foot (w/no dog) not yielding the right of way	7	6	4	15	14
People on foot (w/no dog) failing to give verbal warning upon approach	8	7	6	11	43
People with dogs not under vocal control	43	45	30	45	75
People with dogs being rude or discourteous	22	23	19	32	43
People with dogs not yielding right of way	21	25	16	27	43
People with dogs failing to give verbal warning upon approach	30	27	14	21	57

*Cell entries for the percent of respondents who indicated a problem represent respondents who selected 2=slight problem, 4 = moderate problem, or 5 = extreme problem

Observed and problem conflict events reported by dog walkers

Respondents whose primary activity was dog walking also exhibited conflict with mountain bikers, other people with dogs, and to a lesser extent people on foot with no dogs. Approximately 2/3rd of dog walkers observed mountain bikers riding too fast and slightly fewer observed mountain bikers failing to give verbal warning. Both of these events were considered a problem by about 1/3rd of dog walkers. Mountain bikers not yielding right of way were observed by 43% of respondents and considered a problem by 22% of dog walkers. Most people with dogs (~90%) did not observe issues with horseback riders. Approximately 1/3rd of dog walkers observed other visitors on foot (no dog) being rude or discourteous or failing to give verbal warning upon approach, though fewer than 10% of dog walkers considered these issues a problem. Approximately 2/3rd of dog walkers observed other people with dogs not under vocal control and 30% considered this a problem. Nearly 50% of dog walkers noticed other people with dogs failing to give warning and 14% said it was a problem. A little more 1/3rd of dog walkers observed people with dogs being rude or failing to yield the right of way and a little fewer than 20% of dog walkers considered these issues a problem.

Observed and problem conflict events reported by mountain bikers

There is some in-group conflict especially in terms of mountain bikers riding too fast and failing to give warning upon approach (e.g., both events were observed by approximately 60% of mountain bikers and considered a problem by ~25% of mountain bikers). Nearly 50% of mountain bikers also observed other bikers not yielding the right of way and 1/4th of them said it was a problem. Other bikers being rude or discourteous was observed by 32% of mountain bikers. There was also some out-group conflict as well. Approximately 30% of bikers observed horseback riders being rude or failing to give verbal warning upon approach, though only slightly more than 10% of bikers considered these issues a problem. Approximately 1/3rd or more of mountain bikers also observed people on foot without dogs being rude, not yielding the right of way, and failing to give verbal warning, though no more than 15% of mountain bikers said either issue was a problem.

The biggest issues from mountain bikers' perspective seems to be with people with dogs not under vocal control. Approximately 75% of mountain bikers observed people with dogs not under vocal control and 45% considered it a problem. Approximately 50% of mountain bikers

observed people with dogs being rude, not yielding the right of way or failing to give verbal warning upon approach and 21-32% of bikers considered these issues a problem.

Observed and problem conflict events reported by horseback riders

Nearly 90% of horseback riders observed mountain bikers riding too fast, not yielding the right of way, or failing to give verbal warning and 86% of them considered each event a problem. Mountain bikers being rude were also observed and considered a problem by 71% of horseback riders. Nearly 30% observed other horseback riders being rude, though no horseback riders said it was a problem. Approximately 50% of horseback riders observed people on foot with no dog being rude, not yielding the right way, or failing to give verbal warning. People on foot not giving verbal warning was considered a problem by 43% of horseback riders and 29% of horseback riders considered other people on foot being rude a problem. Most (75%) of horseback riders observed people with dogs not under vocal control and considered it a problem. Slightly more than 70% of horseback riders observed people with dogs failing to give verbal warning upon approach. More than 40% of horseback riders observed people with dogs being rude or not yielding the right of way and 43% of horseback riders considered each event a problem.

*Conflict observations among **household** respondents*

We also examined *household* respondents' perspectives about conflict events on the Forests (Table 74). Among *household* respondents, the most common (>75% of respondents) conflict events observed were mountain bikers riding too fast and people with dogs not under vocal control. The other more common events noticed by at least 50% of *household* respondents were mountain bikers failing to give verbal warning upon approach, people with dogs failing to give verbal warning, people with dogs being rude or discourteous, and noise from Forest management operations. The events observed the least often by participants were any activity by horseback riders (riding too fast, being rude, or failing to give warning) and people on foot with no dog being rude or not yielding the right of way. More than 60% of *household* respondents considered people with dogs not under vocal control as a problem and 45% of *household* respondents said mountain bikers riding too fast was a problem. Any event related to horseback riders was considered a problem by no more than 5% of *household* respondents and only approximately 10% of *household* respondents considered events with people on foot with no dogs a problem. In other words, *household* respondents reported minimal conflict events with horseback riders. Speeding vehicles were observed and considered a problem by approximately

25% of *household* respondents. Slightly more than 1/3rd of *household* respondents observed people entering their property from the Forests and only 13% considered that a problem.

Household respondents seem less tolerant of mountain bikers than *onsite* respondents. A higher percent of *household* respondents observed conflict events with mountain bikers and considered those events a problem compared to *onsite* respondents. The difference was particularly noticeable in terms of mountain bikers riding too fast, where 16% more *household* respondents observed this and 14% more considered it a problem compared to *onsite* respondents. *Household* respondents seem more tolerant of horseback riders than *onsite* respondents because a smaller percent of them observed conflict events with horseback riders and considered those events a problem compared to *onsite* respondents. *Household* and *onsite* respondents generally observed and reported similar levels of conflict with people on foot (with no dog). *Household* respondents appear to be less tolerant of people with dogs than *onsite* respondents, especially in terms of people with dogs not under vocal control.

Table 74. Observed and problem conflict events reported by ***HOUSEHOLD*** respondents (% of respondents)

	Observed	**Considered a problem**
Mountain bikers riding too fast	77	45
Mountain bikers being rude or discourteous	32	22
Mountain bikers not yielding the right of way	46	28
Mountain bikers failing to give verbal warning upon approach	63	37
Horseback riders riding too fast	2	0
Horseback riders being rude or discourteous	11	5
Horseback riders failing to give verbal warning upon approach	15	5
People on foot (w/no dog) being rude or discourteous	23	8
People on foot (w/no dog) not yielding the right of way	18	12
People on foot (w/no dog) failing to give verbal warning upon approach	34	9
People with dogs not under vocal control	79	61
People with dogs being rude or discourteous	54	35
People with dogs not yielding right of way	49	38
People with dogs failing to give verbal warning upon approach	58	36
People entering my property from the OSU Research Forests	28	13
Noise from management operations on the Forests	54	17
Speeding vehicles passing my property to/from the Forests	26	22

Cell entries for observed are percentages of respondents who selected 1 = once or twice, 2=sometimes, or 3 = many times. The percent of respondents who indicated a problem represent respondents who selected 2=slight problem, 4 = moderate problem, or 5 = extreme problem

Summary of respondents' perceptions of conflict events at the Forests

Overall, there are several key insights from the above tables and summaries about conflict events at the Forests. The most commonly observed conflict events were people with dogs not under vocal control, mountain bikers failing to give verbal warning upon approach, mountain bikers riding too fast, and people with dogs failing to give verbal warning upon approach. There were also no substantial changes in conflict events observed and considered a problem between 2009 and 2017, except perhaps for a nearly 10% increase in the number of visitors who observed mountain bikers riding too fast. It is likely that the site on the Forests with greatest potential for conflict involving mountain bikes is at Dan's Trail. Peavy and Hwy 99 were generally the sites with the least potential for conflict events with mountain bikers. Issues surrounding conflict events with horseback riders and people on foot were generally minimal, though slightly more of an issue at Dan's Trail, Oak Creek, and perhaps Hwy 99 and Gate 400. Conflict events surrounding events with people with dogs appear to be of greatest concern at Oak Creek, and perhaps Dan's Trail, Lewisburg Saddle, and Hwy 99.

Certain conflict events involving mountain bikers and/or people on foot with dogs exhibit the most potential for conflict at the Forests. At least 50% of respondents from every activity group, including mountain bikers, had observed mountain bikers riding too fast and mountain bikers failing to give verbal warning upon approach. At least 23% of respondents for each activity group considered these events a problem and that percentage was much higher for some groups (especially horseback riders). Similarly, at least 60% respondents from of every activity group had observed people with dogs not under vocal control and at least 30% considered it a problem. People with dogs failing to give warning upon approach were also noticed by many respondents in each group and considered a problem by between 15% and 57% of respondents.

Similar to the previous study on the Forests in 2009, there was clearly two-way out-group conflict occurring between horseback riders and mountain bikers. As many as 86% of horseback riders observed mountain bikers riding too fast, not yielding the right of way, and failing to give verbal warning upon approach, with a similar proportion of horseback riders finding these events problematic. Approximately one-third of mountain bikers observed horseback riders failing to give verbal warning and 26% of mountain bikers observed horseback riders being rude or discourteous. However, approximately 10% of mountain bikers found these events problematic.

There was also strong evidence of two-way out-group conflict between mountain bikers and people on foot with dogs. Nearly 75% of mountain bikers observed people with dogs not under vocal control and 45% considered it a problem. At least 50% of mountain bikers also noticed people with dogs being rude, not yielding the right of way, and failing to give warning upon approach. At least 20% of mountain bikers considered these events a problem. More than 60% of people in the dog walking activity group observed mountain bikers riding too fast and failing to give verbal warning upon approach, and 28% -30% of them considered these events problematic.

Between 43% and 86% of horseback riders observed every conflict event with each of the other activity groups (except other horseback riders) and many of these events were considered a problem by at least half of horseback riders. This indicates either a low tolerance among horseback riders for conflict events among other groups, and/or a lack of proper etiquette by other activity groups around horseback riders. Further investigation, perhaps through observations/monitoring or focus groups with different activity groups, could examine this insight more carefully to inform future communication and other management strategies.

Nearly 30% or more of respondents in each activity group reported observing every other activity group (except for horseback riders) failing to give verbal warning upon approach. Although the level of importance of this event varied widely, it signals an etiquette issue that future communication and perhaps enforcement activities should address. In other words, there was in-group and out-group conflict evident across all activity groups when it comes to failing to give verbal warning upon approach.

Overall, *household* respondents seem less tolerant of mountain bikers and people with dogs than *onsite* respondents. *Household* respondents seem more tolerant of horseback riders than *onsite* respondents. This is likely due in part to the fact that a higher percentage of *household* respondents were horseback riders than the percent of *onsite* respondents who said that was their primary typical activity.

Discussion about conflict at the Forests compared to other sites

Similar to the discussion earlier about crowding at the Forest compared to other recreation sites across the country, it is ultimately up to managers to determine which conflict events are a problem on the Forests and when action needs to be taken to reduce conflict. Difference in methodological approaches to measuring and reporting conflict across studies, and

differences in social, environmental, and managerial aspects, also make comparisons across recreation areas difficult. However, several inferences can be gained from the broader literature about conflict on recreation sites.

Conflict in recreation settings among user groups has been identified and considered substantial in many cases over the past several decades (Manning, 2010). It also is likely to continue increasing in the future as demand for recreation increases and the types of activities and differences between activity groups change with new and different visitors. However, many studies have also found low levels of conflict among visitors at recreation sites, which may in part be due to coping behaviors used to avoid conflict (e.g., visitors might avoid an area at a certain day, time, or all together if they expect some level of conflict between any other visitors there) (Graefe & Thapa, 2004).

In some ways, there may be more potential for conflict at urban proximate areas than more remote areas. For example, in a comparative study with visitors in a wilderness area and at a more developed urban park by Schneider (2000) reported that 17% of respondents in the urban park reported conflict with other visitors compared to 12% of respondents in the wilderness area. Many factors affect this potential trend, however, and either way, conflict is often an important aspect to consider and monitor across most recreational settings. Manning (2010) notes that conflict is related to "motivations for recreation, diverse social values, perceived similarity of groups or activities, type and level of technology employed, levels of experience or commitment (*visitors with higher skill level are more likely to perceive conflict*), attachment to place, tolerance for sharing resources, expectation for encountering other types of activity groups, safety concerns, and recreation related norms (p.219)." The data in our survey efforts make it difficult to know with certainty the extent to which any of these factors affect conflict on the Forests, however, it is likely that each factor plays some role across visitor types and locations.

Our study found that most problematic events at the Forest tended to involve mountain bikers and people with dogs. In particular, mountain bikers riding too fast and not giving verbal warning upon approach, and people with dogs not under vocal control and not giving verbal warning upon approach, were revealed as the most likely conflict events to be reported by visitors. Many of these events seemed most problematic at Dan's Trail. Conflict related to visitors with dogs is not uncommon and can often lead to negative social and ecological impacts (Banks & Bryant, 2007; Eder & Arnberger, 2012; Lenth, Knight, & Brennan, 2008; Weston &

Stankowich, 2014). One study found that more experienced and more frequent visitors are more likely to report 'annoyance' towards dog walkers and to believe that dogs in recreation settings negatively affect wildlife (Eder & Arnberger, 2012). Our data suggests that the problems with dogs on the Forests are connected to issues related to dogs being off leash not under voal control and visitors being surprised by other visitors with dogs approaching them without warning.

Conflict between mountain bikers and other user groups have been fairly well-documented. For example, Cessford (2003) found that at a park in New Zealand, among people walking, perceptions about bikers were more positive if they actually had encounters (i.e., walkers who had not encountered bikers had more negative perceptions of bikers than those walkers who did have encounters with bikers). This is a common example of social values conflict, where perceived differences in social values towards other groups can lead to more perceived conflict (Graefe & Thapa, 2004; Vaske et al., 2007). The Cessford (2003) study illustrates that actual encounters between activity groups may not be as negative as certain groups expected before actually having any encounters. Another study of hikers and mountain bikers in an urban proximate park near Denver, CO found that less conflict was reported towards hikers than towards mountain bikers, and that mountain bikers and dual sport participants were more likely than hikers to report unacceptable behaviors (Carothers et al., 2001). In that study, interpersonal conflict (i.e., where perceptions of goal interference affect perceptions of conflict) was more important than social values conflict. That study also found similar levels of conflict between hikers and mountain bikers as we did in this study on the Forest.

The point here is that conflict between mountain bikers and other groups on the Forests is likely driven to some extent by different interpersonal and social values, which may or may not be realized by the visitor. The most notable concerns were that mountain bikers were riding too fast and not giving verbal warning upon approach. As with most conflict events, the most common management strategies to address these issues are through zoning and educational strategies aimed at changing visitor behavior through normative and other persuasive approaches (Manfredo et al., 2004; Manning, 2010). We offer more insights about these options in the recommendations section of this report.

Section summary: Recreation experiences at the Forests

- Similar to the 2009 study, the majority (>90%) of all respondents were satisfied with their recreation experiences at the Forests.
- Comments revealed a high degree of appreciation for access to the Forests and especially the variety of trails and recreation opportunities there. Other comments reflect that there is room for improvement in managing dogs at the Forests (e.g., dog waste and not being under vocal control), addressing negative encounters with mountain bikers and people with dogs (generally not giving warning upon approach), and improving the trail system with improved signage and information about trail options, distances, and connectivity.
- *Onsite* respondents were overall more satisfied with most characteristics at the Forest compared to *household* respondents. However, many of these differences between *onsite* and *household* respondents were not substantial.
- For *onsite* respondents, managers should pay attention to the amount of dog waste seen, the availability of single-track trails and the number of directional signs on trails/roads given the higher importance and relatively lower satisfaction of these attributes. Further analysis of the importance and satisfaction with different characteristics suggests managers should focus on:
    - Hwy 99, Sulphur Springs, Oak Creek, and Lewisburg Saddle to provide adequate parking space for vehicles or for promoting alternate transportation options
    - Oak Creek, Lewisburg Saddle, and Gate 400 for ensuring visitor safety and communicating about logging and Forestry activities in those areas
    - Hwy 99, Sulphur Springs, and Gate 400 to increase satisfaction with the availability of trash cans at trailheads
    - Hwy 99 trailhead for providing free brochures at the trailhead
    - Oak Creek, Sulphur Springs, and Gate 400 for improving trail maintenance
    - Oak Creek and Sulphur Springs for areas to provide more single-track trails
    - Dan's Trail and Gate 400 for controlling the amount of horse waste seen
- For *household* respondents, it may make the most sense to focus efforts on the amount of dog waste seen, the availability of single-track trails, the number of directional signs on trails/roads, and perhaps the amount of litter seen.
- Overall, crowding does not seem to be a major issue at the Forests. However, crowding may be an issue in the future, especially in terms of the number of vehicles at trailheads (or, vehicle/parking capacity in general). Perceptions of crowding tended to indicate higher levels of crowding on the weekends compared to the weekdays.

- Crowding based on the *number of vehicles* at trailheads is perceived by visitors as moderately high across the Forests, especially at Lewisburg Saddle, Sulphur Springs, and Oak Creek parking areas.
- Nearly 1/3rd of *household* and *onsite* respondents reported feeling moderately or extremely crowded based on the number of *vehicles seen at trailheads*, while 34% of *onsite* respondents and 23% of *household* respondents reported not feeling crowded at all based on the number of vehicles at trailheads. It appears that the number of vehicles seen at trailheads is perceived as being crowded more so on weekends and in the afternoons.
- Perceptions of crowding based on the number of *people at trailheads* is not a major concern. The number of people seen at trailheads was perceived as being moderately or extremely crowded by 10% of *onsite* respondents and 17% of *household* respondents. Nearly 60% of *onsite* respondents and 40% of *household* respondents indicated that they did not feel crowded at all based on the number of people seen at trailheads.
- Perceptions of crowding along *trails and roads* in the Forests was minimal compared to people and vehicles at trailheads. Approximately a least 60% of respondents did not feel crowded at all in terms of people seen on Forest trails and people seen on Forest roads.
- Managers may consider developing monitoring programs and setting indicators and standards based on their overall objectives, which should be informed by this baseline data and the expectation that visitation is likely to continue increasing in the future. These efforts should be focused on the vehicle capacity and perceptions of crowding at trailheads and parking areas.
- On average, *onsite* and *household* respondents reported seeing about 5 other people on the trails on the Forests. *Onsite* respondents reported seeing about 4 other people on the roads inside the Forest and *household* respondents reported typically seeing about 5 other people. *Onsite* respondents saw an average of 4 people at the trailhead. *Onsite* respondents reported seeing approximately 8 vehicles at the trailhead they used on the day questionnaire ed. *Household* respondents reported seeing an average of 1-2 vehicles on Forest roads inside the Forests (*onsite* respondents were not asked this question).
- Among all respondents in 2017, overall, the most observed conflict events were related to people with dogs not under vocal control, mountain bikers riding too fast, mountain bikers failing to give verbal warning upon approach, and people with dogs failing to give verbal warning upon approach.
- More respondents in 2017 observed each of the four conflict events associated with mountain bikers than in 2009 (especially for riding too fast), though fewer respondents in 2017 considered each of these events a problem compared to 2009 respondents. Each of the three events related to horseback riders on the Forests were observed by fewer respondents and considered a problem by fewer respondents in 2017 compared to 2009. There was also minimal change in conflict events observed and reported as a problem concerning people on foot (without dogs) between the two survey years.

- The site on the Forests with greatest potential for conflict involving mountain bikes is at Dan's Trail. Peavy and Hwy 99 were generally the sites with the least potential for conflict events with mountain bikers.
- Issues surrounding conflict events with horseback riders and people on foot are generally minimal, though slightly more of an issue at Dan's Trail, Oak Creek, and perhaps Hwy 99 and Gate 400.
- Conflict events surrounding events with people with dogs appear to be of greatest concern at Oak Creek, and perhaps Dan's Trail, Lewisburg Saddle, and Hwy 99.
- Similar to the 2009 study, there was two-way out-group conflict occurring between horseback riders and mountain bikers. As many as 86% of horseback riders observed mountain bikers riding too fast, not yielding the right of way, and failing to give verbal warning upon approach, with a similar proportion of horseback riders finding these events problematic. Approximately one-third of mountain bikers observed horseback riders failing to give verbal warning and 26% observed horseback riders being rude or discourteous. However, only approximately 10% of mountain bikers found these events problematic.
- There was also evidence of two-way out-group conflict between mountain bikers and people on foot with dogs. Nearly 75% of mountain bikers observed people with dogs not under vocal control and 45% considered it a problem. At least 50% of mountain bikers also noticed people with dogs being rude, not yielding the right of way, and failing to give verbal warning upon approach. At least 20% of mountain bikers considered these events a problem. More than 60% of people in the dog walking activity group observed mountain bikers riding too fast and failing to give verbal warning upon approach, and 28% -30% of them considered these events problematic.
- Between 43% and 86% of horseback riders observed every conflict event, that we included in the questionnaire- with the other activity groups (except other horseback riders), and many of these events were considered a problem by at least half of horseback riders. This suggest that horseback riders may be more sensitive to conflict events than other groups, although the small sample size of horseback riders makes reliable inferences difficult.
- Nearly 30% or more of respondents in each activity group reported observing every other activity group (except for horseback riders) failing to give verbal warning upon approach. This indicates an etiquette issue that managers should address, likely through education, demonstrations, and some sort of monitoring plan.
- *Household* respondents generally reported more conflict than *onsite* respondents. *Household* respondents seem less tolerant of mountain bikers and people with dogs than *onsite* respondents. *Household* respondents seem more tolerant of horseback riders than *onsite* respondents.

- We offer insights from published literature about crowding and conflict at the Forests in the context of other recreation areas. It is difficult to compare one recreation site to another in terms of crowding and conflict and whether they are 'problems.' Ultimately, managers will decide when conflict and crowding are problems based on their specific management objectives, desired future conditions for the Forests, and considerations about increasing visitation growth trends.
- However, our data does indicate that crowding at the Forests is fairly minimal, though it is becoming a concern regarding the number of vehicles at certain trailheads (and capacity in general there). Also, conflict involving mountain bikers and visitors with dogs (especially off leash) are also at a level that signals a potential problem that at least requires some level of monitoring to track the issue and consider potential management actions if these events increase to an unacceptable level.

Attitudes about management strategies and communication

The topics discussed in this section include:

- Attitudes about management strategies at the Forests
- Communication preferences and information use
- Volunteering and stewardship at the Forests

Attitudes about management strategies at the Forests

Respondents were asked about their level of support regarding different potential management strategies at the Forests. Table 75 shows the percent of *onsite* respondents in 2009 and 2017 who supported the management actions that were included in both survey years. Compared to 2009, more respondents in 2017 supported developing more trails designated only for people on foot, developing trails primarily for mountain biking, and increasing enforcement of trail use and regulations (though this last item was worded differently between the years). Compared to 2009, fewer respondents in 2017 supported providing more signage informing visitors of appropriate behavior, although that item in 2009 did not include verbiage about signage specifically. Slightly fewer visitors in 2017 compared to 2009 supported requiring dogs to be kept on leash everywhere in the Forests. Perhaps the most notable difference between respondents in 2009 and 2017 is that nearly half as many respondents in 2017 supported not changing anything compared to 2009. This decrease support for not changing anything signals that visitors may be more accepting of management actions overall than they were in 2009.

Table 75. Support for possible future management strategies among 2009 and 2017 ***ONSITE*** respondents (% of respondents) *

	2009 *onsite* respondents	**2017 *onsite* respondents**
Develop more trails designated only for people on foot	53	61
Develop trails designated primarily for mountain biking	45	51
Provide more signage, informing visitors of appropriate behavior**	47	41
Do not change anything / keep things as they are now	65	36
Increase enforcement of trail use rules and regulations***	8	22
Require that dogs be kept on leash everywhere in the Forests****	19	17

**The percent of respondents who selected support or strongly support*
*** In 2009, the item was worded as 'better inform visitors about appropriate behavior'*
****In 2009, the item was worded as 'increase the presence of management personnel'*
*****In 2009, the item was worded as 'require that dogs be kept on leash'*

At least 40% of all respondents in the 2017 survey supported the majority of management actions, and at least 50% of all respondents supported at least half to two-thirds of the actions. Also, fewer than 20% of all respondents opposed most actions. Lastly, at least 25% of respondents selected 'neither oppose nor support' for many of the potential management actions. This suggests that visitors may not yet have strong opinions for many of these actions or did not understand them.

Differences in level of support between onsite and household respondents

The most supported management actions by both *onsite* and *household* respondents (>60% in each group supported the action) were providing additional dog-bag dispensers and developing more trails designated only for people on foot. Most differences in support for the various management actions between *onsite* and *household* respondents were fairly small, however some were notable. Compared to *household* respondents, **a higher percentage of *onsite* respondents supported**:

- providing additional dog bag dispensers
- developing more trails designated only for people on foot
- proving more way-finding signage along trails and roads
- using natural surfaces and having wet weather restrictions on trail use
- providing more signage about Forest resources
- developing trails designated primarily for mountain biking
- improving the availability of free maps at trailheads
- developing easy trails for novice bikers
- proving more information at trailhead kiosks
- not changing anything
- *Note, the difference between the percent of household and onsite respondents who supported these items was fairly negligible (<10%).*

Compared to *onsite* respondents, **a higher percent of *household* respondents supported**:

- using gravel surfaces and having trails accessible year round
- developing and installing difficulty rating systems to help people know what to expect
- proving more signage informing visitors about the management activities and closures on the Forests
- increasing the size of parking areas
- providing additional trash cans along the trails
- providing bike racks at trail heads
- requiring dogs be kept on leash at all areas
- providing more electronic tools to be used for way-finding and information sharing
- **providing more signage informing visitors of appropriate behaviors

- **increasing enforcement of trail use rules and regulations
- **requiring dogs be kept on leash in high volume areas
- **proving information through email and web communications
- *Note, the most noticeable differences were that household respondents were quite a bit more supportive regarding the items above with a ** if front of it.*

The data for respondents' attitudes about management strategies are shown in Tables 76 and 77 for *onsite* and *household* respondents, respectively, and show collapsed percentages of people who oppose or support an action and who neither oppose nor support an action. Uncollapsed percentages can be found in the appendix for each questionnaire (Appendix F for *onsite* and Appendix G for *household* respondents).

Among *onsite* respondents, 60% or more of respondents supported providing additional dog bag dispensers for dog waste, developing more trails for people on foot only, and providing more way-finding signage along trails and roads. At least 50% of *onsite* respondents supported developing and installing trail difficulty rating system to help people know what to expect, using natural surfaces and having wet weather restrictions on trail use, using gravel surface and have trails accessible all year-round, developing trails designated primarily for mountain biking, providing more signage, and informing visitors about the management activities and closures on the Forests. Only 17% of *onsite* respondents supported requiring that dogs be kept on leash everywhere in the Forests (62% of *onsite* respondents opposed it), and only 22% supported increasing enforcement of trail use rules and regulations. Twenty eight percent opposed requiring dogs to be on leash in specific high-volume areas, and 26% opposed increasing enforcement of trail use rules and regulations. All other potential options were opposed by fewer than 20% of *onsite* respondents.

Among *household* respondents, 60% or more respondents supported providing additional dog bag dispensers for dog waste, require that dogs be kept on leash in specific high-volume areas, develop more trails designated only for people on foot, and provide information through email and web communication. At least 50% of *household* respondents support providing more signage to inform visitors of appropriate behavior, using gravel surfaces for trails and having year round access, providing more signage, informing visitors about the management activities and closures on the Forests, providing more signage, explaining Forest resources, research, ecology, and management, develop and install a trail difficulty rating system, provide additional trash-cans along the trails, and increase the size of parking areas for more parking spaces. Only

20% supported doing nothing (no changes) and only 23% supported requiring dogs be on leash everywhere in the Forests. Notably, 51% of *household* respondents opposed leash requirement everywhere on the Forests. Nearly 25% of *household* respondents also opposed providing trash cans along the trails and increasing the enforcement of trail use rules and regulations.

Table 76. Support for possible future management strategies among ***ONSITE*** respondents (% of respondents) *

	Oppose	**Neither**	**Support**
Provide additional dog-bag dispensers for dog waste/excrement	6	26	68
Develop more trails designated only for people on foot	7	33	61
Provide more way-finding signage along trails and roads	6	35	60
When building new trails, use natural surface and have wet weather restrictions on trail use	13	28	59
When building new trails, use gravel surface and have trails accessible all year-round	16	28	57
Provide more signage, explaining Forest resources, research, ecology, and management	5	40	55
Develop trails designated primarily for mountain biking	14	35	51
Develop and install trail difficulty rating system to help people know what to expect	8	42	50
Provide more signage, informing visitors about the management activities and closures on the Forests	4	46	50
Increase the size of parking areas, for more parking spaces	13	37	49
Require that dogs be kept on leash in specific high-volume areas	28	25	47
Provide information through email and web communication	6	48	46
Provide additional trash-cans along the trails	16	38	45
Improve the availability of free maps at trailheads	5	52	44
Provide more signage, informing visitors of appropriate behavior	10	50	41
Develop easy trails for novice mountain bikers	12	48	40
Provide more information at trailhead kiosks	5	56	40
Provide bike racks at trailheads	12	51	37
Provide more electronic tools to be used for way-finding and information sharing	16	49	36
Do not change anything / keep things as they are now	17	48	36
Increase enforcement of trail use rules and regulations	26	53	22
Require that dogs be kept on leash everywhere in the Forests	62	21	17

*The oppose column represents the percent of respondents who selected strongly oppose or oppose; The percent of respondents who support a management strategy represents respondents who selected support or strongly support

Table 77. Support for possible future management strategies among ***HOUSEHOLD*** respondents (% of respondents) *

	Oppose	Neither	Support
Provide additional dog-bag dispensers for dog waste/excrement	8	28	64
Require that dogs be kept on leash in specific high-volume areas	11	27	61
Develop more trails designated only for people on foot	7	34	60
Provide information through email and web communication	2	39	60
Provide more signage, informing visitors of appropriate behavior	13	28	59
When building new trails, use gravel surface and have trails accessible all year-round	10	32	58
Provide more signage, informing visitors about the management activities and closures on the Forests	3	40	56
Provide more signage, explaining Forest resources, research, ecology, and management	5	41	54
Develop and install trail difficulty rating system to help people know what to expect	7	42	51
Provide additional trash-cans along the trails	23	26	51
Increase the size of parking areas, for more parking spaces	12	38	50
Provide more way-finding signage along trails and roads	7	45	49
When building new trails, use natural surface and have wet weather restrictions on trail use	18	34	48
Develop trails designated primarily for mountain biking	18	34	48
Improve the availability of free maps at trailheads	7	52	42
Provide more electronic tools to be used for way-finding and information sharing	10	48	42
Increase enforcement of trail use rules and regulations	23	37	40
Provide bike racks at trailheads	15	48	38
Provide more information at trailhead kiosks	3	60	37
Develop easy trails for novice mountain bikers	7	59	34
Require that dogs be kept on leash everywhere in the Forests	51	26	23
Do not change anything / keep things as they are now	17	63	20

*The oppose column represents respondents who selected strongly oppose or oppose; The percent of respondents who support a management strategy represents respondents who selected support or strongly support

We also examined the percent of *onsite* respondents, by primary activity type, who supported activity-specific management strategies (Table 78). As one might expect, more mountain bikers supported developing mountain bike only trails and easy trails for novice mountain bikers than any other activity group. More on foot visitors supported developing trails designated for people on foot than other activity groups. Dog walkers were the least supportive of on-leash requirements compared to all other activity groups.

Table 78. Support for activity-specific management strategies across different primary activity types among ***ONSITE*** respondents (% of respondents)*

	Trail runners/ joggers	Dog walkers	Other visitors on foot	Mountain bikers	Horseback riders
Develop more trails designated only for people on foot	49	59	67	48	17
Develop trails designated primarily for mountain biking	44	46	47	89	14
Develop easy trails for novice mountain bikers	35	37	37	68	29
Provide bike racks at trailheads	40	32	40	27	20
Require that dogs be kept on leash in specific high-volume areas	43	24	55	53	72
Require that dogs be kept on leash everywhere in the Forests	10	5	21	16	29
Provide additional bags for dog waste	72	74	66	63	71

* The percent of respondents who support a management strategy represents respondents who selected support or strongly support

Communication preferences and information use

Two sets of items in the questionnaire asked respondents about their information use at the Forests. The first set had five yes/no questions (Table 79). Most *onsite* (76%) and *household* (73%) respondents had seen the free brochure with the map at the trailhead kiosks and 84% of *onsite* and 85% of *household* respondents said the information in the brochure was useful. Most (72%) of *onsite* respondents did not look at a trailhead kiosk on the survey day. However, 80% of *onsite* respondents found the information provided on the trailhead kiosk to be useful. Fewer than 20% of *onsite* and ~50% of *household* respondents receive information updates on the Forests. Nearly 80% of *onsite* visitors do not receive information updates about the Forests, compared to fewer than half of the *household* respondents who do not receive updates.

Table 79. Information use at the Forests (% of respondents)

	***Onsite* (all) respondents**			***Household* respondents**		
	n	No	Yes	*n*	No	Yes
Have you seen the free brochure with map at trailhead kiosks	*1,208*	24	76	*62*	27	73
Is the information in the brochure useful?	*877*	16	84	*39*	15	85
Did you look at a trailhead kiosk today?	*1,174*	73	27	*0*	n/a	n/a
Do you find the information provided on the trailhead kiosk very useful?	*604*	20	80	*0*	n/a	n/a
Do you receive information updates on the Forests?	*1,220*	82	18	*68*	47	53

Table 80 shows the information use among *onsite* visitors comparing newer visitors (those who have been visiting for less than 1 year) to longer-term visitors (those who have been visiting for at least 1 year). Compared to newer visitors, a higher percent of longer-term visitors had seen the free brochure at the kiosks, found the information in the brochure useful, and received information updates on the Forests. More newer visitors looked at the trailhead and found information at the trailhead kiosk useful compared to longer-term visitors. The data indicates that newer respondents are more likely took at the trailhead kiosk for more information. Perhaps most importantly, 98% of newer visitors do not receive information updates on the Forests, compared to 70% of longer-term visitors who do not receive updates.

Table 80. Information use at the Forests for 2017 ***ONSITE*** visitors comparing newer and longer-term visitors (% of respondents)

	Newer visitors			**Longer-term visitors**		
	n	**No**	**Yes**	*n*	**No**	**Yes**
Have you seen the free brochure with map at trailhead kiosks	*187*	33	66	*1,020*	22	78
Is the information in the brochure useful?	*120*	21	79	*756*	15	85
Did you look at a trailhead kiosk today?	*178*	47	53	*995*	78	22
Do you find the information provided on the trailhead kiosk very useful?	*111*	17	83	*492*	20	80
Do you receive information updates on the Forests?	*192*	98	2	*1,027*	79	21

Information use by survey location and primary typical activity

We examined the percent of respondents who answered 'yes' to each question about information use for *onsite* respondents based on the location where they were surveyed (Table 81) and their primary typical activity (Table 82). Findings for horseback riders and the respondents at Sulphur Springs and Gate 400 should be considered with caution due to small samples sizes. More visitors looked at the brochure at the kiosks at Dan's Trail and Sulphur Springs than other locations, and the fewest looked at the brochure at Hwy 99 and Gate 400. At least 75% of respondents at each location rated the brochure information as useful. More people looked at the trailhead kiosk at Dan's Trail and Gate 400 than other sites. Most respondents at all locations found the information at the trailhead kiosk useful. Only 10% of Hwy 99 respondents and 12% of Peavy respondents receive information updates on the Forests, though no more than 30% of respondents at any site said they receive information updates.

Table 81. Information use at the Forests by survey location (% who answered 'yes')

	Hwy 99	Dan's Trail	Lewisburg Saddle	Oak Creek	Peavy	Sulphur Springs	Gate 400
Have you seen the free brochure with map at trailhead kiosks	67	82	76	78	78	82	50
Is the information in the brochure useful?	85	85	81	86	86	76	83
Did you look at a trailhead kiosk today?	23	38	25	23	29	31	54
Do you find the information provided on the trailhead kiosk very useful?	85	86	76	82	78	63	78
Do you receive information updates on the Forests?	10	24	20	21	12	28	21

Among *onsite* respondents, approximately 75% or more said they have seen the brochure at trailhead kiosks and at least 80% said the information in the brochure is useful, regardless of their primary activity type (Table 82). More people on foot (35%) and on horseback (63%) said they looked at the kiosk than any other activity group. At least 70% of all activity groups said they found the information provided to be useful. Mountain bikers and trail runners appear the most likely to receive information updates on the Forests.

Table 82. Information use at the Forests for ***ONSITE*** respondents by primary typical activity (% who answered 'yes')

	Other people on foot	Dog walking	Trail running	Mountain biking	Horseback riding
Have you seen the free brochure with map at trailhead kiosks	74	79	78	79	100
Is the information in the brochure useful?	83	87	83	84	86
Did you look at a trailhead kiosk today?	35	22	15	15	63
Do you find the information provided on the trailhead kiosk very useful?	82	84	75	72	80
Do you receive information updates on the Forests?	11	13	30	38	22

Respondents were asked to suggest one thing that could be improved regarding information provided in the free brochure and categorized based on their response to whether the brochure information was useful to them. Appendix L lists the comments from *onsite* respondents who said that information in the brochure was not useful. These comments fell into five general categories of topics, with some overlap: maps, incomplete or outdated information,

clarity and readability, signs, and general comments. Many of the comments about maps were that the maps could be better or improved without giving much detail about how to make them better. Several people requested that a 'you are here' marker be placed on maps in the brochure. Others suggested a different scale so there was more information about each trail, which would probably mean having multiple maps for different areas or zones of the Forests. Comments about incomplete or outdated information typically requested more detail in the maps, especially regarding including new trails, better scales, and mileage/distance descriptions of each trail. The several comments categorized as being about signs were generally that the signs should be improved, and one person said to make sure the signage matches the map information. Lastly, there were about 20 comments categorized as 'general' and they typically reflected respondents who did not use the map/brochure because they did not need it due to familiarity with the area. Two people suggested providing more online resources.

There were more comments from *onsite* respondents who said the brochure was useful. See Appendix M for all comments. The comments were organized into categories labelled: maps, incomplete or outdated information, clarity and readability, signs and other markers, and 'other' comments. Most comments about the maps were suggesting they could be better, clearer, more accurate, bigger, updated, and more detailed. Several people suggested showing topography on the maps, as well as more information about closures and logging activities and where different recreation activities are prohibited. Many of the comments about incomplete or outdated information were requesting more information in the brochure about mileage and distance information for the trails, as well as trail difficulty ratings. Several people also noted an interest in having more information about the natural features and natural and cultural history of the area, more information about seasonal recommendations for trail use on the Forests, and more information about unmarked trails. Comments about clarity and readability generally focused on the need for larger font, higher quality graphics, color, and perhaps weather proofing or lamination of some sort. Comments about signs and other markings generally reflected an interest in having more mile markers/signs along the trails and making sure names on trail signs matched trail names in the map. The substantive 'other' comments were suggestions for more detailed online maps and that the maps were helpful especially for newer visitors.

Appendix N shows the comments from *household* respondents for those who found the brochure information useful and not useful. There were only three comments from *household*

respondents who said the brochure information was not useful. One person suggested adding information on context and adjacent properties. Another person said the brochure was not user friendly and the scale and legend should be changed, and they suggested hosting a focus group for user feedback. The other person mentioned that they use a detailed topographic map but did not expect that map to be provided for free. There were a few more comments from *household* respondents who found the brochure information useful. The comments ranged from people who liked the map and its simplicity to those who wanted more information in there about trail conditions (including difficulty level, mileage indicators, and best trails for different activities), more information in general about the Dunn Forest, and stronger language for civility. Two people suggested making the map bigger.

Respondents were also asked to suggest one thing that could be improved regarding the information provided on the trailhead kiosk. No *household* respondents left comments in these regards. Appendix O shows the comments from *onsite* respondents who did not find the information at the trailhead kiosk very useful. About 10% of the comments were that they did not pay attention to the kiosk. About 1/3rd of the comments were about maps and reflected similar comments described above about maps (e.g., add more detail, increase the size, improve clarity and accuracy, and add 'you are here' markers). Another 1/3rd or so of the comments were about the kiosks and/or information and generally requested more detail, elevation/topography and distance information, more information about logging activity and closures, and where different activities were allowed.

Appendix P shows all the comments from *onsite* respondents who said that the information at the trailhead kiosk was very useful. One category of comments encompassed about 1/3rd of the comments and was focused on maps. Again, these comments generally requested better, more detailed, up to date maps that are clearly and have more information on them (such as trail distances). Several people noted that all the maps/brochures were gone. About half of the comments were regarding the kiosks and/or information provided. More information about trail mileage and distances was a common response here, as well as more information about wildlife sightings, logging operations, closures (including location and reasons), trail conditions, and ecological information (e.g., wildflowers, habitat, problems in the Forests, etc.). A couple people also noted an interest in getting more information about OSU Forest management, the history of the Forest, and research activities on the Forests.

Finally, Appendix Q shows responses for how respondents receive information about the Forests for respondents who said they do receive information updates. Among *onsite* respondents, 80 people listed email, 41 listed Facebook, 14 listed the internet, 8 listed Team Dirt, 7 listed word of mouth, 5 listed trailhead kiosks, 5 listed trail runner listserv/emails, 5 listed Sierra club newsletter, 3 listed Soap Creek electronic newsletter, 3 listed mail/letter, 3 listed OSU College of Forestry website, 2 listed Mary's peak group website/email, and 2 listed mountain bike club email list. Other responses mentioned once include activities webpage, newsletter, signs, social media, and newspapers. Among *household* respondents, 15 people listed mail, 13 people listed email, 3 people listed the Soap Creek neighborhood newsletter or listserv, 2 people listed Facebook, and one person each listed 'web page,' from volunteers, local newspaper, and OSU Research Forest email newsletter.

Preferred information sources

The other set of questions related to information use first asked respondents about their preference for receiving information about the Forests from different sources. Then respondents were asked to rate the effectiveness of the Forests' information program regarding different topics related to management and recreation use on the Forests.

Table 83 shows the percent of respondents who indicated that they preferred different information sources for receiving information about the Forests. Among *onsite* respondents, the most preferred sources were trail signs (76%), trailhead kiosks (72%), and OSU Research Forests website (58%). The least preferred options for *onsite* respondents were neighborhood meetings (17%), community programs (22%), and local magazines (23%). No respondents indicated which sources they meant by 'other.'

Among *household* respondents, the most preferred information sources were trailhead kiosks (70%), trail signs (70%), email (66%), and the OSU Research Forests' website (66%). The least preferred sources among *household* responses were local magazines (11%), Facebook (22%), and community programs (23%). No respondents elaborated on 'other.'

Onsite and *household* respondents prefer getting information *onsite* and directly from the OSU Forest in other manners and less so indirectly through other sources.

Table 83. Preferred information sources for information about the Forests (% respondents) *

	***Onsite* respondents (all)**		***Household* respondents**	
	n	%	*n*	%
Trail signs	*1,160*	76	*66*	70
Trailhead kiosks	*1,165*	72	*66*	70
OSU Research Forests website	*1,141*	58	*64*	66
Email	*1,153*	49	*65*	66
Facebook	*1,144*	37	*64*	22
Conversation with Forest officials	*1,131*	36	*65*	42
Open cycle map	*1,107*	36	*62*	32
Newspapers	*1,139*	31	*65*	37
Newsletters	*1,119*	30	*67*	51
Guided field visits	*1,133*	30	*64*	34
Online videos	*1,125*	30	*64*	30
Local magazines	*1,133*	23	*63*	11
Community programs (churches, schools, scouts)	*1,138*	22	*64*	23
Neighborhood meetings	*1,127*	17	*64*	34
Other	*443*	9	*10*	0

**% who selected 2 = slightly preferred, 4 = moderately preferred, and 5 = extremely preferred*

Table 84. Preferred information sources for information about the Forests for ***ONSITE*** respondents by primary activity type (% of respondents) *

	Other visitors on foot	**Trail runners**	**Dog walkers**	**Mountain bikers**	**Horseback riders**
n	*641*	*197*	*232*	*144*	*9*
Newsletters	23	34	34	31	57
Trailhead kiosks	74	75	70	65	100
Newspapers	31	33	34	27	13
Local magazines	24	27	21	19	100
Trail signs	78	77	73	71	100
Email	45	59	46	57	100
Neighborhood meetings	15	18	18	20	100
Conversation with Forest officials	37	39	31	36	63
Community programs (churches, schools, scouts)	23	22	21	19	25
Guided field visits	34	23	27	29	25
Facebook	33	38	40	45	50
Open cycle map	28	40	30	72	14
OSU Research Forests website	58	61	52	63	50
Online videos	29	31	29	30	25
Other	10	13	7	5	0

**% of respondents who selected 2 = slightly preferred, 4 = moderately preferred, and 5 = extremely preferred*

Table 84 (above) shows the preferred information source among *onsite* respondents depending on their primary typical activity. There were minimal trends across activity types in terms of the preferred source of information about the Forests. However, 72% of mountain bikers preferred "Open cycle map" compared to fewer than 40% of any other activity group. This may indicate that other activity groups may prefer specific source more relevant to their group

Effectiveness of OSU Forest information program

The final question about information use asked respondents to rate the effectiveness of the Forests' information program in helping visitors understand more about different topics relevant to the Forest (Table 85). Among *onsite* respondents, the topics rated as most effectively communicated included regulations for recreating at the Forests (46%), information needed to plan a visit (43%), and the location and timing of timber harvest closures (43%). The topics rated by *onsite* respondents as least effectively communicated include management decisions (25%), research at the Forests (35%), and recreation programs or events (35%).

The topics rated as most effective among *household* respondents include location and timing of timber harvest closures (59%), regulations for recreating at the Forests (50%), information needed to plan a visit (47%), and the Forests' goals and missions (45%). The topics rates as least effectively communicated among *household* respondents include management decisions (27%), research at the Forests (38%), and recreation programs or events (39%).

Table 85. Percent of respondents who rated information programs about different topics as effective *

	***Onsite* respondents (all)**		***Household* respondents**	
	n	**%**	*n*	**%**
Regulations for recreating at the OSU Research Forests	*1,130*	46	*62*	50
Location and timing of timber harvest closures	*1,126*	43	*63*	59
Information needed to plan your visit	*1,129*	43	*62*	47
McDonald and Dunn Forests' goals and mission	*1,126*	39	*64*	45
Recreation programs or events	*1,129*	35	*64*	39
Research at the OSU Research Forests	*1,129*	35	*63*	38
Management decisions	*1,121*	25	*64*	27

**Percent of respondents who selected 4 = effective or 5 = extremely effective*

It is important to note that many respondents selected 'neither' for most of these topics, often around 50% of respondents. See the un-collapsed percentages in the appendices (Appendix F for *onsite* and Appendix G for *household* respondents) for more details. The point is that a lot

of visitors may not have a strong opinion or awareness of information about these different topics listed in Table 85. However, the results in the table are useful and indicate that visitors are interested in learning more about the different research and management activities at the Forests, including the reasoning for management decisions and the purpose and findings from research activities at the Forests.

Another important and noticeable trend is that, among *onsite* and *household* respondents, those who indicated that they do receive updates about the Forest were more likely to rate every informational program topic as effective compared to those who do not receive information updates about the Forests (Table 86). Chi-square analysis confirmed these significant differences. Although the data does not allow specific inferences into *why* respondents did or did not rate the informational programs about different topics as effective, receiving updates about the Forests likely has a positive effect on perceptions of the effectiveness of the Forests' informational program. Goals to enhance visitors' perceptions of the effectiveness of the informational program should include efforts to increase the number of people who receive Forest updates.

Table 86. Percent of respondents who rated information programs about different topics as effective depending on whether or not they receive updates about the Forests *

	***Onsite* respondents (all)**		***Household* respondents**	
	Receives updates	Does not receive updates	Receives updates	Does not receive updates
OSU Research Forests' goals and mission	51	36	60	29
Recreation programs or events	59	29	57	18
Management decisions	35	23	46	4
Location and timing of timber harvest closures	67	38	77	33
Information needed to plan your visit	61	40	63	27
Regulations for recreating at the OSU Research Forests	58	43	54	42
Research at the OSU Research Forests	44	34	54	19

**Percent of respondents who selected 4 = effective or 5 = extremely effective*
**Chi-square statistics indicated significant differences for every topic between respondents who do and do not receive information updates about the Forests*

Volunteering and stewardship at the Forests

Several items in the questionnaire asked about volunteer and stewardship engagement for the Forests (Table 87). Most *onsite* (95%) and *household* (90%) respondents had not heard of the Forest Connection Fundraising Program. Similarly, 98% of *onsite* respondents and 88% of *household* respondents were not a member of the program. Nearly 20% of *household* respondents and 14% of *onsite* respondents have volunteered for the Forests.

Table 87. Volunteering and stewardship characteristics (% of respondents)

	***Onsite* (all) respondents**			***Household* respondents**		
	n	**No**	**Yes**	*n*	**No**	**Yes**
Have you ever volunteered for the OSU Research Forests?	*1,217*	86	14	*68*	81	19
Have you ever heard of the Forest Connection Fundraising Program?	*1,217*	95	5	*69*	90	10
Are you a member of the Forest Connection Fundraising Program?	*653*	98	2	*25*	88	12

Nearly 75% of *onsite* respondents and 65% of *household* respondents who have volunteered for the Forests have volunteered one or fewer times in the past 12 months (Table 88). Fifteen percent of *onsite* respondents and 21% of *household* respondents who have volunteered for the Forests reported volunteering 3 or more times in the past 12 months.

Table 88. Percent of respondents indicating how many hours they volunteered in the past 12 months at the Forests

	***Onsite* respondents**	***Household* respondents**
n	*160*	*14*
0 times	40	29
1 time	34	36
2 times	11	14
3 times	6	7
More than 3 times	9	14

Section summary: Attitudes about management strategies and communication

- Compared to the 2009 study, more respondents in 2017 supported developing more trails designated only for people on foot, developing trails primarily for mountain biking, and increasing enforcement of trail use and regulations.
- Slightly fewer visitors in 2017, compared to 2009, supported requiring dogs to be kept on leash everywhere in the Forest. Perhaps the most notable difference between respondents in 2009 and 2017 is that nearly half as many respondents in 2017 supported not changing anything compared to respondents in 2009.
- In 2017, at least 40% of all respondents supported most management actions. Also, fewer than 20% of all respondents opposed most actions.
- The most supported management actions by both *onsite* and *household* respondents (>60% in each group supported the action) were providing additional dog-bag dispensers and developing more trails designated only for people on foot.
- Among *onsite* respondents, 60% or more supported providing additional dog bag dispensers for dog waste, developing more trails for people on foot only, and providing more way-finding signage along trails and roads. Approximately 60% of *onsite* respondents opposed leash requirements everywhere on the Forests.
- 67% of *onsite* visitors on foot (with no dogs) supported developing more trails designated only for people on foot, compared to 59% of dog walkers, 49% of trail runners, 48% of mountain bikers, and 17% of horseback rides who supported this option.
- 89% of *onsite* mountain bikers supported developing trails designated primarily for mountain biking, compared to 47% of visitors on foot with no dog, 46% of dog walkers, 44% of trail runners, and 14% of horseback riders.
- 24% of *onsite* dog walkers supported requiring that dogs be kept on leash in high-volume areas, compared to 72% of horseback riders, 55% of visitors on foot with no dog, 53% of mountain bikers, and 43% of trail runners.
- The management actions supported by the most (at least 60%) *household* respondents include providing additional dog bag dispensers for dog waste, requiring that dogs be kept on leash in specific high-volume areas, developing more trails designated only for people on foot, and providing information through email and web communication. Approximately 50% of *household* respondents opposed requiring dogs to be on leash everywhere in the Forests.
- Most respondents had seen the free brochure with the map at the trailhead kiosks and said the information in the brochure was useful.

- Most (73%) *onsite* respondents did not look at a trailhead kiosk on the day they were surveyed. However, 80% of *onsite* respondents found the information provided on the trailhead kiosk to be very useful.
- Newer visitors are more likely to look at the trailhead kiosk for more information. On the other hand, 98% of newer visitors do not receive information updates on the Forests, compared to 70% of longer-term visitors who do not receive updates.
- More respondents looked at the trailhead kiosk at Dan's Trail and Gate 400 than other sites.
- More people on foot (35%) and on horseback (63%) said they looked at the kiosk than any other activity group. At least 70% of all activity groups said they found the information provided as being useful.
- Slightly more than half (53%) of *household* respondents and only 18% of *onsite* respondents said that they receive information updates on the Forests.
- Comments showed that respondents wanted to see the maps and other information in the brochure improved. The maps could be clearer, updated, and enlarged to show more detail of each trail, and include more information about trail mileage, conditions, and activity appropriateness for different trails.
- Comments about information on the trailhead kiosks reflected similar attitudes about the maps and trail information, in addition to an interest in more information about other topics such as research happening on the Forest, closures due to logging, and information about wildlife and recent sightings.
- Among *onsite* respondents, the most preferred sources were also trail signs, trailhead kiosks, and the OSU Research Forests' website. Their least preferred sources were neighborhood meetings, community programs and local magazines.
- Among *household* respondents, the most preferred information sources were trailhead kiosks, trail signs, email, and the OSU Research Forests' website. Their least preferred sources were local magazines, Facebook, and community programs.
- Among *onsite* respondents, the topics rated as most effectively communicated by Forest managers included regulations for recreating at the Forests, information needed to plan a visit, and the location and timing of timber harvest closures. The topics rated as least effectively communicated among *onsite* respondents include management decisions, research at the Forests, and recreation programs or events.
- The topics relevant to the Forests rated as most effectively communicated by Forest managers among *household* respondents include location and timing of timber harvest closures, regulations for recreating at the Forests, information needed to plan a visit, and the Forests' goals and missions. The topics rates as least effectively communicated

among *household* respondents include management decisions, research at the Forests, and recreation programs or events.

- Many respondents selected 'neither' for most of these topics. This suggests that a lot of the Forests' visitors may not have a strong opinion or awareness of information about these different topics listed. However, visitors are interested in learning more about the different research and management activities at the Forests including the reasoning for management decisions and the purpose and findings from research activities at the Forests.
- Among *onsite* and *household* respondents, those who indicated that they do receive updates about the Forests were more likely to rate every informational program topic as effectively communicated compared to those who do not receive information updates. Goals to increase perceptions of informational program effectiveness should include efforts to increase the number of people who receive updates about the Forests.
- Most respondents had not heard of the Forest Connection Fundraising Program and were not a member of the program. Nearly 20% of *household* respondents and 14% of *onsite* respondents have volunteered at the Forests. Nearly 75% of *onsite* respondents and 65% of *household* respondents who have volunteered for the Forests have volunteered no more than once in the past 12 months.

Additional comments from respondents

The final section of the questionnaire asked respondents to share any other comments. All comments are in the appendices (Appendix T for *onsite* respondents and Appendix U for *household* respondents). The comments were reviewed and organized by theme. Many comments touched on multiple issues, so there is some overlap in themes for many of the comments. The following is a general summary of the themes from the comments beginning with *onsite* respondent comments followed by *household* respondent comments.

Additional comments from *onsite* respondents (Appendix T) were more extensive and organized into these general categories or themes:

- dog issues
- transportation/access to the Forests
- parking/facility issues
- trails
- maps, signs, kiosk, information, and education
- Forestry/logging operations
- visitor behavior and crowding
- community partnerships and public input
- mountain biking and cycling
- invasive species and other ecological issues
- safety, emergencies, fire, theft, etc.
- general/other
- gratitude and appreciation for the Forest

Approximately 15-20% of the comments from *onsite* respondents reflected an appreciation for access to the Forests for recreation and other purposes. This included an appreciation for management efforts and for the ability to experience a natural setting so close to a city.

Approximately 10-15% of the comments from *onsite* respondents were about dog issues. Many of these comments reflected concern over increasing presence of dog waste and uncontrolled dog behavior. However, there was also clear appreciation among dog owners for the opportunity to use the Forests to bring their dogs with them for recreation.

Approximately 10-15% of the comments from onsite were about the trails at the Forests. Several of these respondents requested more trails, particularly single track for either biking or running. Others discussed the need for enforcing restricted trail use during wet weather conditions to decrease trail damage. Other responses illustrate that visitors clearly appreciate the variety of the trails and several respondents mentioned that improving connectivity between trails would be welcomed.

Approximately 10-15% of the comments from onsite respondents related to parking and facilities at the Forest. Several respondents noted an interest in having more restroom facilities, benches, and overlooks. A couple others mentioned an interest in improved parking lot conditions, which others expanded on by discussing the need for bathrooms, more trashcans, and more parking spaces. A few comments from *onsite* respondents referenced issues related to transportation and access to the Forests. Respondents appreciate the proximity to the Forests from town. A couple respondents noted interest in a shuttle to the Forests from Corvallis.

Another 10-15% of the *onsite* respondent comments were about maps, signs, kiosks, information and education. These comments generally reflected the same comments discussed earlier for improving brochure and trailhead kiosk information. Visitors would like to know more about management issues, decisions, and research activities at the Forests. There is also an interest in more hands-on educational opportunities like plant and wildlife identification. Several visitors requested improved communication about forestry and logging operations. Improved maps and trail signage is also desired, including access to digital maps. Adding closure information to maps is also desired.

Approximately 5% of comments from *onsite* respondents mentioned a dislike for logging activities on the Forests, particularly clear cuts. These comments included safety issues connected to logging, which generally referred to Forest operation vehicles travelling too quickly on Forest roads.

Approximately 5% of comments from *onsite* respondents mentioned visitor behavior and crowding issues. A couple people mentioned not visiting at certain days/times because it was too busy. Most other comments reflected the need to continue improving etiquette among trail users, particularly mountain bikers, those with dogs, and larger groups. Four comments mentioned either an appreciation for community partnerships and public input opportunities or an interest in increasing those relationships and opportunities.

Approximately 5% of the comments from *onsite* respondents were about mountain biking and cycling. Several people wanted more trails for mountain bikes. Others wanted bike racks and one person wanted a bike washing station. There was also a lot of appreciation for the opportunity to mountain bike at the Forests. However, numerous comments also reflected concerns with mountain bikers at the Forests in terms of impacts on the trails from bikes during

wet periods, illegal mountain bike trails or features like jumps, and conflict with mountain bikers usually stemming from a lack of warning when bikers approach other visitors.

Fewer than 5% of *onsite* respondents urged the Forests to more aggressively address invasive species. Three respondents mentioned concerns about poison oak and one person suggested identifying areas with a lot of poison oak on a map or brochure. Five comments mentioned concern about either vehicle safety around pedestrians, theft in the parking lots, cigarette butts and fire danger, and people getting lost. The remaining comments were categorized as 'other' and were very wide ranging.

There were 14 additional comments from *household* respondents (see Appendix U). Six of the comments expressed appreciation for access to the Forests for recreation. One person wanted a spot with a good view. One person wanted vehicles on Forest roads to slow down. There were also comments about the need for clear signage, invasive species treatment, and restricting visitor behavior in off leash areas for dogs.

Section summary: Additional comments from respondents

- Open-ended comments from respondents in the final section of the questionnaire mentioned a variety of issues. The most prominent issues discussed were those related to dogs, trails, parking/facilities, and information use. Many comments expressed gratitude for the ability to use the Forests for recreation.
- There were many comments about the need to update and improve the maps on brochures and at kiosks, as well as to improve trail signage throughout the Forests.
- Events surrounding dogs off leash not under vocal control and signs of dog waste were identified as a problem by many respondents. Comments reflected an interest in having more trails, especially single-track trails for mountain bikes or other activity intended purposes (e.g., trail running). Restroom facilities, trash cans, and parking lot improvements were requested by a fair number of respondents.

Recreation use level estimates

In this section, we present the results of the use level estimates in 2017 at the Forests based on exit count data. We then use that data about the number of annual visits to estimate the number of separate visitors in 2017. Then, we compare these findings previous estimates of visitation at this Forest (Finley, 1990; Wing, 1998; Wing & Shelby, 1999; Needham & Rosenberger, 2011) and to overall population growth trends in Corvallis and Benton County using Census Bureau data.

Estimates for the number of annual visits are likely conservative and do not include the Dunn Forest. While surveys were issued at Gate 400 on the Dunn Forest, visitor counts were not conducted at this low use site. Also, additional visits made by users during non-daylight hours, or people accessing this Forest using secondary or unauthorized access points are not accounted for in these estimates. Many people access the Forests multiple times/week from their backyards or neighborhood access points. Furthermore, the number of daylight hours in each season is also conservative and is likely much higher than estimated in the late spring, summer, and early fall. The estimates for the total number of visitors is presented with a 50% margin of error due to the difficulty in accurately estimating that figure. However, we used the same methods for estimating the number of visitors as was used in the 2009 study and visitation frequency among visitors does not appear to have changed significantly between the years. Thus, it is still helpful to see the estimates for the number of visitors especially in comparison to 2009. Since the data was collected and analyzed consistently during both studies, the use numbers are accurate for comparing changes over time.

Estimating the number of annual visits to the Forests in 2017

We estimate that the total number of annual visits in 2017 was 155,446, plus or minus 10% (i.e. to 139,901 to 170,990 visits). Table 89 shows the estimates for the number of annual visits in total and at each of the five trailheads where exit count data was collected.

Table 89. Annual visitation estimates from January 2017 to January 2018

	Annual visits	% of the total annual visits
Hwy 99	30,446	20%
Dan's Trail	19,494	13%
Lewisburg Saddle	37,483	24%
Oak Creek	38,112	24%
Peavy	29,911	19%
Total	**155,446**	**100%**

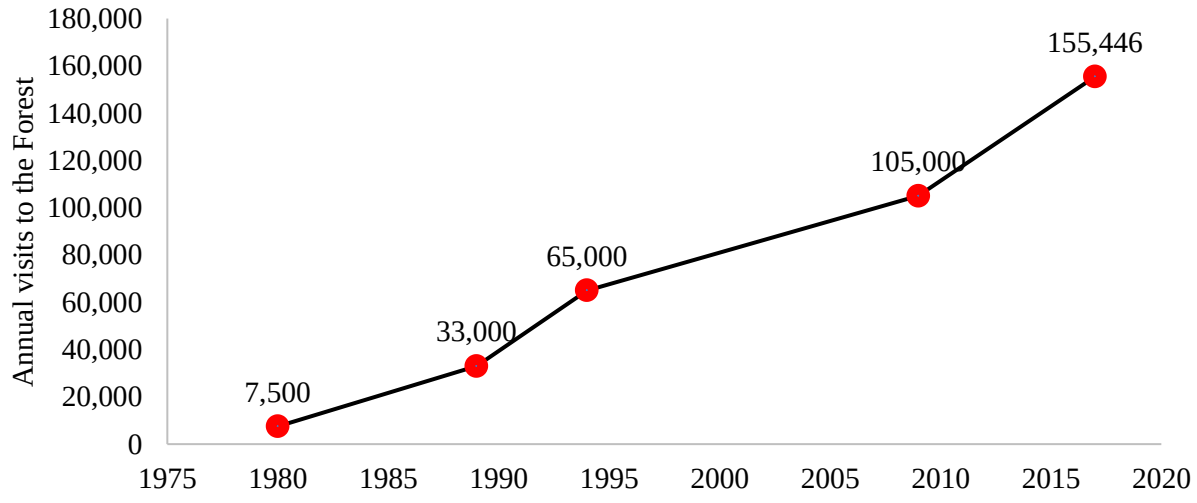
Table 90 shows the estimates of annual visitation (i.e., the number of visits annually) for each trailhead by season. Spring is the busiest season overall and at every trailhead except Peavy, where summer is the busiest season. Fall is the least busy season overall and at Oak Creek, Dan's Trail, and Hwy 99. Winter is the least busy season at Peavy and Lewisburg Saddle.

Table 90. Annual visitation estimates for each season from January 2017 to January 2018

	Fall	Winter	Spring	Summer	Total # of annual visits
Hwy 99	4,273	7,561	10,189	8,423	30,446
Dan's Trail	3,393	4,185	5,707	6,209	19,494
Lewisburg Saddle	8,761	6,409	11,462	10,851	37,483
Oak Creek	6,187	11,128	12,838	7,959	38,112
Peavy	4,941	4,224	9,569	11,177	29,911
Total	**27,555**	**33,507**	**49,765**	**44,619**	**155,446**

Figure 5 shows the trends in annual visits at the Forests since 1980. Between 2009 and 2017, there were an average of 5,605 additional visits each year. Assuming this trend in visitation and population growth continues, we estimate that the annual number of visits to the Forest each year could reach ~200,000 visits by 2025.

Figure 5. Trends in the estimated total number of annual ***visits*** to the Forests since 1980



Estimating the number of individual visitors to the Forest in 2017

We used the estimate of 155,446 total visits in 2017 to estimate the total number of unique or separate visitors in 2017. As discussed in more detail in the methodology section of this report, we used a similar approach as the authors of the 2009 study report. That is, we assumed that, on average, there were 9 visits/person and then provided a margin of error of 50%. This approach seemed appropriate given that visitation frequency among *onsite* respondents did not vary significantly between 2009 and 2017. Therefore, **we estimate that the total number of individual visitors to the Forests in 2017 was 17,271 plus or minus 8,635 (i.e., 8,635 to 25,908 visitors).** Specifically, we found this number by dividing 155,446 total visits by 9 visits/person to come up with 17,271 visitors, then divided that number by 2 and subtracted and added it to 17,271 to get the range within a 50% margin of error. Table 91 shows the estimates for the number of annual visits and separate visitors from 2009 and 2017 along with the corresponding margins of error.

Table 91. Estimates for the number of annual **visits** and the number of separate **visitors** at the Forest with margins of error

	2009	**2017**
Number of individual visitors*	11,702 (5,851 to 17,553)	17,271 (8,635 to 25,908)
Number of annual visits**	105,000 (94,500 to 115,500)	155,446 (139,901 to 170,990)

**50% margin of error; **10% margin of error*

Visitation trends compared to Corvallis and Benton County trends

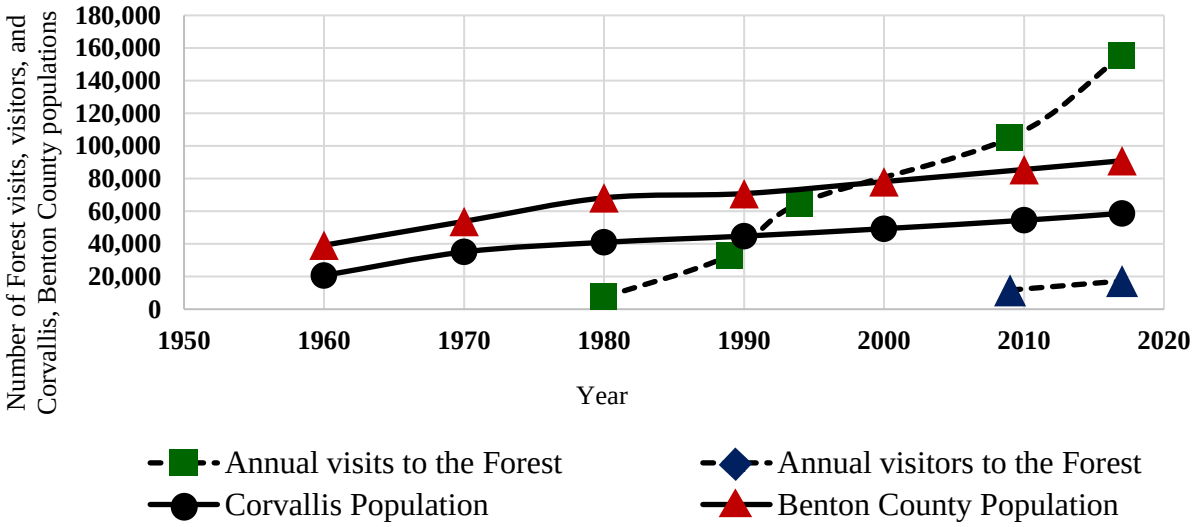
Table 92 and Figure 6 show the population growth trends for Corvallis and Benton County, the estimated number of annual visits to the Forests, and the estimated number of individual *visitors* to the Forest since 1960 (when available). The number of annual visits to the Forest is growing at a faster rate than the local population(s). This relatively larger increase in annual visits compared to population growth trends is due in part to an increasing number of visitors to the Forests. Recreation popularity continues to increase nationwide, especially in the western U.S. (Outdoor Foundation, 2017; White et al., 2016). With the available data, it is difficult to know if the portion of local populations who recreate at the Forest has changed substantially over the years. Another potential explanation for this increase in annual visits is that

people are visiting more frequently. However, according to our data presented earlier, the frequency of visitation among visitors to the Forests does not appear to have changed significantly since 2009. Therefore, it may be likely that an increasingly larger portion of the local population is recreating at the Forests compared to in the past.

Table 92. Trends in Forest visitation and populations of Corvallis and Benton County

Year	The number of annual Forest visits	The number of individual Forest visitors	Corvallis population	Benton County population
1960			20,669	39,165
1970			35,056	53,776
1980	7,500		40,960	68,211
1989	33,000			
1990			44,757	70,811
1994	65,000			
2000			49,322	78,153
2009	105,000	11,702		
2010			54,462	85,579
2017	155,446	17,271	58,735	90,951

Figure 6. Trends for the number of annual visits to the Forests, the number of individual annual visitors to the Forest, and population size in Corvallis and Benton county



Section summary: Use level estimates for 2017

- We used exit count data to estimate that the total number of annual visits to the Forests in 2017 was 155,446, plus or minus 10% (i.e. to 139,901 to 170,990 visits). The estimate in 2009 was 105,000 visits.
- We used the estimate of annual visits to roughly estimate that in 2017 the number of separate visitors was 17,271 plus or minus 8,635 (i.e., 8,635 to 25,908 visitors). The estimate in 2009 was 11,702 separate visitors.
- Estimates for the number of annual visits are likely conservative and do not include the Dunn Forest. Also, additional visits made by users during non-daylight hours, or people accessing the Forests using secondary or unauthorized access points are not accounted for in these estimates. Furthermore, the number of daylight hours in each season is also conservative and is likely higher than estimated in the late spring, summer, and early fall.

Discussion and management recommendations

Based on the preceding review of findings from the 2017 survey, several insights and recommendations emerge that managers may consider. We acknowledge that Forest resources, including staff availability and funding, are limited, so some of these recommendations may be more feasible than others with current resources. Prioritization of these recommendations should be at the discretion of Forest managers and could include input from FRAC (Forest Recreation and Advisory Council) members. We recognize that conditions and management strategies change over time. We attempted to discuss any management changes in the context of pertinent findings that occurred after data was collected as of the completion date of this report. However, conditions and management direction continue to change, and managers should use their discretion to interpret how the study findings apply in the context of those changes in the future.

The three most important issues that emerged from the questionnaire findings relate to issues surrounding visitor behavior, perceptions of vehicle crowding at trailheads, and the Forests' communications program. **Our primary recommendation is to develop a comprehensive visitor use management plan and a separate, yet related, communications plan for the Forests.** These plans should address the findings and recommendations reported here, and other high-priority issues, at the Forests' managers' discretion. The purpose of the comprehensive management plan and process is to identify key management goals and desired conditions and integrate them with management and monitoring strategies. The findings in this report should be one of many resources used throughout that process.

Management of the Forests is currently guided by several documents and goal statements. We recommend integrating the content of these documents into an actionable visitor use management plan. Existing documents (hyperlinked) include the:

- 2005 Forest Plan
- Collaborative Community Recommendations for Oregon State University College Forests Recreation Planning
- Recreation and Engagement Program Goals and Objectives document
- Interpretive Plan and Style Guide
- Alternative Trailhead Transportation Strategy
- Recreation and Trails 5-year Action Plan
- Parking Philosophy

These existing documents provide a range of general to specific management directions and goals, and address to some extent the main issues identified in this report (e.g., trail development, parking management, planning, and public information and outreach). The utility of the guidelines and directions found in these documents, and the ability to collaboratively address current and future recreation issues on the Forests, would be significantly enhanced through a formal planning process to develop a comprehensive visitor use management plan for the Forests. This process would involve using the existing documents linked above, the findings from this report and other past studies (e.g., recent focus groups), and consultation with FRAC members and other stakeholders. These resources should be used to identify the need and goals for visitor management, identify specific management strategies, and implement, monitor, evaluate, and adapt those strategies as needed over time.

To guide this process, we recommend that the Forests consider using the Interagency Visitor Use Management Framework developed by the Interagency Visitor Use Management Council. The Framework can be adapted as needed by Forest managers. The Framework is endorsed by the major federal land management agencies and offers a structured, yet flexible, set of guidelines for working through different steps of the planning process towards effective and adaptive visitor use management across different recreation settings. More information about the Council and the Framework can be found here and the actual Framework document can be found here. Figures 7 and 8 are from the Framework and provide an overview of the Framework.

Figure 7. Overview of the Visitor Use Management Framework

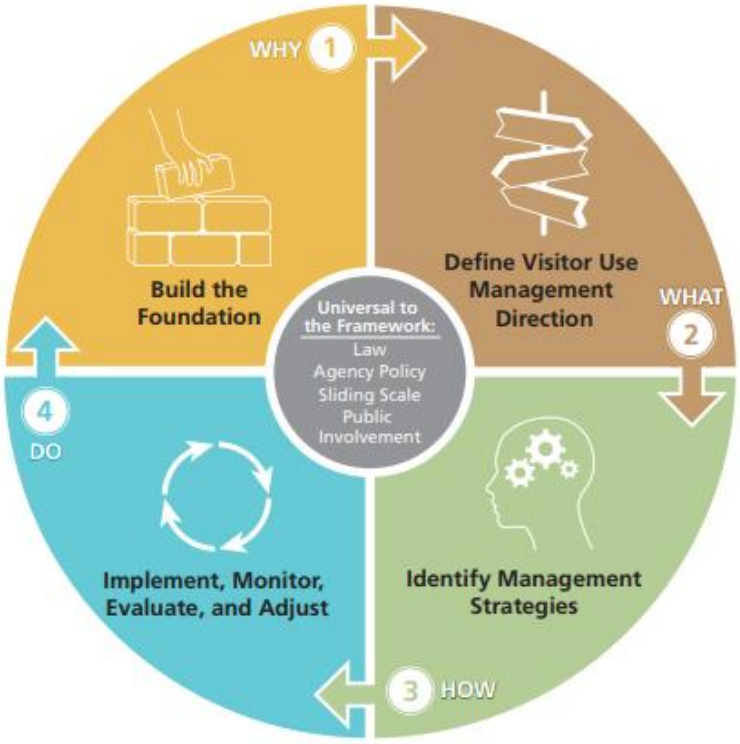


Figure 8. Steps and outcomes of the Visitor Use Management Framework from the Interagency Visitor Use Management Council

Steps:

1. Clarify project purpose and need.
2. Review the area's purpose and applicable legislation, agency policies, and other management direction.
3. Assess and summarize existing information and current conditions.
4. Develop a project action plan.

Outcome: Understand why the project is needed, and develop the project approach.

Steps:

5. Define desired conditions for the project area.
6. Define appropriate visitor activities, facilities, and services.
7. Select indicators and establish thresholds.

Outcome: Describe the conditions to be achieved or maintained and how conditions will be tracked over time.

Steps:

8. Compare and document the differences between existing and desired conditions, and, for visitor use-related impacts, clarify the specific links to visitor use characteristics.
9. Identify visitor use management strategies and actions to achieve desired conditions.
10. Where necessary, identify visitor capacities and additional strategies to manage use levels within capacities.
11. Develop a monitoring strategy.

Outcome: Identify strategies to manage visitor use to achieve or maintain desired conditions.

Steps:

12. Implement management actions.
13. Conduct and document ongoing monitoring, and evaluate the effectiveness of management actions in achieving desired conditions.
14. Adjust management actions if needed to achieve desired conditions, and document rationale.

Outcome: Implement management strategies and actions, and adjust based on monitoring and evaluation.

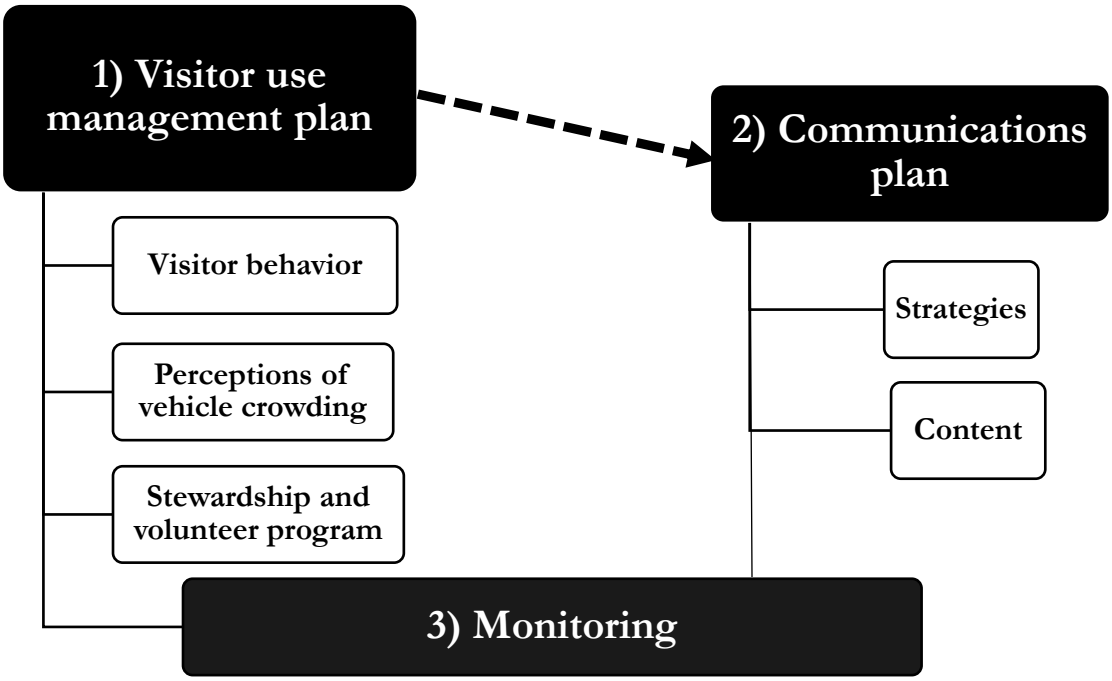
Engaging in a comprehensive planning process requires support from the Forests' management team, FRAC members, the OSU community, and volunteers. Hiring a temporary, full-time employee or a third-party consultant to lead these efforts should be considered. A primary goal in this process is to identify acceptable social and environmental conditions on the Forests and how to achieve and maintain those conditions. Identifying these conditions includes selecting indicators of those conditions to monitor and setting standards or levels of those indicators to act as signals for when management actions are required. The management planning process would include identifying specific management actions related to different conditions and indicators and could consider integrating some of the recommendations in this report.

Next, we discuss the important issues that emerged from the questionnaire findings in this report in more detail to aid Forest managers as they consider management plan development options. Specifically, we first discuss issues surrounding visitor behavior and perceptions of crowding at trailheads evident in the questionnaire findings. The discussion about these issues provides guidance for their inclusion in a visitor use management plan. We also briefly discuss an idea for expanding the Forests' stewardship and volunteer program to address these and other issues at the Forests. An enhanced stewardship program could be developed more carefully in the visitor use management plan. Then, we discuss the need for a formal communications plan for the Forests, which would align with the visitor use management plan but could also be a separate process. Lastly, we discuss ideas about integrating monitoring activities into the planning process. As shown in Figures 7 and 8 above, the process to develop the visitor use management plan includes many other steps and aspects for the managers to consider at their discretion.

Figure 9 below outlines our discussion. We begin by discussing the three main issues (visitor behavior, perceptions of vehicle crowding, and the Forest's stewardship and volunteer program) that emerged from the questionnaire data and should be integrated into a formal visitor use management plan in the future at the discretion of Forest managers (1). Then, we discuss similar considerations around a communications plan for the Forests that could be integrated into a visitor use management plan (2). Lastly, we discuss suggestions for monitoring the effectiveness of any plans developed (3). We want to emphasize that the following recommendations and discussion about a visitor use management plan focus on the findings in

this report. Managers will decide at their discretion what, if anything, to include in the planning process, which could include the issues discussed here or other issues of importance to them.

Figure 9. Illustration of planning needs emerging from the questionnaire findings



Visitor Use Management Plan

As seen in the Interagency VUM framework in Figures 7 and 8, there are many different considerations when developing a visitor use management plan. Here, we focus our discussion on the key survey findings and management options related to visitor behavior, perceptions of crowding, and enhancing the stewardship and volunteer program at the Forests. Each of these (and other) issues and suggestions can be integrated into the visitor use management plan at the manager's discretion and perhaps with consultation with FRAC members and other stakeholders if time and resources allow.

Visitor behavior

Visitor behavior in outdoor recreation settings can have a substantial impact on other visitors' experiences (Manning, 2010; Manfredo et al., 2004). Common behaviors that affect other visitors' experiences include large group sizes, being loud, rude, or discourteous, failing to give notice upon approach or yielding the right of way, and any display of values that conflict

with one's own values. Some behaviors like user-created trails (i.e., social trails) and people recreating with dogs off leash and not under vocal control can lead to ecological impacts like erosion, the spread of invasive species, habitat damage or fragmentation, and wildlife harassment or displacement (Banks & Bryant, 2007; Barros & Pickering, 2017; Lenth, Knight, & Brennan, 2008; Weston & Stankowich, 2014). Therefore, it is important to understand which behaviors are likely to lead to negative social and ecological impacts and which management actions can change those behaviors and mitigate associated negative impacts.

At the McDonald and Dunn Forests, there are several types of behavior leading to some conflict between users revealed in the questionnaire results that are likely negatively impacting other visitors' experiences there. Visitors failing to give a verbal warning upon approaching other visitors is an issue at the Forests that requires more attention. Excluding horseback riders, most activity groups were perceived as contributing to this problem to some degree. It was clear throughout multiple sections of the questionnaire results that mountain bikers and people with dogs are the groups more likely to affect other visitors' experiences by not giving proper warning upon approach. Similarly, mountain bikers going too fast and people with dogs off-leash not under vocal control also emerged as major issues affecting other visitors' experiences. There are several potential options to address these issues related to visitor behavior.

Zoning and enforcement to reduce conflict

The practice of zoning is a common management technique to reduce conflict and enhance visitor experiences. Conflict events at the Forests between mountain bikers and people with dogs, as well as between mountain bikers and horseback riders, were relatively common among respondents. One zoning option could be to create areas on the Forests that exclude mountain bikes and areas that only allow mountain bikers. Adding more trails or restricting other users on certain trails could be considered. Indeed, the Forests are currently building more trails geared towards mountain bikers near McCullough Peak through a partnership with Team Dirt.

As common as these activity-based zoning strategies are, enforcement and implementation realities pose significant challenges to using zoning on the Forests. It also may appear to be too heavy-handed among many Forest users who are accustomed to less regulatory approaches at the Forests. Furthermore, law enforcement at the Forests is through a partnership with Benton County Sheriff's Department and the ability to use them is limited. Perceptions of excessive law enforcement may also be perceived negatively by many visitors. Enforcement is

also a difficult endeavor for Forest staff, even with the help of volunteers for monitoring, given the dispersed nature of recreation on the Forests and the lack of regulatory policies in place that would facilitate enforcement through fines. Forest managers also noted that recent focus groups with key Forest recreation stakeholders revealed that prohibiting specific uses on trails was generally not preferred. Furthermore, there are also plans on the Forests for constructing more multi-use trails that connect different points of the Forests and create the potential for longer routes. All user types are interested in having access to these longer distance connections. These types of trails and increased connectivity and access will make it increasingly difficult to implement and communicate activity-based zoning at the Forests. Thus, zoning may not be the most feasible option to address visitor behavior issues at the Forests.

Zoning options for addressing dog-related issues face similar challenges but may be more feasible. Questionnaire data shows that many visitors do not support requiring dogs on leash in all areas of the Forests. However, 47% of *onsite* respondents and 61% of *household* respondents did support leash requirements in high-use areas. Any use of zoning to reduce conflict related to dogs off leash would require appropriate signage and other communication strategies so that visitors have clear expectations of leash regulations in that area. Communication about zoning and regulations in different areas of the Forests should be through signage at kiosks and along trails, in the visitor map, on the Forests' website, working with local guide books, and local stores (e.g., pet stores, Peak Sports, REI). Managers may consider a monitoring process to identify specific areas on different trails where etiquette-based conflicts or inappropriate behavior are more likely to occur, then place signs in these areas to remind visitors of proper etiquette. Another option is to request input from FRAC members and/or representatives of different activity groups to better understand the specific locations and dynamics involved in etiquette related conflicts and generate ideas to address potential conflicts (including zoning options that would designate off-leash and on-leash areas). Volunteers can help with monitoring and implementation of ideas that emerge from these processes.

Communication and normative influences to manage visitor behavior

Perhaps the most feasible and cost-effective approach to managing etiquette or behavior-based conflict lies in a suite of communication and education strategies. Some behaviors, such as failing to yield right of way and give verbal warning upon approach, are occurring among different activity groups at the Forests. Leaving evidence of dog waste behind is also a behavior

of concern among a fair number of visitors. Communication strategies that address these behaviors, especially among mountain bikers and visitors with off-leash dogs, can be effective in shifting behaviors to some degree. Two main aspects of these communication strategies are content and delivery method. Both aspects should be further developed in a formal communications plan that describes different strategies to address the issues found in this study and other management issues of concern. A few initial suggestions are below, and more considerations are presented in the section below about developing a communications plan.

One way to influence visitor behavior is through emphasizing normative influences. Social norms are generally regarded as a shared set of rules or appropriate conduct usually within a particular setting (Elster, 1989; Farrow et al., 2017). Distinction is made between injunctive and descriptive norms. Descriptive norms generally refer to what people *do* and injunctive norms refer to what most people *approve* of doing (Farrow et al., 2017). Results vary across topics and settings, but it is generally recognized that injunctive norms can be more influential on behavior and descriptive norms can backfire by giving the impression that doing a prohibitive behavior is acceptable (Brown et al., 2010; Cialdini et al., 2006; Farrow et al., 2017; Smith et al, 2012). Examples of injunctive and descriptive norms should be fully developed in a communications plan. Initial ideas include emphasizing to visitors that most other visitors' experiences at the Forests are negatively affected by failing to give verbal warning upon approach and/or yielding the right of way on trails. Other messages might focus on the percent of visitors who consider issues with dogs off leash or mountain bikers a problem. These messages could be standalone messages or part of a larger campaign about visitor behavior or etiquette.

Messages about normative influences could be combined or associated with other messages related to a larger theme of stewardship. Stewardship is a broad concept that should include both social and ecological aspects. Research has shown that people are more likely to be compliant with regulations if they understand the behavior as part of being a good steward of the resource and of being socially responsible (Reigner & Lawson, 2009). Messages about stewardship should emphasize visitors' roles practicing proper etiquette so that others can enjoy recreation experiences as well. For example, messages could also emphasize that practicing proper etiquette sets an example for other visitors (Brown et al., 2010). Identifying ecological impacts related to behaviors could also be useful. This might apply mostly to dogs off leash and dog waste, which likely have some degree of environmental impact, but that impact should be

monitored and evaluated to inform any specific education technique that emphasizes normative aspects of ecological impacts (e.g., 'most people enjoy recreating at these Forests because of the natural setting and X activities disrupt the natural or ecological balance).

Managers may also consider making short videos about visitor behavior and etiquette (e.g., mountain bikers going too fast, dogs without leash not under vocal control, dog waste, etc.) that emphasize proper behavior and can be shared easily on social media and other outlets. The local universities in the area present many opportunities for working with professors and classes related to communication, interpretation, media, planning, or park management to help design and implement these videos.

Another option to consider is hosting events like a 'Visitor Safety Day' at busier, multi-use sites on the Forests once or more a year. These events could range in level of formality and would include demonstrations about proper visitor behavior and etiquette. Attention should be paid to giving verbal warning when approaching other visitors, knowing when and how to yield to different users, controlling dogs off leash, and managing dog waste. Volunteers and representatives from key stakeholder groups could help organize and implement the event(s), including doing demonstrations and having conversations with visitors about these issues.

Managers could also explore other opportunities to communicate with visitors about expectations for visitor behavior at the Forests. For example, developing and advertising a 'welcome packet' for visitors could provide visitors another resource for information about the Forests, visitor behavior expectations and etiquette there, suggestions for alternate transportation at certain sites, or the best times/days to avoid certain sites that may be crowded. This packet of information could be a hard copy displayed at trailheads and the Forests' office and could also be available on the Forests' website. Incentivizing visitors to obtain a welcome packet may be necessary to increase readership. Incentives like receiving an upgraded free digital map of the Forests after downloading the welcome packet (or perhaps taking a short 'quiz' on the material in there) is one idea. The welcome packet would also provide managers with another outlet to contact and engage with visitors. For example, visitors could have an option to register an email address when they download the welcome packet so that they could receive updates about the Forests. Managers could use this growing list of contacts to regularly engage with visitors and seek feedback through different means.

Multiple approaches to influencing visitor behavior will be needed. The point here is to emphasize that there are multiple ways to incentivize visitors to follow proper etiquette and develop and strengthen a sense of normative behavior or rules to which visitors would voluntarily adhere. Forest managers and FRAC members should discuss the feasibility of different options and need for requesting stakeholder or visitor input about potential options.

Vehicle capacity and perceptions of crowding

Another main issue revealed in the questionnaire results relates to perceptions of vehicle crowding at parking areas around the Forests. Approximately 1/3rd of respondents felt crowded based on the numbers of vehicles at trailheads. Perceptions of vehicle crowding were particularly high at Oak Creek and Lewisburg Saddle. Vehicle capacity is an issue that Forest managers are aware of and are actively trying to address. Managers recently developed and released their parking philosophy to help guide future decisions (click here to read more about the parking philosophy). The primary goals are to manage parking areas to provide safe and sustainable access to the Forests for research, management, and recreation. The key components of their philosophy are to make parking areas safer and more user friendly, modestly increase capacity where it makes sense, and focus on getting people to the Forests in other ways.

Examples of recent decisions to address parking capacity at some sites include, at Oak Creek, installing a webcam that visitors can monitor for parking space availability, patching potholes, adding a turn-around area, painting lines for parking spaces, and installing signs to clarify appropriate parking locations. Improvements at Lewisburg Saddle include adding a new parking area connected to the main trailhead via the Sidesaddle Trail, adding 'striping' (painting lines for parking spaces) to the existing Lewisburg Saddle parking area to indicate where people should park, and designating a parking spot for people with disabilities near the gate. Managers are also increasing efforts to encourage visitors to carpool and take alternate transportation to the higher-use sites.

Managers should integrate their current parking philosophy and management plans into the visitor use management plan. This includes considering the need to outline a process for determining when parking conditions (e.g., perceptions of crowding, safety, access) are unacceptable and when actions are needed. Ultimately, whether crowding is a major issue of concern that requires management actions at the Forest is something that should be clarified and

developed in the management plan. Overall, crowding along the roads and trails at the Forests does not appear to be a major issue at the Forests currently. However, crowding may be an issue in the future, especially in terms of the number of vehicles at trailheads (or, vehicle/parking capacity in general). This report provides baseline data that can be used to track the number of vehicles seen at trailheads and the number of people seen at trailheads, on trails, and on roads in the Forests. This data can be used to inform monitoring and management strategies.

Expanding the Forests' stewardship and volunteer program

Another important aspect to integrate into the visitor use management plan could consider further development of the Forests' stewardship and volunteer program. Developing a stewardship program could take many different directions. The main goal would be to get as many visitors as possible to be involved to some degree as a steward. There could be different levels of stewardship. For example, a basic level could include a short orientation or training (or resources available online, videos, readings, etc.) about issues affecting recreation at the Forests, then asking visitors to confirm that they read etiquette rules and make a public commitment to follow etiquette rules. A more engaged level could include asking volunteer stewards to spend time at trailheads to have discussions about proper etiquette with visitors before they enter the Forests for recreation. Volunteers could also host demonstrations sessions about proper etiquette when passing other visitors depending on one's mode of transportation, which has been done in the past on the Forests. The stewardship process could also include a commitment activity where the visitors pledge or commit to a particular form of etiquette on the Forests.

The emphasis here is thinking of different ways to 1) instill ownership of Forest conditions in visitors and 2) encourage visitors to publicly make a commitment to other visitors that they will follow etiquette rules. Indeed, commitments and pledges are overall effective in encouraging pro-social and -environmental behaviors (Lokhorst et al., 2013; Widner & Roggenbuck, 2000). Developing a strong stewardship program requires significant time and resources. The Forests currently have a coordinator responsible for volunteer management. However, we recommend expanding the volunteer and stewardship program by developing a 'Friends of the Forests' group or program and hiring a volunteer coordinator or intern to manage the stewardship and volunteer program and oversee the development of a Friends program.

Many parks and protected areas have Friends groups who help with management of the area in many ways. Indeed, using these types of groups for collaborative management is increasingly common and recommended in protected areas across the world (Arni & Khairil, 2013). There are a lot of different possible structures and roles for these types of groups, and Forest managers and FRAC members should decide how a Friends group for the OSU Research Forests could be best organized and utilized. Friends groups often serve as a liaison between managers, visitors, and other stakeholders in an advisory (i.e., non-decision making) role. One major benefit is that they could take some of the pressure off managers by providing the resources and people to accomplish many of the tasks facing managers and recommended here, while enhancing the collaborative nature of the Forests' management. The group could take the lead in harnessing and enhancing volunteer and stewardship potential among Forest visitors, adjacent landowners, and other stakeholders. It could also closely engage with university students and professors regarding volunteerism and other aspects of Forest management and public engagement. This group could lead the way in getting volunteers to help with communication and visitor behavior issues, like contacting visitors *onsite* and in other ways to discuss appropriate behavior at the Forests.

Developing a Friends group will require significant effort. We recommend working with a consultant, hiring a temporary employee or intern, and/or designing a graduate student project/thesis to investigate different options for a Friends group, offer recommendations for how the Forest should proceed, and help implement a Friends program at the managers' discretion. Specifically, we recommend conducting case studies of existing Friends groups to understand options and effectiveness of different structures, roles, ways to engage with and inform managers, how to increase and maintain participation and leadership in a Friends group, how to communicate with and attract members, how to fund the group, and to offer suggestions for being adaptive to changing conditions and addressing many different types of issues concurrently. The effort devoted to developing such a group may take a couple of years, but it will have long term implications by alleviating pressure from managers and providing a formal and ongoing effort to collaboratively manage recreation on the Forests.

Communications Plan

The other main issue revealed in the questionnaire results relates to the Forests' communication strategy. As noted above, many potential solutions to issues at the Forests involve careful communication strategies. These strategies should be formalized in an official communications plan for the Forests. That plan should be integrated into and informed by the visitor use management plan and could be developed in parallel efforts.

Developing and maintaining an effective Forest communication program should be a priority on the Forest, especially as many of the potential issues of concern revolve around communication issues (or solutions). Hiring a temporary full-time communications coordinator to evaluate the current communication program on the Forest and develop a formal communications plan using some of the findings and recommendations discussed here may be needed. This position could be in the form of an AmeriCorps position, a student volunteer, masters student, or a regularly paid position. Longer term solutions (i.e., full-time hire) to managing Forest communications, especially around recreation issues, should be strongly considered.

Many of the issues that emerged in the questionnaire results related to the Forests' communication program are currently being addressed. Respondents had many comments about the brochure needing to be updated, especially the map in the brochure. Managers recently updated the brochure and maps(s) for the Forests and are currently working on an ESRI interactive web map with locations of harvest activities. This system could also be useful for route planning and navigation, especially since improving the directional signs along Forest roads and trails also emerged in the questionnaire results as an issue with room for improvement and was supported by more than half of the questionnaire respondents. Numerous open-ended comments also centered around improving the Forest website. These comments generally preferred a more user-friendly site with more information about the local ecology and natural history of the area, trails, maps, research, logging and harvest activities, and other Forest activities or happenings (e.g., special events). The Forests' website is also set for an update soon. An OSU student is currently undertaking a review of signage and related communication techniques on the Forests and those findings will help inform a formal communications plan.

Communication strategies on the Forests

Communicating information with visitors to recreation areas is challenging because visitors get their information from a variety of sources and are often not actively seeking information. Most Forest visitors prefer to get information from trailhead kiosks at the Forests and most found the information at kiosks and in the brochure useful or helpful. However, most visitors did not look at the kiosks on the day they were surveyed, so looking at the kiosks is likely not a regular occurrence for many repeat visitors.

Visitor attention to kiosk information and information retention vary widely across natural and social settings (Cole et al., 1996; Hall et al., 2010). In terms of accessing kiosk information, managers should consider ways to encourage more visitors to look at the kiosks through attention-getting tactics or directing them to kiosks through choke points (i.e., they have to pass in front of a kiosk to get to a trail). In terms of content, messages on kiosks should be direct, clear, and limited in number. Too much information (i.e., more than 5 different messages) is likely to result in lower comprehension. Again, message development should consider taking a normative approach that uses injunctive norms to highlight expected behavior.

At a recent event in Corvallis, Dr. Troy Hall (a communications expert and Professor and Department Head in the OSU College of Forestry) discussed several challenges to effectively communicate messages across visitors and tips to increase success. Presentations from that event can be viewed here. We summarize her points here to encourage their consideration in future communications plan efforts. Dr. Hall identified the key challenges to getting messages across as failure to capture attention (distractions that take focus away from signs/kiosks/message, poor design, and that many people feel that the information does not apply to them), failure to hold attention (e.g., poor design, topics are not of interest or do not seem relevant to visitors), and failure to convince visitors that an issue is of concern or that behavior change is necessary. She also offered the following tips to increase communication effectiveness:

1) Deliver messages at the right place and time
    a. Need to get some messages to people before they get to the site
    b. Place messages about problem behaviors near where those behaviors occur
2) Capitalize on novelty (carefully, could give the wrong idea)
3) Make messages vivid
4) Be specific about the appropriate/desired behavior
5) Be brief, don't include too many messages or words
6) Say it visually

7) Connect to your audience's values
8) Find a compelling argument
9) Use emotion (e.g., fear, humor, sadness) carefully
10) Monitor and evaluate

Dr. Hall also explained that effective communication comes down to identifying key messages, analyzing audiences and settings, using designs, visuals and text to capture attention, using compelling arguments, assessing the effectiveness of different approaches, and adapting accordingly. Sign fatigue is also a problem, where people become familiar with signs in the same location and ignore the signs during future visits even if the information has changes. Mixing up the sign locations, designs, and messages will help get people into the habit of reading signs for new information. Dr. Hall also recommends using actual photos on signs, such as the three-way yield signs that could use actual pictures of hikers, bikers, and horseback riders, instead of drawings. Actual photos are more likely to stick in the minds of visitors and resonate with them when they encounter situations referenced in signs. Lastly, messages about maintaining the conditions of the resource and access to it are often effective in influencing visitor behavior. Most visitors care about the Forest's ecological conditions and access to the Forest, so framing messages around those key points could help increase the effectiveness of communicating about issues like leaving dog waste behind. Other potential ecological issues include erosion on trails, impacts to research sites, damage to cultural resources, and impacts to aquatics and native prairies.

Another key to communicating with visitors is to use a wide variety of sources, outlets, media, people, and strategies to communicate with visitors and stakeholder groups. Visitors get information from many sources. They prefer to get information about the Forests from trailhead kiosks, trail signs, the Forests' website, and email. *Household* respondents also seem to appreciate getting updates in the mail about the logging operation schedules being mailed to their house when a logging operation is scheduled adjacent to their property boundary. Using a variety of sources to communicate with visitors (trail kiosks, QR codes on kiosks and signs along the trails and roads, the Forests' website, email, social media, and newsletters) is an important aspect to develop further in a formal Forests' communications plan. Finding ways to increasing readership of newsletters is also important, such as through Facebook 'boosts' (which have been successful in the past for Forest managers) and targeting different groups with relevant information.

Many Forest visitors (82% of *onsite* respondents and 47% of *household* respondents) do not get updates about the Forests. This is problematic for relying on updates to communicate important information about the Forests. Indeed, goals to improve perceptions of the effectiveness of the Forests' informational program should include efforts to increase the number of people who receive updates about the Forests. A communications plan for the Forests should also include ways to encourage visitors to sign-up for updates (e.g., the newsletter) and monitor readership trends (e.g., who is getting updates, are they being read, and are updates having an impact on visitor awareness of issues and visitor behavior?). Forest managers could place notices at trailheads or along the trails inviting visitors to sign up for updates about the Forest. They should also work with key stakeholder representatives to get the word out through as many channels and people as possible. A more formal campaign to increase the number of visitors who get updates about the Forests should be an integral component of an updated communications plan for the Forests.

Content suggestions for a formal communications plan for the Forests

Ultimately, the content and organization of a communications plan is up to the managers to determine what works best for them. Integrating it with the visitor use management plan will help identify priorities and issues to include in the communications plan. Issues discussed earlier in this report, including developing normative and other messages aimed at influencing visitor behavior, continuing to develop messages about alternative transportation options and avoiding peak use times at busier sites, and identifying and implementing strategies to increase the number of people who get Forest updates in different formats, should be included to some degree in a formal communications plan. Here, we briefly discuss other ideas for inclusion in the communications plan.

Visitors are looking for more information about the Forests, particularly about management decisions, research on the Forests, recreation programs or events, goals and missions of the Forests, and ecological or natural history type of information. These are the types of topics and information that should be included in regular updates or newsletters about the Forests, in addition to other issues that affect Forest access like logging/harvest or special events. The communications plan will clarify content and delivery methods related to information about the Forests.

Given the history and importance of research on the Forests, communicating about research projects taking place there seems particularly relevant, especially given the interest expressed among questionnaire respondents to learn more about that aspect of the Forests. Efforts to increase awareness of research projects on the Forests could include a combination of continuing to highlight past, present, and future research projects on the Forests and key findings through report summaries and videos shared through newsletters, the website, or social media. Another option is to have signs placed along the trails near areas where research projects either have or are being conducted or areas where research on the Forests would apply (since researchers may not want to alert the public of their specific study sites while a study is ongoing). Signs could give information about the research (e.g., what is the study, why is it being conducted, how will the findings be used) and could include web links or QR codes to more information. Requiring or requesting presentations by researchers at the Forests, at OSU, or in Corvallis would also be a good way to directly connect researchers to other Forest users. This could be done throughout the year based on different research topics or through larger events like a research symposium. Managers could also consider organizing field trips with researchers and the public to talk about the research projects happening at the Forests. These trips could include discussions about other Forest issues and users, which would give attendees a better idea of bigger picture issues and multi-use management on the Forests.

Lastly, another issue related to communication that is noteworthy from the questionnaire findings is that 54% of *household* respondents observed noise related to Forest operations and 17% considered it a problem. This likely refers to timber hauling, since only a small portion of neighbors are within hearing range of actual harvest operations. Managers should continue to monitor adjacent *household* perspectives about Forest noise and develop clear standards or guidelines for when tolerance for noise has been exceeded and when action should be taken to mitigate the perceptions of noise problems among landowners. Addressing concerns about noise could also be accomplished through more frequent communication with landowners about when and where to expect logging operations and hauling. Managers currently send letters to each affected landowner in advance. They may consider earlier notifications, additional follow-up letters reminding landowners of operations plans and potential noises, as well as updates on the projects in their area. Reaching out to landowners through other media, such as via email, on the website, at trailheads/kiosks, and perhaps through automated telephone messaging (texts or

voicemail – if feasible), is also a suggestion. Plans for communicating with adjacent landowners about noise from Forest operations should be clarified and integrated into the Forests' visitor use management plan and the communications plan. This also means defining an acceptable level or portion of adjacent landowners who are unsatisfied with noise, because it is unlikely that noise levels will ever be acceptable to every single adjacent landowner.

OSU and other area universities have communication experts that could be engaged in these processes to develop a communications plan. Furthermore, the Forests could help coordinate key representatives of the different user groups (e.g., FRAC members) to pair up with the professors/classes to help design communication techniques towards different user groups. The Forests are an excellent setting for testing different communication techniques using experiments to see which messages work better for affecting visitor behavior (e.g., use different messages at different trailheads and then use observations or questionnaires to track and record any pre/post message changes in behavior/conflict or perceptions of conflict). As with any other planning processes, incorporating a formal monitoring process of any planning decision and management actions are necessary to evaluate the effectiveness of decisions and make any necessary adjustments to align Forest conditions (e.g., recreation experiences, vegetation and water quality, and timber productivity) with defined management goals.

Summary: Recommendations to develop comprehensive visitor use management and communications plans

- Prioritization of these recommendations should be at the discretion of Forest managers and could include input from FRAC members.
- We attempted to discuss any management changes in the context of pertinent findings that occurred after data was collected as of the completion date of this report. However, conditions and management direction will continue to change, and managers should use their discretion to interpret how the study findings and our recommendations apply in the context of those changes.
- Use the recently developed Interagency Visitor Use Management Framework to create a comprehensive management plan for the Forests. The plan should integrate and expand on current management guidelines and social science data (i.e., results in this report and

from previous focus groups) to set specific goals, define acceptable and future conditions, and identify appropriate management actions and implementation strategies.

- The visitor use management plan for the Forests should also pay particular attention to addressing visitor behavior, vehicle capacity and perceptions of crowding at trailheads, and expanding the volunteer and stewardship program.
- More specifically, for visitor behavior issues (especially regarding trail etiquette, controlling dogs off leash, and managing dog waste), the following recommendations could be considered and developed more carefully in a visitor use management plan:
    - Explore zoning and enforcement options with stakeholders and visitors to reduce conflict between recreation users.
    - Develop, implement, monitor, and adapt different communication and outreach techniques for influencing visitor behavior.
        - Use normative influences and messages to set the expectations and for proper behavior and obtain commitments from visitors to uphold these expectations.
        - Use diverse communication strategies, messages, and outlets including making short videos and targeting written messages to different activities and groups.
        - Consider hosting events like a 'Visitor Safety Day' and developing a 'welcome packet' as a mechanism to provide additional communication opportunities.
- In relation to vehicle capacity and perceptions of crowding at parking areas:
    - Include capacity issues in a comprehensive visitor use management plan (and monitoring plan) and set specific goals and acceptable levels of crowding or capacity at different Forest locations.
    - Incorporate the recently developed 'Parking Philosophy' into the management plan to clarify management and monitoring strategies related to parking and perceptions of crowding at the Forest.
- In relation to enhancing Forest stewardship and volunteer capacity:
    - Continue to develop the Forests' stewardship and volunteer program, specifically with aims to foster a sense of ownership of issues among more visitors, increase

volunteer involvement in monitoring, informing, and influencing visitor behavior, and to enhance communication opportunities.

  - Develop a Friends group to expand the collaborative potential of the Forests and provide management support without creating more work for managers. Conduct a formal assessment or graduate student project/thesis to consider different approaches to developing, structuring, and maintaining a Friends group and considering how their input would be included in management strategies.
  - Hire a volunteer coordinator for the Forests to continue developing the volunteer and stewardship capacity of the Forests.

- Develop a formal communications plan for the Forests that defines specific communication and outreach goals, messages, and strategies to increase communication effectiveness with visitors and other stakeholders and address issues of concern like visitor behavior, conflict, alternative transportation, and parking lot capacity.
  - The communications plan should be integrated with the visitor use management plan to set priorities and strategies.
  - Improve directional signage and maps/kiosks around the Forest and add 'you are here' indicators on signs or kiosks at main parking areas and/or trail intersections.
  - Determine tactics to encourage or direct visitors look at the kiosks through attention-getting strategies or directing them to kiosks through choke points (i.e., they must pass in front of a kiosk to get to a trail).
  - In terms of content, messages on kiosks should be direct, clear, and limited in number.
  - Message development should include normative approaches to highlight expected visitor behavior.
  - Use a variety of sources, outlets, media, people, and strategies to communicate with visitors and key stakeholder groups, especially trailhead kiosks (including QR codes), trail signs, social media, the Forests' website, and email.
  - Boost messages through advertising techniques (e.g., Facebook boosts) and targeting specific user and stakeholder groups for message content and delivery.
  - For effective communication, identify key messages, analyze audience and settings, use designs, visuals and text to capture attention, use compelling

arguments, and asses the effectiveness of different approaches and adapt accordingly. Also mix up sign locations, designs, and messages and use real photos to communicate expected behaviors.

- Explore and implement ways to encourage more visitors to sign up for Forest updates.
- Provide more information about the Forests to visitors, particularly about management decisions, research on the Forests, recreation programs or events, goals and missions of the Forests, and ecological or natural history information.
- Continue current communication strategies with Forest-adjacent landowners regarding harvest and relate noise issues.
- Monitor the effectiveness of communication strategies and outlets, including ongoing changes to the Forest brochure, the Forest website, Forest maps, and other outlets.

Develop and implement monitoring plans

We have made several references in this report to the importance of monitoring social and environmental conditions at the Forests. Recreation visitation at the Forests is likely to continue increasing, making it even more important to continue documenting and monitoring conditions there. Monitoring also presents another opportunity to engage volunteers in the management process and specifically in the capacity of citizen science at the Forests. Visitors and other stakeholders are interested in how decisions are made and getting them involved in data collection for monitoring that helps inform those decisions is a great opportunity to harness their energy and resources and collaboratively inform management with scientific data. Student participation in these efforts, through long term involvement with instructors, also presents a great opportunity for managers.

Ideally, a formal monitoring program will be developed within the visitor use management and communication plans described above. The program will include details about which aspects to monitor, how and when to monitor them, and how monitoring data should be analyzed and used to help inform management decisions. Here, we offer some initial suggestions based on the questionnaire data reported here regarding aspects of recreation on the Forests to consider monitoring.

An important part of the monitoring process is deciding specifically what to monitor on the Forests. Much of the scholastic material on monitoring recreation impacts revolves around using indicators and standards. Indicators are tangible elements or aspects of an issue that can be routinely monitored to help managers assess the current conditions related to that issue. Standards are levels of that indicator that alert managers when an unacceptable level of the indicator has been reached, signaling that management action is required. Again, selecting these indicators and the standards should be an integral part of the management plan development process where managers, FRAC members, and perhaps other stakeholders collaboratively work together to determine acceptable conditions and which indicators and standards to use to monitor those conditions.

Table 93. Characteristics of good indicators (from Manning, 2010)

Characteristic	Description
Specific	Define specific rather than general conditions. For example, the number of groups encountered at a parking lot rather than 'crowding'
Objective	Measure in absolute, unequivocal terms. Variables that are subjective, expressed in relative terms or subject to interpretation make poor indicators. For example, the number of people at one time at a trailhead rather than percent of visitors who feel crowded at a trailhead (subjective).
Reliable and repeatable	Measurement yields similar results under similar conditions. Use clear instructions and guidelines for measurements so different people can collect data over time in a similar manner.
Related to visitor use	Indicators should relate to some aspect of visitor use, such as level of use, type of use, location of use, or behavior of visitors. This allows managers to identify correlations between impacts and visitor use and help inform visitor use management.
Sensitive	Indicators should be sensitive to visitor use over a relatively short period of time. As the level or type of use changes, an indicator should respond in roughly the same proportional degree. If an indicator changes only after impacts are substantial, it will not serve as an early warning mechanism, or allow managers to react in a timely manner.
Manageable	Indicators should be responsive to, and help determine the effectiveness of, management actions. The underlying rationale of indicators is they should be maintained within prescribed standards of quality – this implies that they should be manageable.
Efficient and effective to monitor	Indicators should be monitored on a regular basis. Therefore, the more expertise, time, equipment, and staff needed to take such measurements, the less desirable a potential indicator may be.
Significant	Perhaps the most important characteristic of indicators is that they help define the quality of the visitor experience. This is inherent in the term "indicator." It does little good to monitor the condition of a variable that is unimportant in defining the quality of the visitor experience.

Selecting indicator variables to monitor and identifying acceptable levels or standards of those variables should be part of a more extensive monitoring plan developed in the process of developing a comprehensive visitor use management plan. Here, were offer some initial considerations. Tables 93 (above) and 94 (below) show general guidelines for the characteristics of good indicators and standards, respectively. Again, indicators are characteristics of specific issues or phenomena that can be measured and monitored regularly to assess the condition and trends of that issue or phenomena. Standards are set in a management plan based on site-specific goals and objectives within a larger management framework and are levels of the different indicators used to signal when an issue or phenomenon is at an unacceptable level or scale requiring management action.

Table 94. Characteristics of good standards of quality (from Manning, 2010)

Characteristic	Description
Quantitative	Indicators are specific and measurable variables, thus standards can and should be expressed in an unequivocal way. For example, if an indicator is the number of encounters with groups per day on the river, then the standard might be an average of no more than three encounters with other groups per day on the river.
Time- or space-bound	Incorporating a time- or space-bounded element into a standard of quality expresses both how much of an impact is acceptable and how often or when such impacts can occur. It is often particularly desirable for standards to include a time period; this is especially relevant for crowding related issues. For instance, the standard for encounters with other group son the river was expressed in terms of per day.
Expressed as a probability	It will often be advantageous to include in the standard a tolerance for some percentage of the time that a particular condition will be unacceptable; in other words, the standard will include a probability that conditions will be at standard or better. For example, no more than three encounters with other groups per day along trails for 80% of days in the summer use season. Incorporating a tolerance for peak use days, holiday weekends, or other days of high visitation may be wise as well. The amount of tolerance depends on the unpredictability of each individual situation and the degree to which management can consistently control conditions.
Impact-oriented	Standards should focus directly on the impacts that affect the quality of the visitor experience (or environmental impact), not the management action used to keep impacts from violating the standards. For example, no more than 10 encounters with other groups on the river per day focuses on the impacts that affects the quality of visitor experience (encounters), but a standard of 'a maximum of 20 groups per day floating the river' is not as good a standard because it does not focus as directly on the impact of concern – visitors experience encounters with other groups more directly than they experience total use levels. Basing standards on management techniques rather than on impacts can also limit the potential range of useful management practices.
Realistic	Standards that limit impacts to extremely low levels may set up unrealistic expectations in the minds of visitors, may be politically infeasible, and may unfairly restrict visitor use to very low levels.

Table 95 offers some initial examples of indicators to monitor, relevant standards, and potential management actions. This type of table should be included and developed more thoroughly in a visitor use management plan and/or a formal separate monitoring plan based on management priorities. Setting these indicators and standards should be informed by current management objectives/goals (e.g., including the need to ensure positive visitor experiences and safety as well as associated resource impacts like vegetation damage and erosion caused by illegal parking). Similarly, the frequency of monitoring for different issues and indicators depends on many factors (e.g., the extent of the problem and when or how often it is likely to occur, the resources available for monitoring, and the ability to react or respond to changes observed during monitoring) and should be decided and included in a formal monitoring plan. The following are some additional considerations related to Table 95:

- Vehicle capacity at different parking areas
    - How often and when are the different parking areas full or near capacity?
    - To what extent do visitors perceive crowding at trailheads and parking areas based on the number of vehicles?
- Visitor behavior
    - When and where on the Forests are problem behaviors (e.g., passing other visitors without verbal warning, mountain bikers riding too fast, uncontrolled off leash dogs, or dog waste) occurring the most or most likely to occur? This type of information can come from observations or from mapping workshops or focus groups with stakeholders.
    - Visitor perceptions of these issues– continue monitoring through survey efforts when needed and as feasible.
- Communication effectiveness
    - Where on the Forests are visitors more likely to look at signs and kiosk information? Are they retaining information? Is it having an impact on visitor behavior? Which types of messages (content and format) are more successful at getting visitor attention and affecting behavior change? Pre-post tests are one option in addition to observations, focus groups, and other survey options.
    - How many visitors receive and read updates? Continue getting evaluations from visitors about updates and effectiveness.

- Ecological impacts associated with recreation
    - The questionnaire results do not indicate that ecological impacts from recreation on the Forest are a major issue from visitor perspectives. However, developing a program to record baseline data and monitor ecological conditions is recommended to the extent possible because these issues are of interest to managers.
    - Consider monitoring common recreation impacts, such as from dogs (e.g., off leash dogs chasing wildlife, affecting water quality, spreading invasive species, or causing stream bank erosion) or mountain bikes and horses (e.g., impacts to soil erosion or water quality from heavy braking, vegetation trampling, travelling on loose surfaces, or horse waste).
    - Monitor the presence and extent of social or user-created trails.
    - Showing locations on a maps of problem areas and having data to support calling the issue a problem can be helpful in communication techniques.
- Visitor perception and experience surveys
    - We recommend future monitoring efforts include visitor surveys every 5-10 years (or when resources are available, and/or a specific need arises) to continue tracking trends in visitor experiences and attitudes about management.

Table 95. Examples of key issue to monitor at the Forests

Issue	Indicator	Example standard	Sites to monitor	Potential management actions
Vehicle capacity at different parking areas				
Perceptions of crowding in terms of vehicles at parking lots	% visitors who feel crowded in terms of vehicles at parking lots during peak use days	No more than 50% of visitors feel crowded…	Lewisburg Saddle and Oak Creek	-communication strategies to reduce or disperse use and/or change expectations for conditions
Visitor behavior issues				
Mountain bikers riding too fast	e.g., number of events reported or observed along a certain distance of trail	e.g., no more than 5 events reported for a given trail on a weekend during peak use	e.g, the first two miles of Dan's Trail	-communication strategies to enhance visitor behavior

Mountain bikers failing to give warning upon approach	% of mountain bikers observed giving warning upon approach	no more than 20% of bikers failing to give warning during 3-hr observation sessions	e.g., the first three miles of Dan's Trail	-communication -demonstrations -distribute alert bells
People with dogs off leash not under vocal control	The number of dogs not under vocal control when visitors are contacted and asked for control demonstration	No more than 20% of visitors with off leash dogs have dogs not under vocal control within 2 miles of trailhead	Peavy	-communication -zoning for off leash or on-leash only areas
People with dogs failing to give warning upon approach	Number of observed people with dogs failing to give warning upon approach	No more than 2 observations of people with dogs failing to give warning within 2 miles of trailhead	Dan's Trail	-communication -demonstrations -zoning
The amount of dog waste seen	The number of dog waste incidences seen within 10 feet of the trail	No more than 2 incidences of dog waste per mile of trail	Peavy, Lewisburg Saddle, Gate 400	-Dog waste awareness days -communication -zoning -add waste bags and bins
Communication effectiveness				
Low attention and retention rate of visitors looking at kiosks	% of visitors who look at trailhead kiosks The time spent looking at trailhead kiosks % correct answers on 'quiz' about Forest events, decisions, research, rules etc (or pre-test post-test)	At least 50% of visitors not looking at trailhead kiosk Visitors spend an average of less than 5 seconds looking at trailhead kiosks Visitors get at least 50% of questions wrong on a quiz about etiquette from info on kiosk	Varies – consider Oak Creek, Lewisburg Saddle, and Dan's Trail	-add choke points to direct people to kiosks -update information regularly -simplify messages and content
Receiving updates about the Forests	The number of clicks and/or opens for regular newsletter	At least 100 clicks and/or opens for each newsletter	n/a	-use Facebook boosts -reach out to stakeholder groups and reps

	The number of people signed up for updates	At least 500 people signed up for updates	-use *onsite* campaign to increase sign-ups

Summary: Recommendations for monitoring

- Develop a formal monitoring plan integrated into a comprehensive visitor use management plan and a communications plan for the Forests.
- Decisions about monitoring (e.g., which aspects to monitor, how often to monitor, indicators to monitor, standards of quality to indicate the need for action, and potential management actions related to each issue or aspect) depend on goals, priorities and desired conditions developed in a formal planning process.
- Initial considerations for monitoring may focus on issues of priority noted in this report:
    - Vehicle capacity at different parking areas
    - Visitor behavior (e.g., giving verbal warning upon approach)
    - Communication effectiveness on visitor knowledge and behavior
- Volunteers, OSU faculty/classes, and other stakeholders could be engaged in the monitoring process to encourage the role of citizen science on the Forests.

Conclusion

This report presented and discussed the findings of a 2017 survey of Forest visitors and Forest-adjacent *household*s. Overall, the findings indicate that OSU Research Forest managers are continuing to provide a wide range of high-quality recreational experiences on the Forests. Visitors appreciate the Forests' resources and recreation access and they are overall highly satisfied with their experiences there. Issues related to visitor behavior, the Forests' communication program, and vehicle capacity at parking areas are important for managers to continue monitoring. We recommend that managers develop and implement a comprehensive visitor use management plan, communications plan, and an associated monitoring program to define, clarify, and evaluate management goals and objectives and current and desired future conditions. Finally, managers may want to pursue similar survey efforts with the underrepresented groups through more targeted surveys (e.g., emailing an online version of the questionnaire to registered hunters or to equestrian groups and users) or focus groups with people known to have stopped recreating at the Forests or who have significantly altered their recreation patters there for reasons that could be of interest to managers.

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