Recreation Use and Human Valuation on the Nature Reserve of Orange County, California

Appendices

Recreation Ecology Lab *at USU*

October 2019

Recreation Use on the Nature Reserve of Orange County Project Report – Appendices

Located within these appendices are additional analyses related to data collected in 2017 and 2018 sampling seasons that may be of interest to managers and stakeholders, but that were beyond the scope of the 2017-2018 project report document. The appendices are broken into the following component sections:

Appendix A: Visitor Use Estimation – this appendix contains parking lot turnover and visitor use counts derived from automated trail counters. Results are broken up by Reserve unit.

Appendix B: Additional Visitor GPS-Based Tracking and Survey Results – this appendix contains exhaustive survey analyses and GPS tracking data not presented in the report document.

Appendix C: Additional Resource Impact Analyses – this appendix presents several additional analyses related specifically to remote sensing and soil exposure analysis.

Appendix D: Additional Visitor Use Patterns and Sensitive Resources Methods, Flowcharts, and Results – this appendix presents additional detail regarding methods, specifically flowcharts describing data analysis, and results pertaining to the visitor use patterns and sensitive resources section of the project report.

Appendix E: Visitor Survey Instruments – this appendix provides copies of the visitor survey instruments used in 2017 and 2018 respectively.

Appendix A – Visitor Use Estimation

To better understand how many visitors are using each Reserve site for recreation, automatic trail counters were installed on the main trail accessed by each Reserve unit access point (sampling location) every day the Reserve unit was sampled (Table A.1). In 2017, counters were installed and removed daily, and in 2018 counters were installed for the duration of the sampling period at each site (4-5 days). Counters were also manually calibrated by research technicians during the study period to determine the level of error. This level of error was used to generate a "correction factor" for each counter, listed in Table A.1 for both 2017 and 2018 sampling seasons.

Table A.1. *Counter locations, frequencies and correction factors for 2017 and 2018 sampling seasons*.

Counter Location	Average Frequency Away from Trailhead	Average Frequency Toward Trailhead	Correction Factor
2017			
ALWO	38%	62%	1.56
BLST*	20%	80%	--
BOCA	51%	49%	1.33
IROS*	26%	74%	--
MORO	51%	49%	1.44
PECA	26%	74%	1.13
RIPA	33%	67%	0.94
TOWO	53%	47%	1.52
WHRA-Glenn Ranch Rd.*	64%	31%	1.56
WHRA-Borrego Canyon*	33%	67%	3.06
WHRA-Serrano Creek	50%	50%	1.87
WILL-1	67%	33%	1.19
WILL-2	44%	56%	1.80
2018			
ALWO/TOWO-Moulten Meadows	52%	48%	0.92
ALWO/TOWO-Wood Canyon Trl	56%	44%	1.36
ALWO/TOWO-Alta Laguna	50%	50%	0.81
ALWO/TOWO-West Ridge	40%	60%	3.87
PECA-Canyon View x Jamboree	66%	34%	1.31
PECA-Reservoir Rd	68%	32%	1.15
PECA-Mtn to Sea South	44%	56%	0.91
PECA-Lakeview Trail	34%	66%	1.18
RIPA/MORO-Bommer Ridge Trl	45%	55%	1.27
RIPA/MORO-Pacific Ridge Trl	43%	57%	1.27
RIPA/MORO-No Dogs Trl	40%	60%	1.10
RIPA/MORO-Moro Canyon Trl	55%	45%	1.27
WHRA-Serrano Creek	67%	33%	1.48
WHRA-Borrego Canyon	32%	68%	1.35
WHRA-Concourse Park	35%	65%	1.45
WHRA-Glenn Ranch Rd.	25%	75%	1.12

Parking lot turnover was also assessed in 2017 to better gauge vehicular traffic to the parks as well as visitor parking patterns (i.e. were visitors parked in designated – fee required – parking lots, or other "undesignated" areas adjacent to Reserve units). Parking lot turnover was not assessed in 2018 so that researchers could focus on visitor survey and GPS-based tracking efforts.

2017

Parking lot turnover

Hourly average counts of visitor use of designated versus unattended (undesignated) parking areas revealed several locations where rates of unattended parking were higher than use of designated parking (Table A.2, figures A.1 – A.15). These locations include Black Star Canyon and Ridge Park, both of which do not have formally designated parking areas to access the trailhead. Other locations, like Top of the World, saw high levels of use of both designated and unattended parking, particularly on weekend days.

Table A.2. *Summary of average weekday and weekend designated and unattended parking counts across all Reserve units studied.*

Location	Average Hourly Count Weekday	Average Hourly Count Weekend	Average Hourly Count Total
Aliso & Wood Canyon			
Average (± SD) (Designated)	12 (± 8)	36 (± 17)	20 (±16)
Average (± SD) (Unattended)	13 (± 5)	18 (±3)	15 (±5)
Black Star Canyon			
Average (± SD) (Designated)	NA	0	0
Average (± SD) (Unattended)	NA	83 (± 41)	83 (± 41)
Bommer Canyon			
Average (± SD) (Designated)	7 (± 3)	10 (± 4)	8 (± 4)
Average (± SD) (Unattended)	0	0	0
Moro Backcountry			
Average (± SD) (Designated)	20 (± 15)	29 (±13)	23 (± 15)
Average (± SD) (Unattended)	0	0	0
Nix Nature Center			
Average (± SD) (Designated)	21 (± 9)	NA	21 (±9)
Average (± SD) (Unattended)	2 (± 1)	NA	2 (± 1)
Peter's Canyon			
Average (± SD) (Designated)	27 (± 15)	38 (± 24)	30 (± 19)
Average (± SD) (Unattended)	0	2 (± 3)	1 (± 2)
Ridge Park			
Average (± SD) (Designated)	0	19 (± 15)	6 (± 12)
Average (± SD) (Unattended)	62 (± 55)	84 (± 44)	68 (± 53)

Top of the World			
Average (± SD) (Designated)	18 (± 8)	38 (±11)	25 (± 13)
Average (± SD) (Unattended)	10 (± 4)	30 (± 16)	17 (± 13)
Whiting Ranch			
Average (± SD) (Designated)	10 (± 4)	9 (± 6)	10 (± 5)
Average (± SD) (Unattended)	0	0	0
Whiting Ranch (G)			
Average (± SD) (Designated)	2 (± 1)	NA	2 (± 1)
Average (± SD) (Unattended)	0	NA	0
Whiting Ranch (M)			
Average (± SD) (Designated)	9 (± 4)	22 (± 5)	15 (± 7)
Average (± SD) (Unattended)	0	0	0
Willow			
Average (± SD) (Designated)	9 (± 4)	27 (± 15)	15 (± 12)
Average (± SD) (Unattended)	0	0	0

Figures note: Figures for unattended parking were only generated for locations with higher numbers of unattended parking.
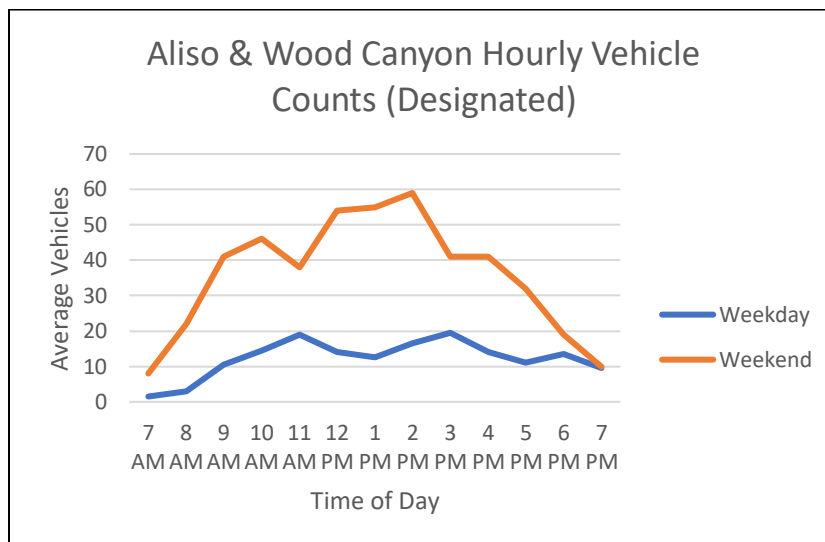
Figure A.1. *Average parking lot turnover (designated parking lot) for Aliso and Wood Canyon Wilderness Park.*
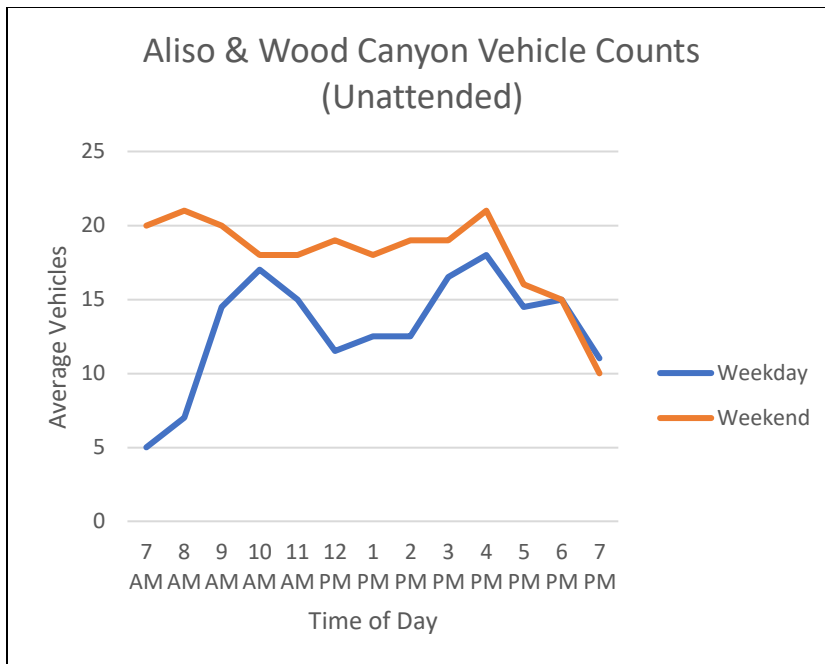
Figure A.2. *Average parking lot turnover (unattended parking) for Aliso and Wood Canyon Wilderness Park.*
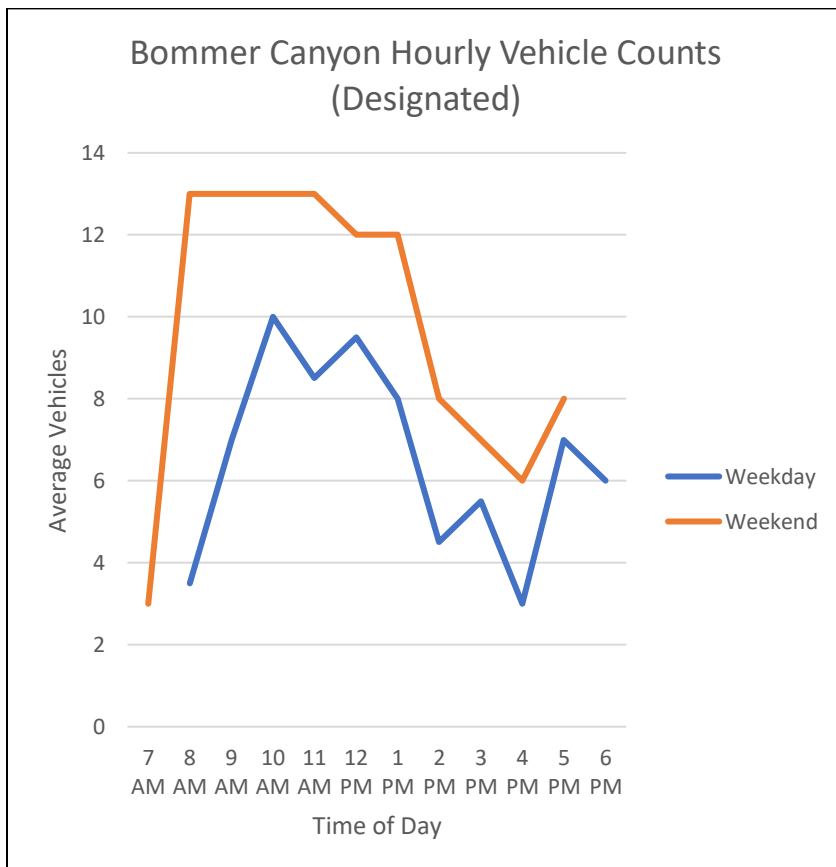
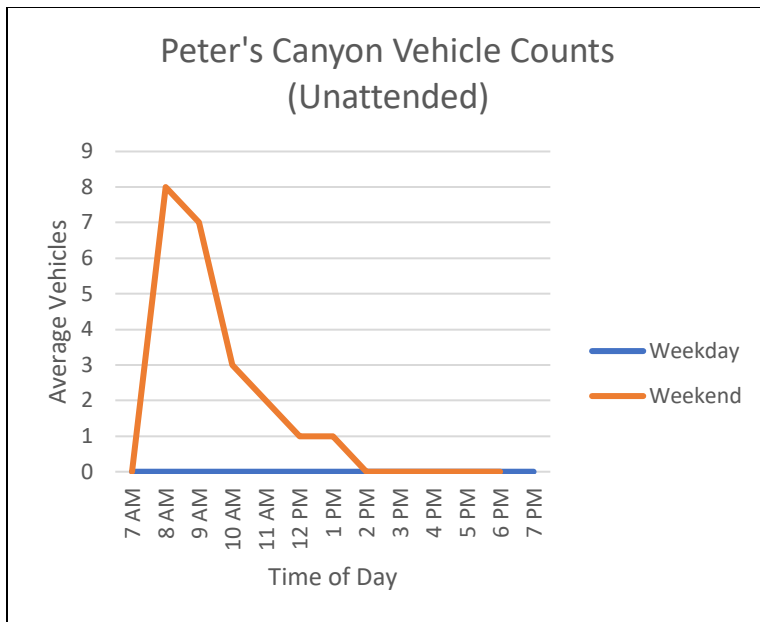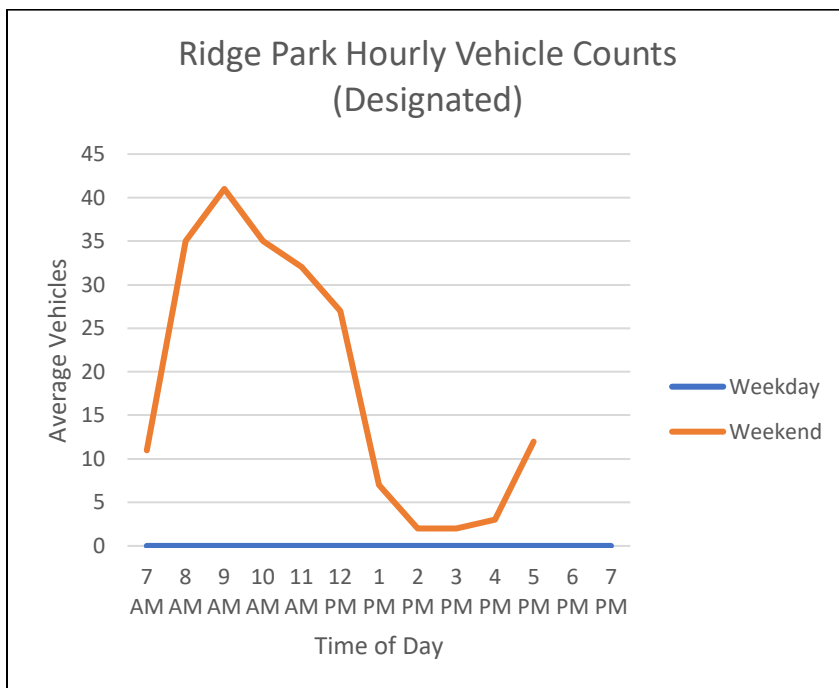**Figure A.3.** *Average parking lot turnover (designated parking lot) for Bommer Canyon.*
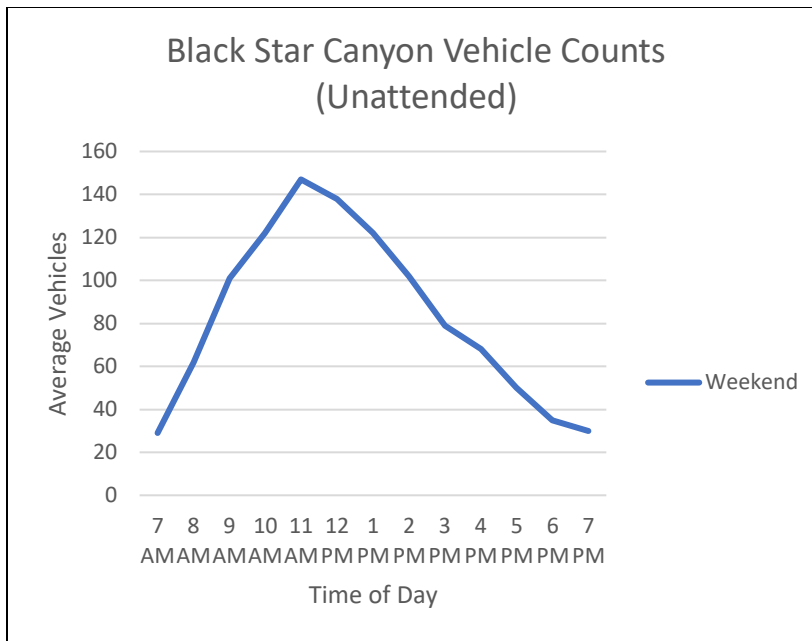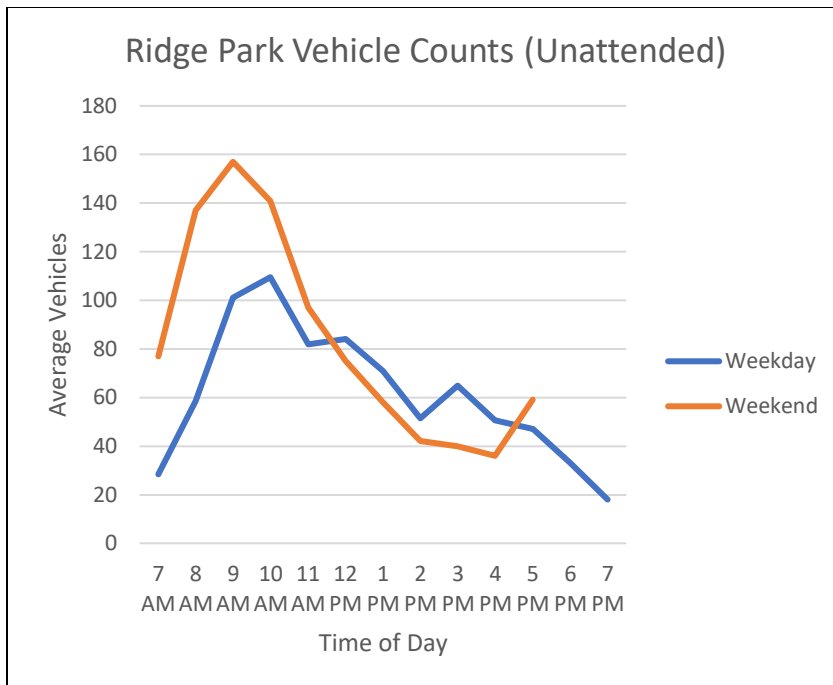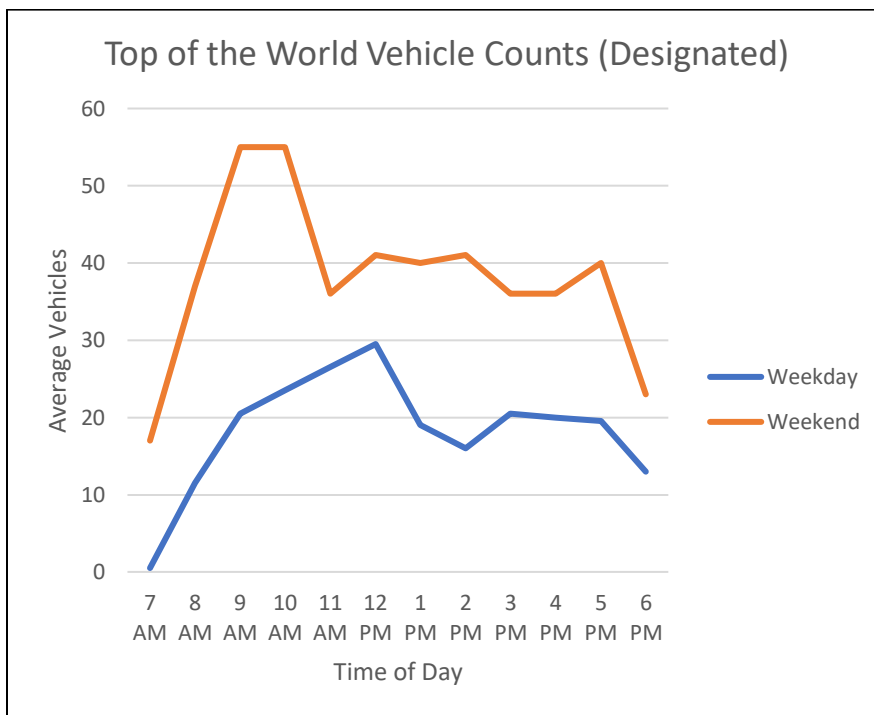
Figure A.4. *Average parking lot turnover (unattended parking) for Black Star Canyon.*
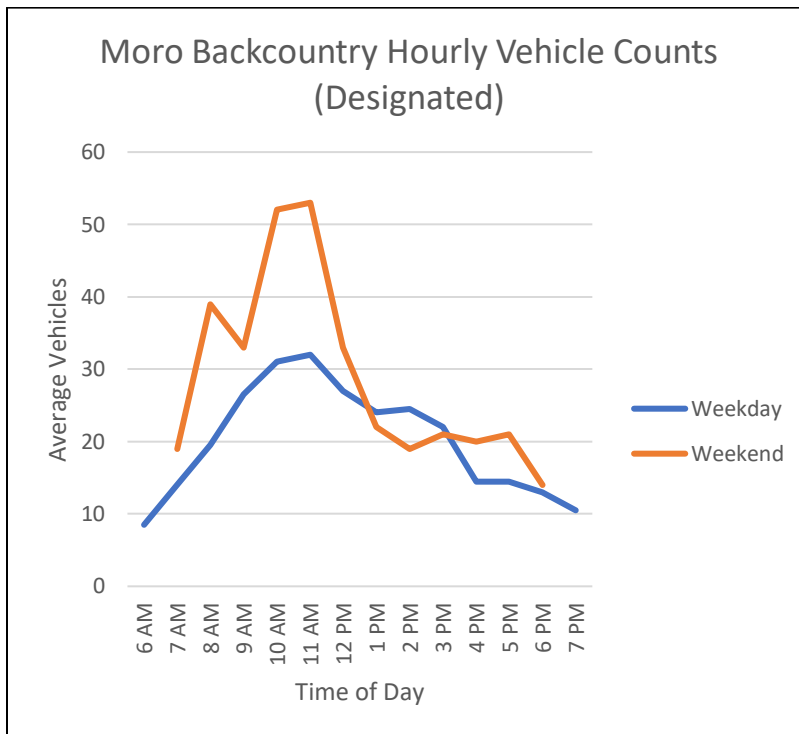
Figure A.5. *Average parking lot turnover (designated parking lot) for Moro Backcountry Trailhead, Crystal Cove State Park*.
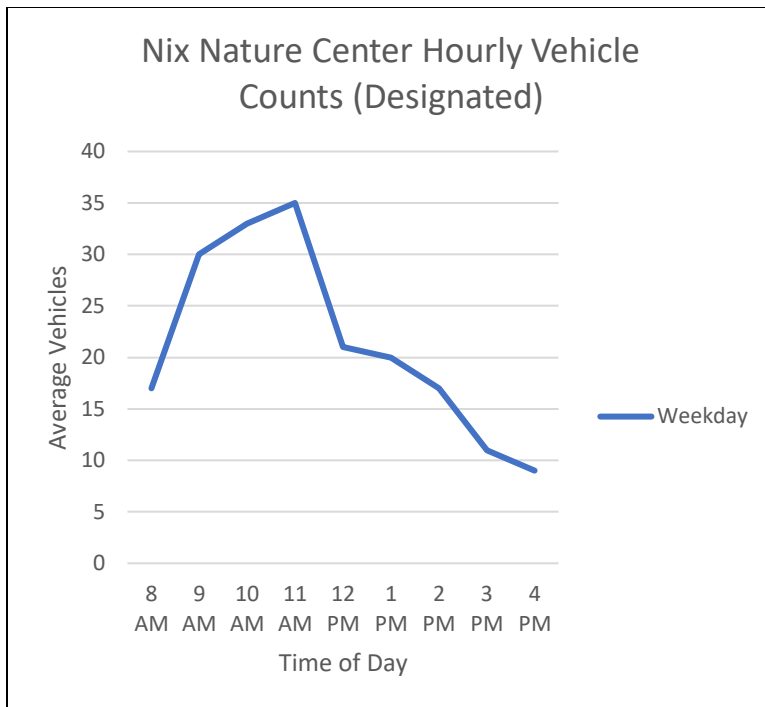
Figure A.6. *Average parking lot turnover (designated parking lot) for Nix Nature Center.*
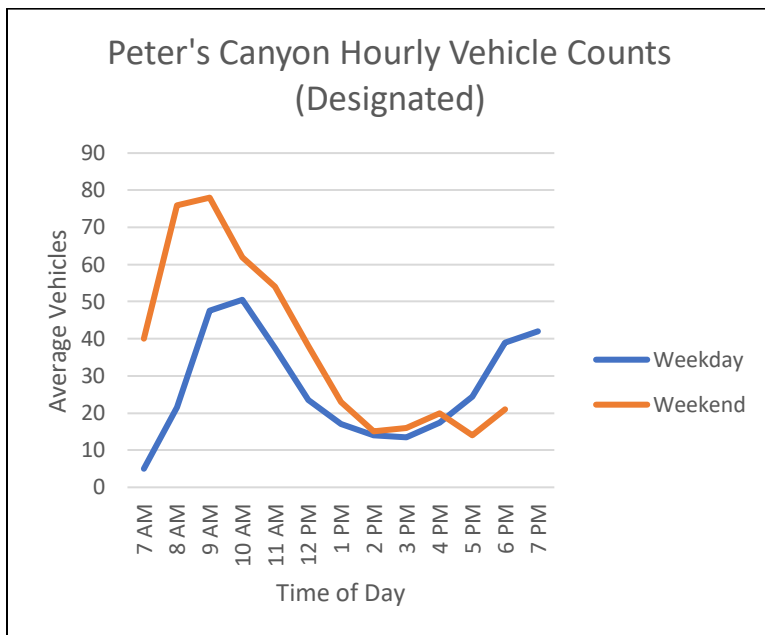
Figure A.7. *Average parking lot turnover (designated parking lot) for Peters Canyon Regional Park.*

Figure A.8. *Average parking lot turnover (unattended parking) for Peters Canyon Regional Park.*

Figure A.9. *Average parking lot turnover (designated parking lot) for Ridge Park.*

Figure A.10. *Average parking lot turnover (unattended parking) for Ridge Park.*

Figure A.11. *Average parking lot turnover (designated parking lot) for Top of the World.*
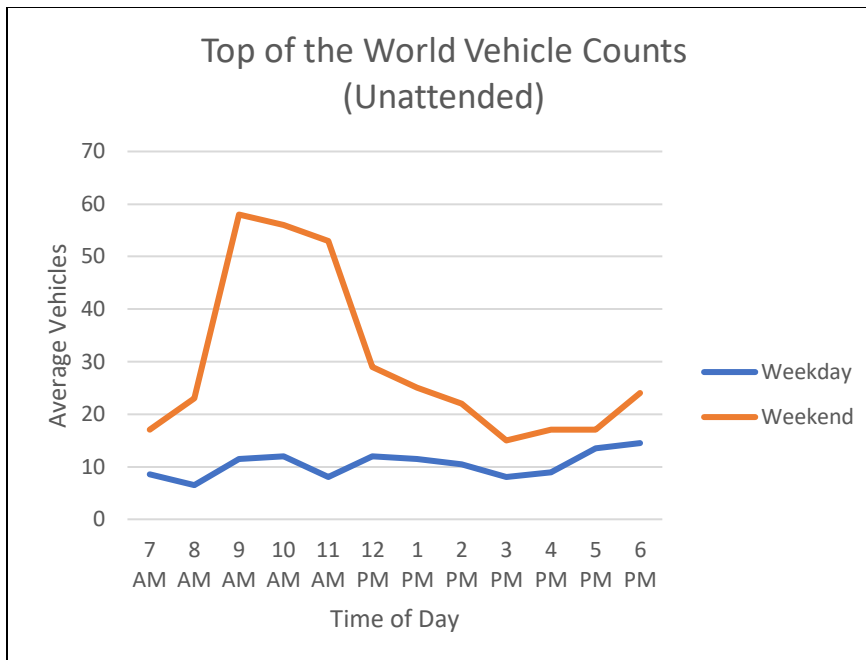
Figure A.12. *Average parking lot turnover (unattended parking) for Top of the World.*
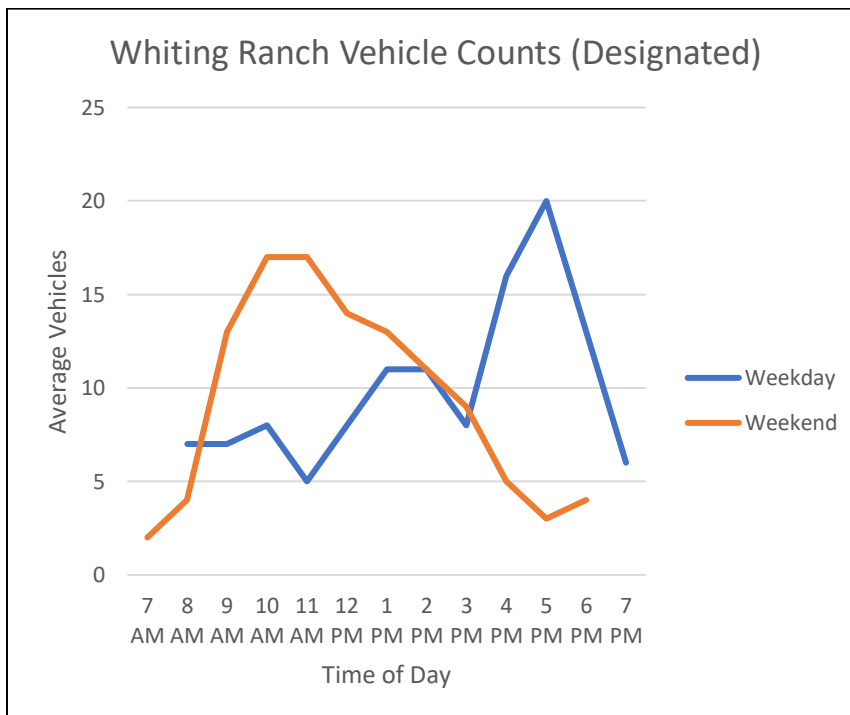
Figure A.13. *Average parking lot turnover (designated parking lot) for Whiting Ranch Wilderness Park.*
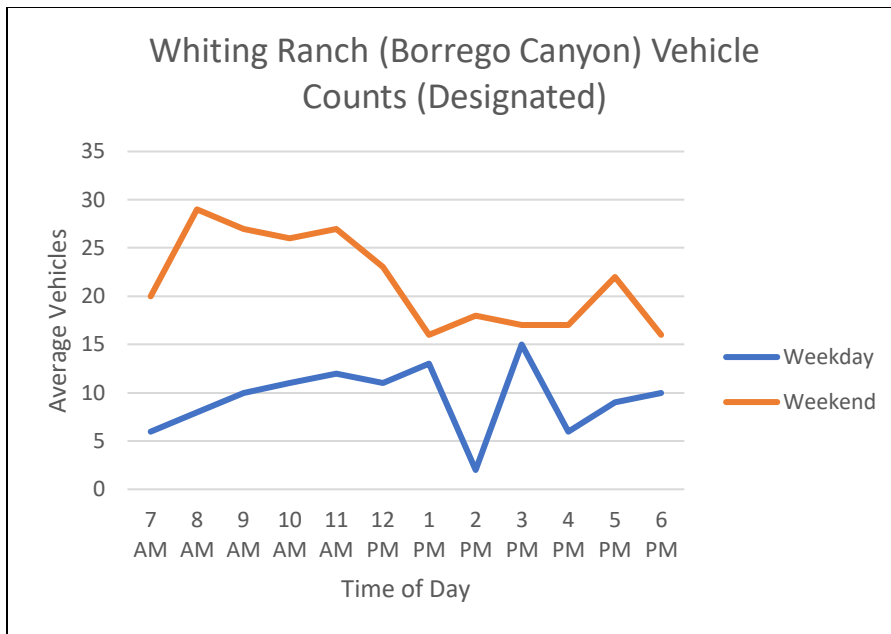
Figure A.14. *Average parking lot turnover (designated parking lot) for the Borrego Canyon entrance of Whiting Ranch Wilderness Park.*
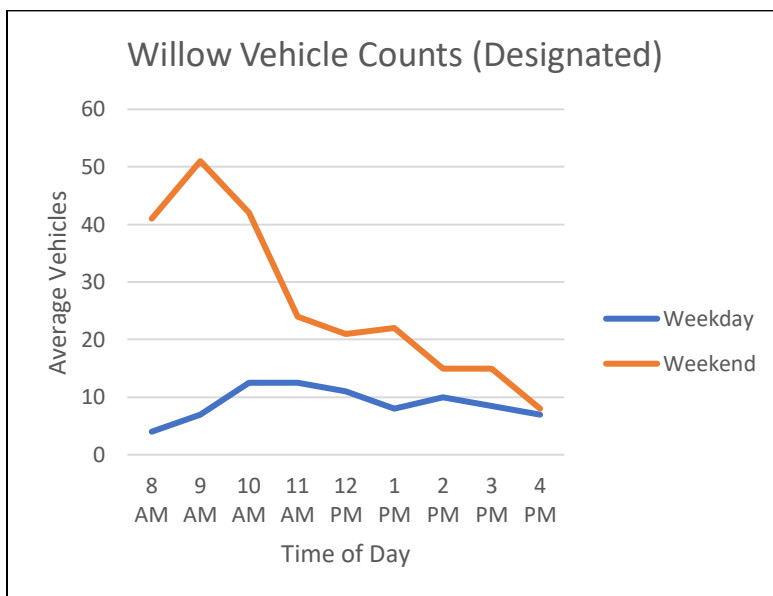
Figure A.15. *Average parking lot turnover (designated parking lot) for Willow Staging Area, Laguna Canyon Wilderness Park.*

Automated trail counter data

Visitor use at Reserve units studied in both 2017 and 2018 varied by day of week and hour of day with average hourly use levels peaking before noon in most Reserve units in 2017 (figures A.16 – A.40). The exception to this was Top of the World, which saw highest average use levels around 1:00 pm (13:00; figures A.31 – A.32). Additionally, Top of the World saw the highest overall use levels, while Nix Nature Center saw the lowest use. All counts are calibrated unless noted with an asterisk in the figure title or count name.
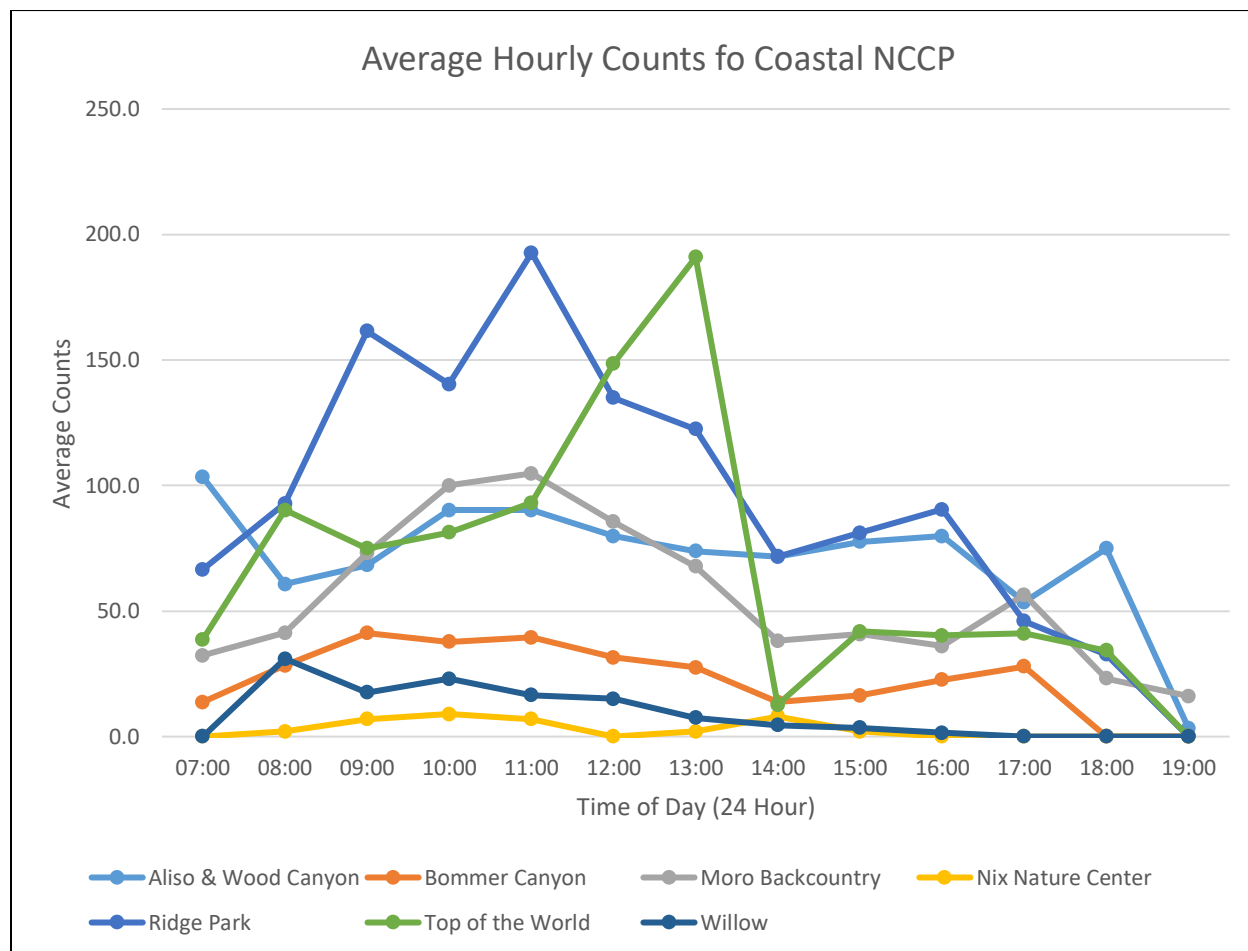
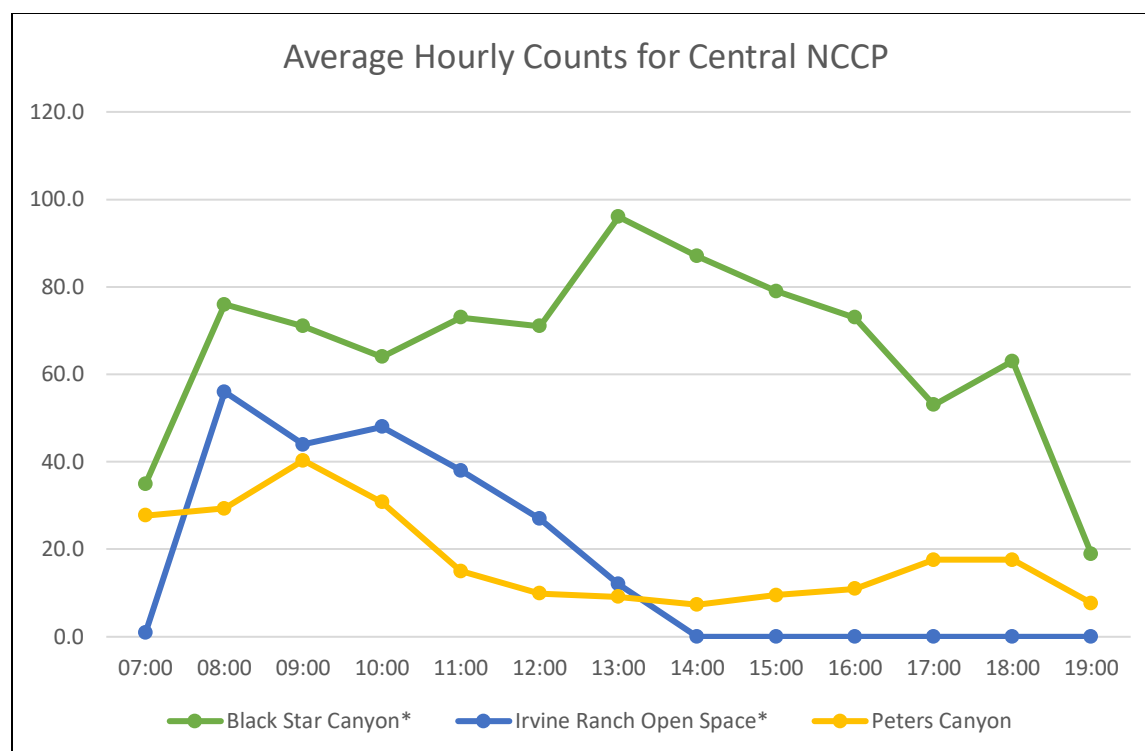**Figure A.16.** *Hourly average visitor use across all coastal Reserve units studied.*

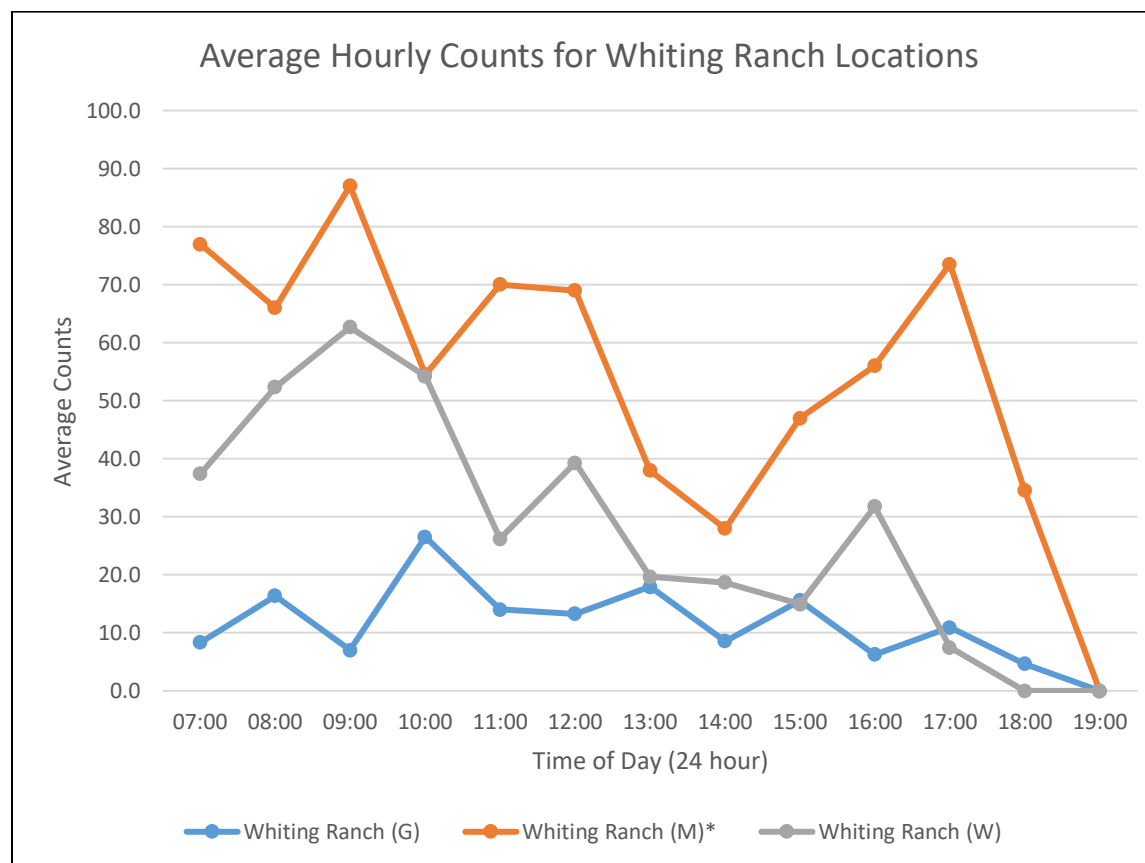**Figure A.17.** *Hourly average visitor use across all central Reserve units studied.*

Figure A.18. *Hourly average visitor use across all Whiting Ranch Reserve unit entrances studied.*
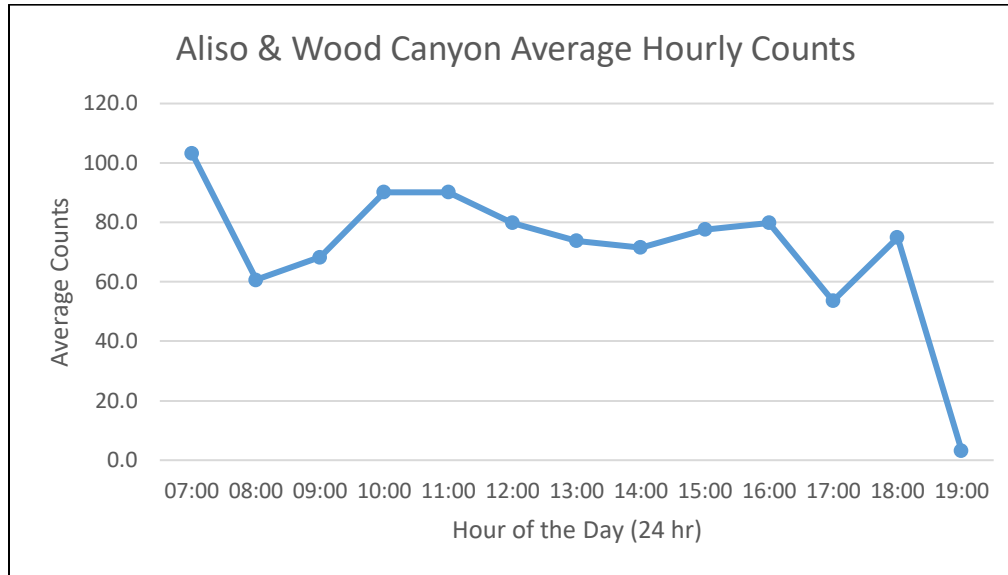
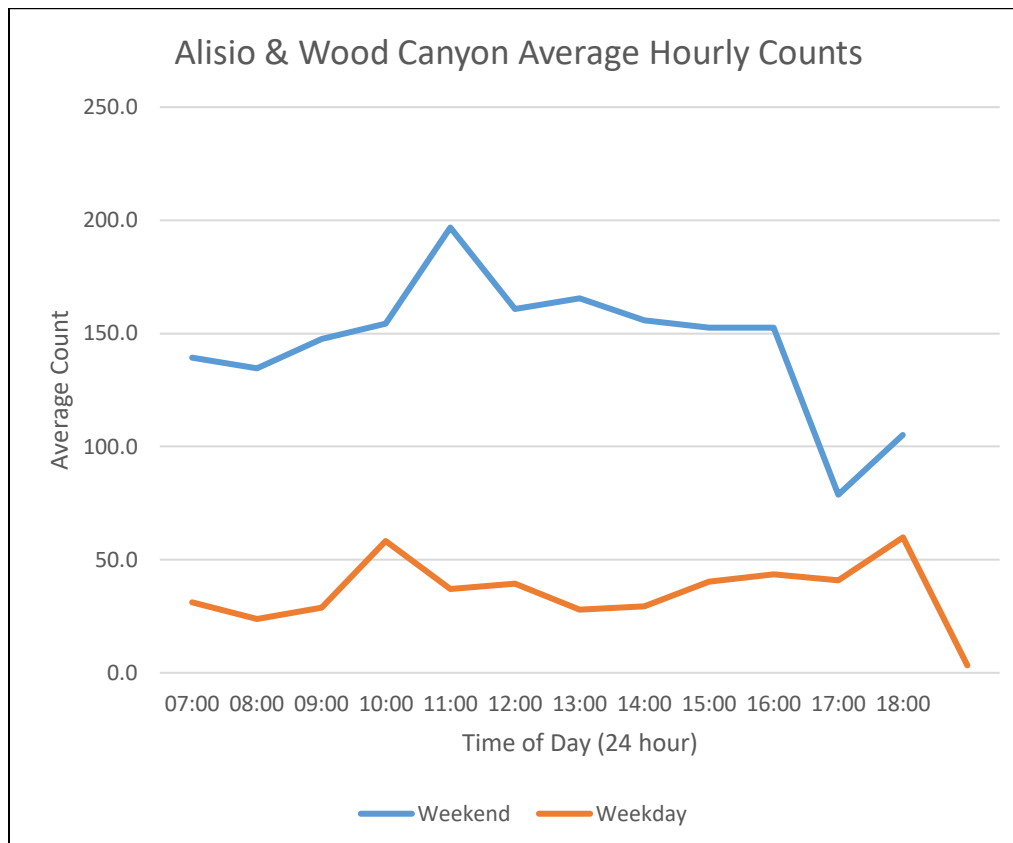**Figure A.19.** *Hourly average visitor use at Aliso and Wood Canyon Wilderness Park.*

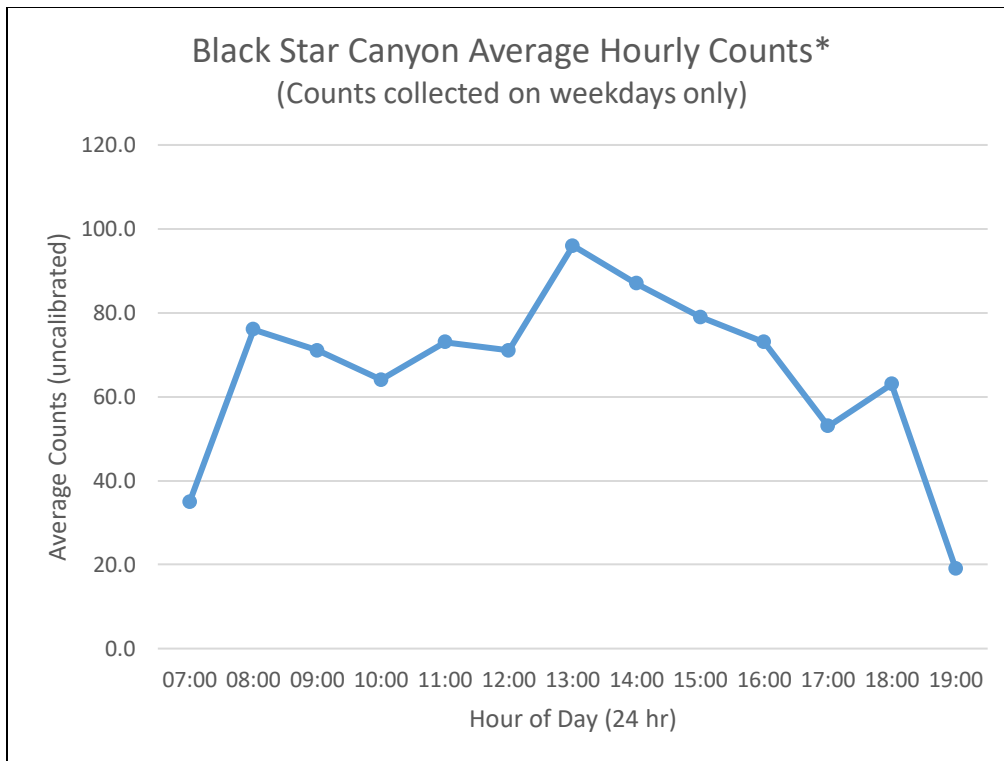**Figure A.20.** *Hourly average visitor use at Aliso and Wood Canyon Wilderness Park by weekend/weekday.*

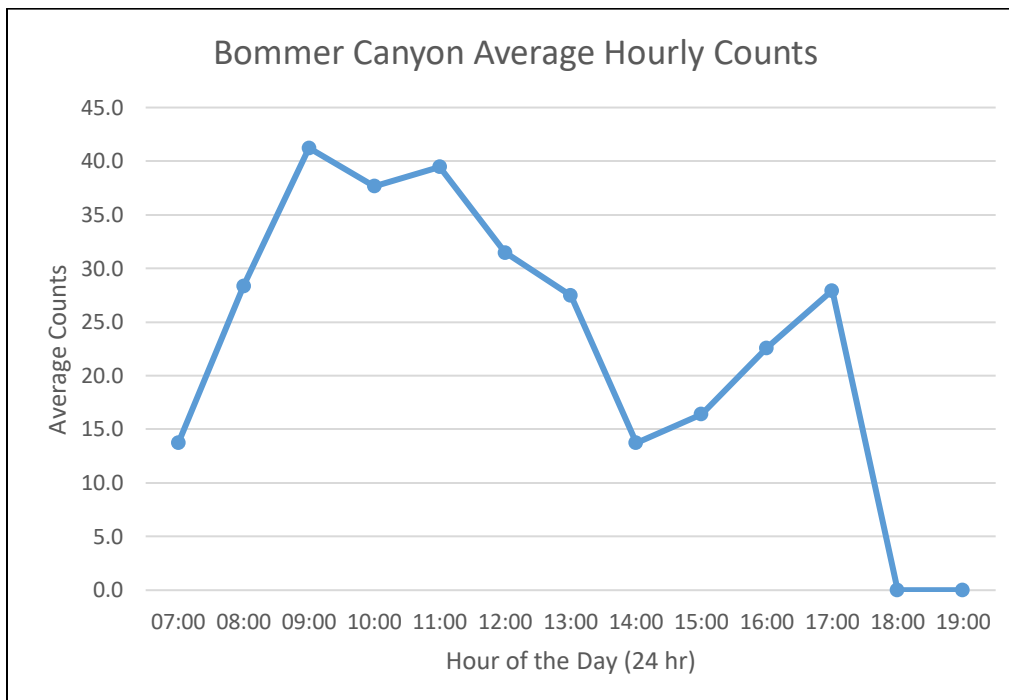**Figure A.21.** *Hourly visitor use at Black Star Canyon Gate.*

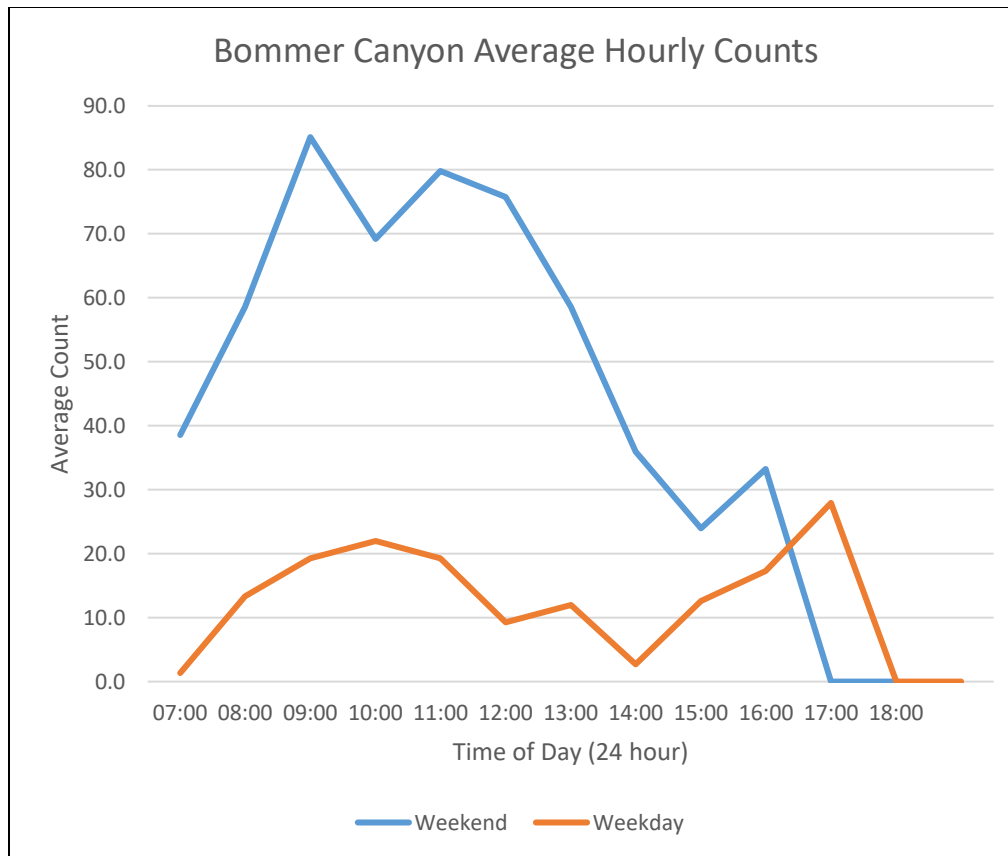**Figure A.22**. *Hourly average visitor use at Bommer Canyon.*

Figure A.23. *Hourly average visitor use at Bommer Canyon, weekend versus weekday.*
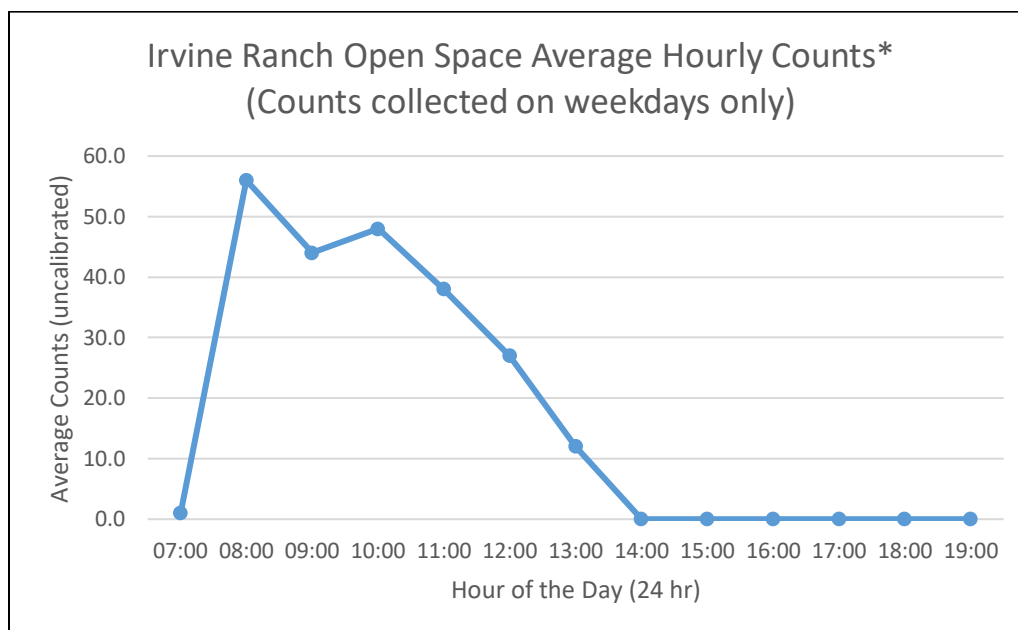

Figure A.24. *Hourly visitor use at Baker Staging Area, Irvine Ranch Open Space.*
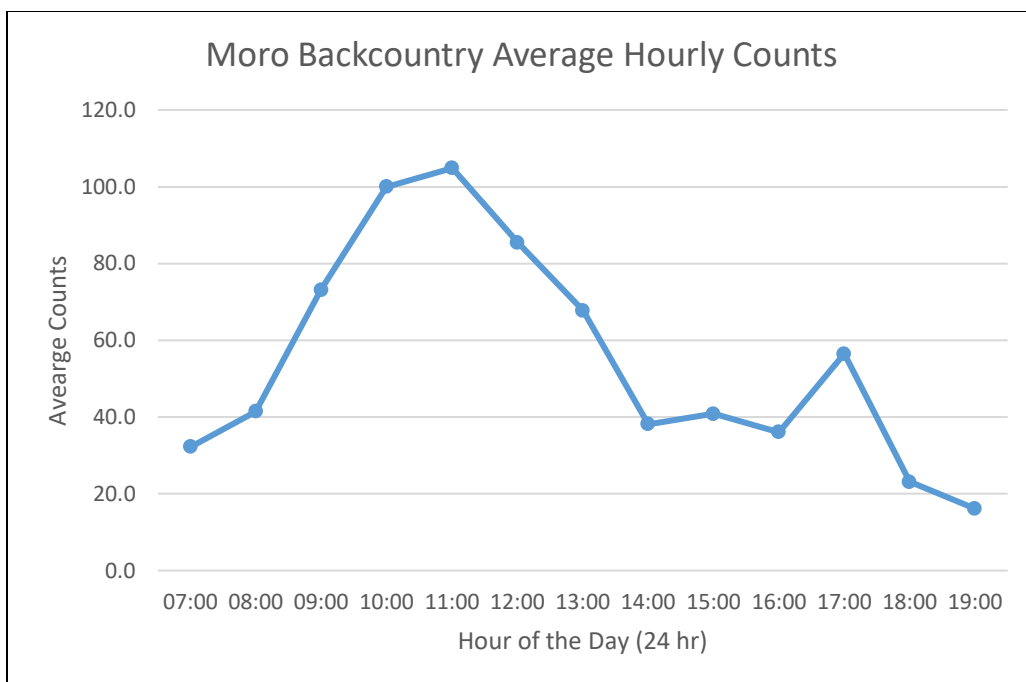
Figure A.25. *Hourly average visitor use at Moro Canyon Trailhead, Crystal Cove State Park.*
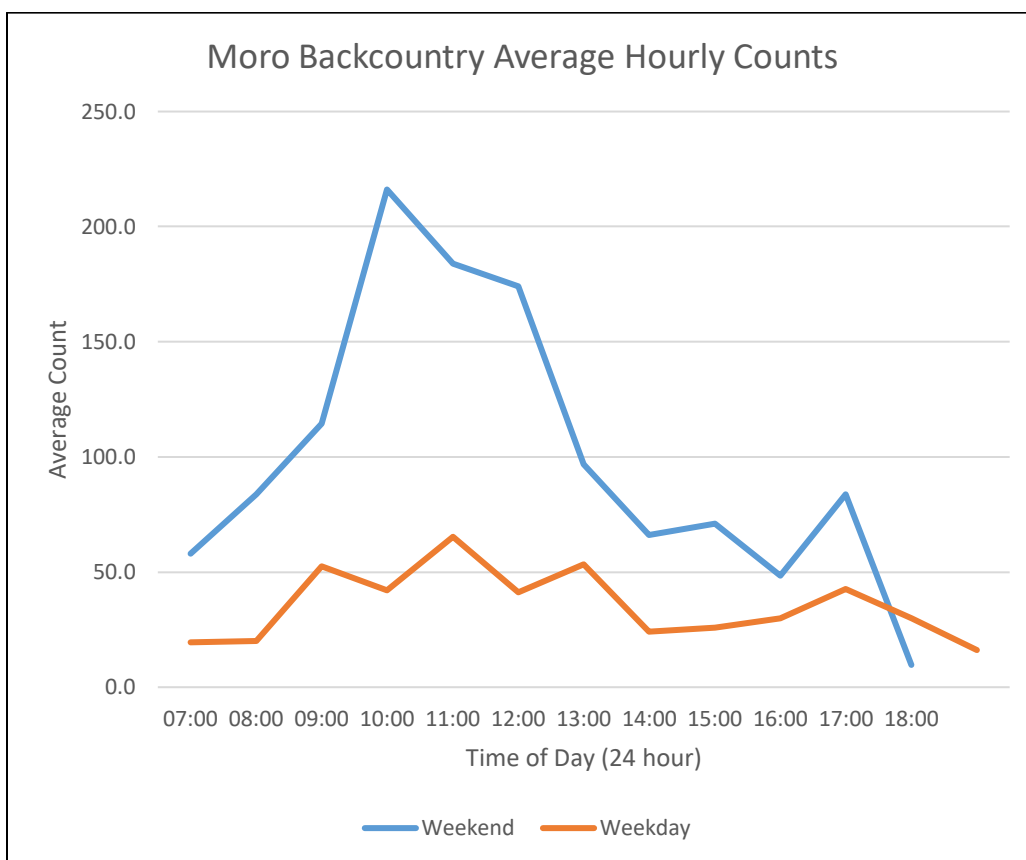

Figure A.26. *Hourly average visitor use at Moro Canyon Trailhead, Crystal Cove State Park, weekend versus weekday.*
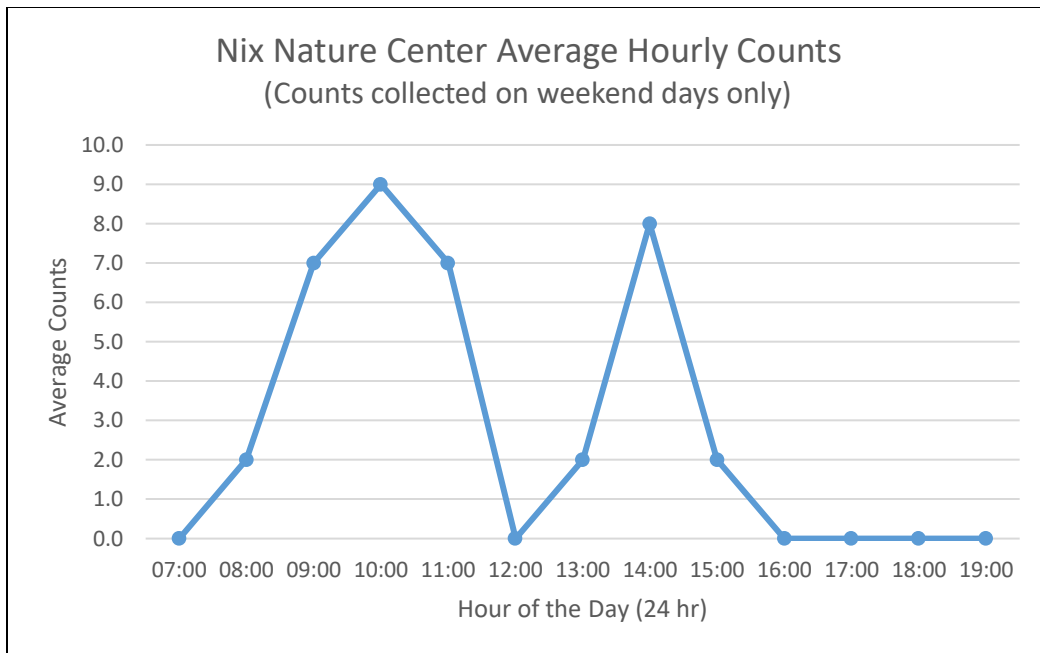
Figure A.27. *Hourly average visitor counts at Nix Nature Center.*

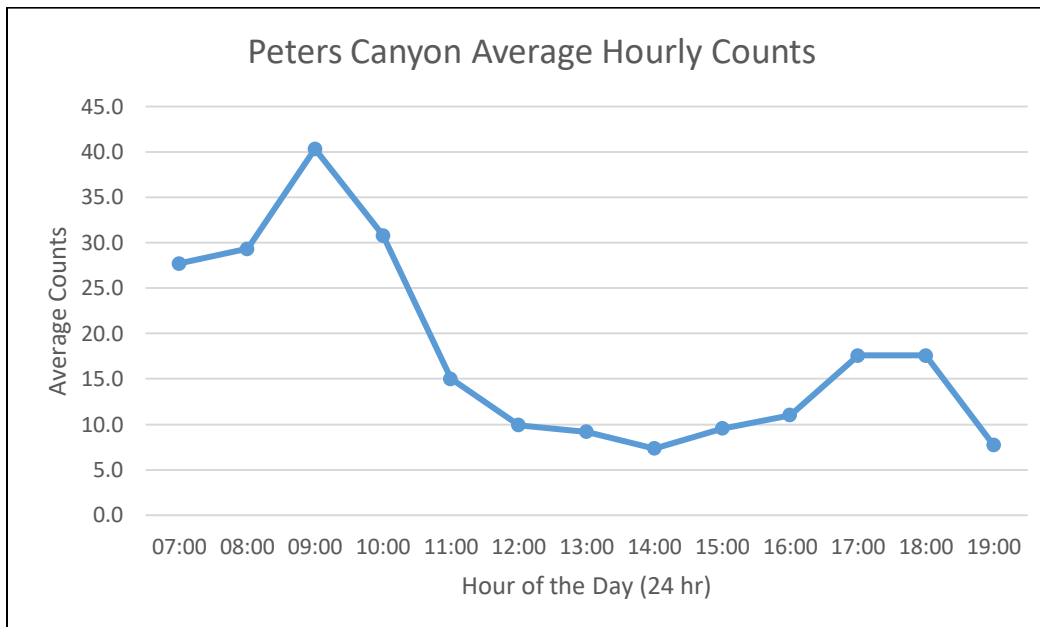**Figure A.28.** *Hourly average visitor use at Peters Canyon Regional Park.*
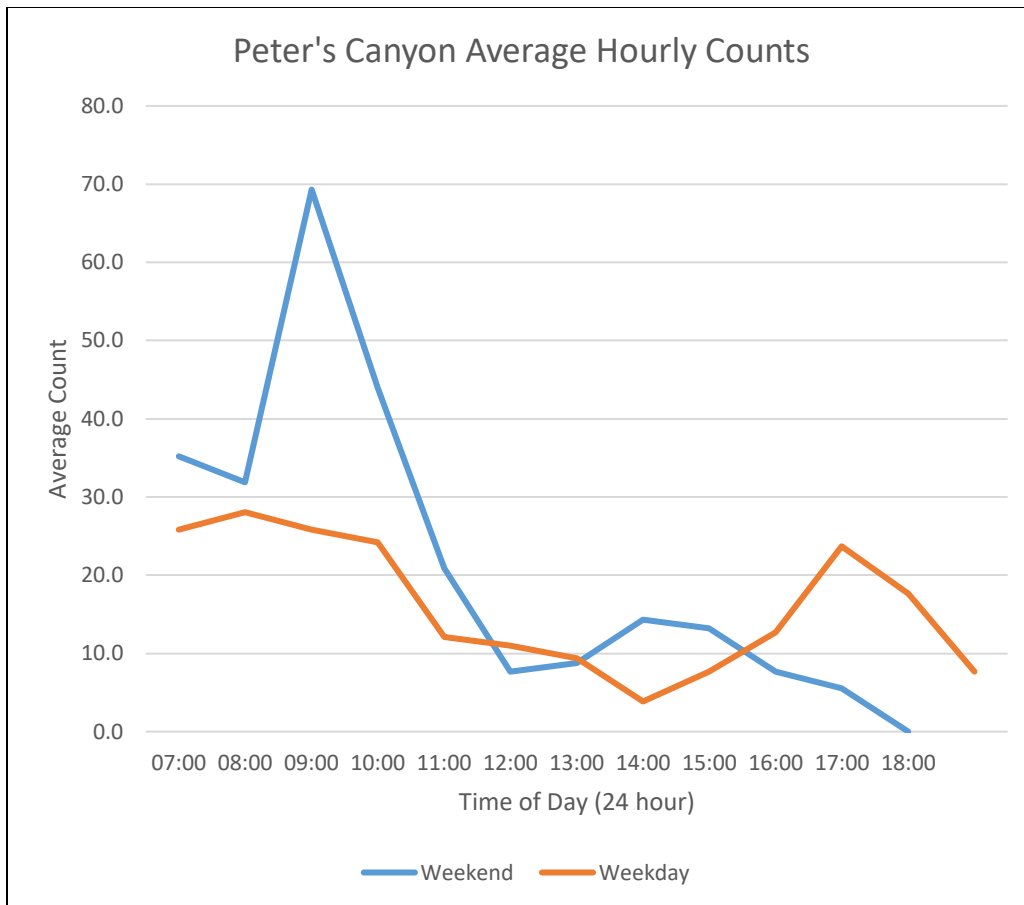
Figure A.29. *Hourly average visitor use at Peters Canyon Regional Park, weekend versus weekday.*
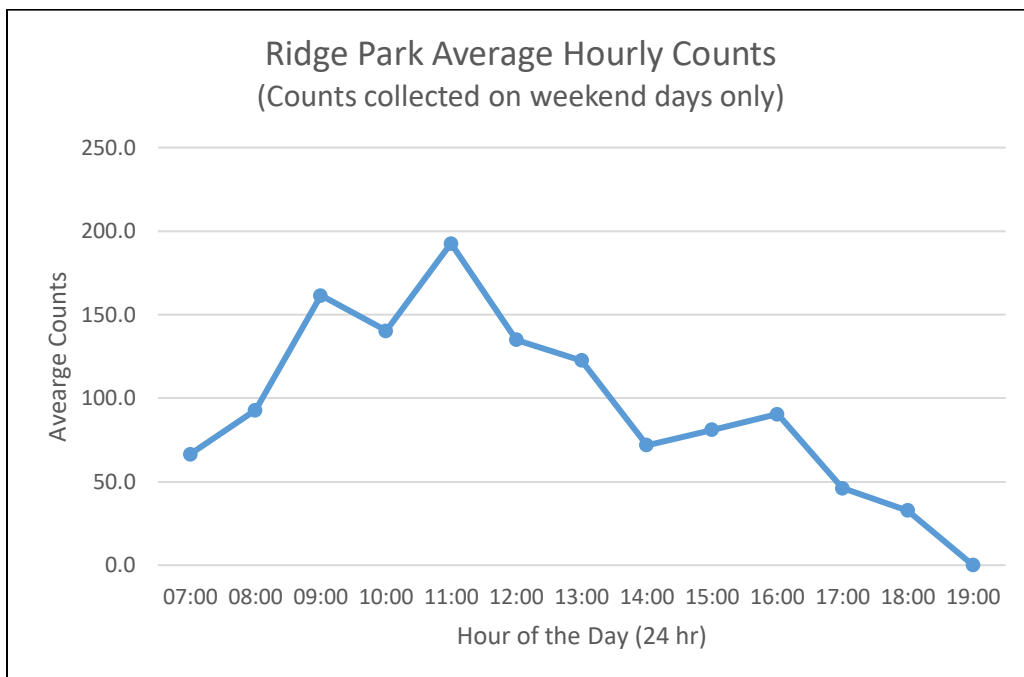
Figure A.30. *Hourly average visitor use at Ridge Park.*
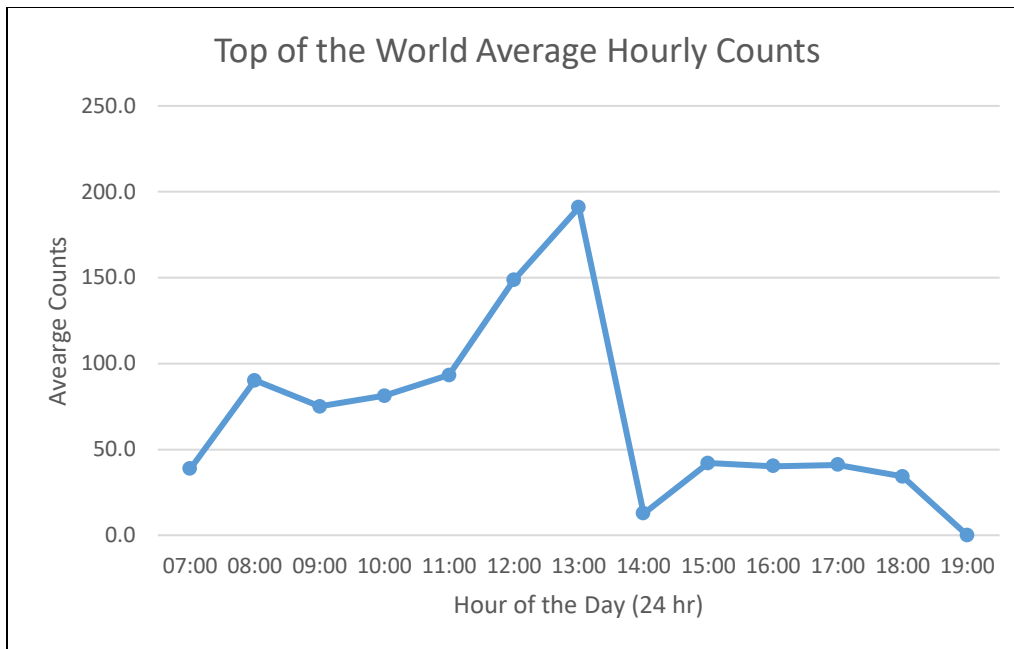
Figure A.31. *Hourly average visitor use at Top of the World.*
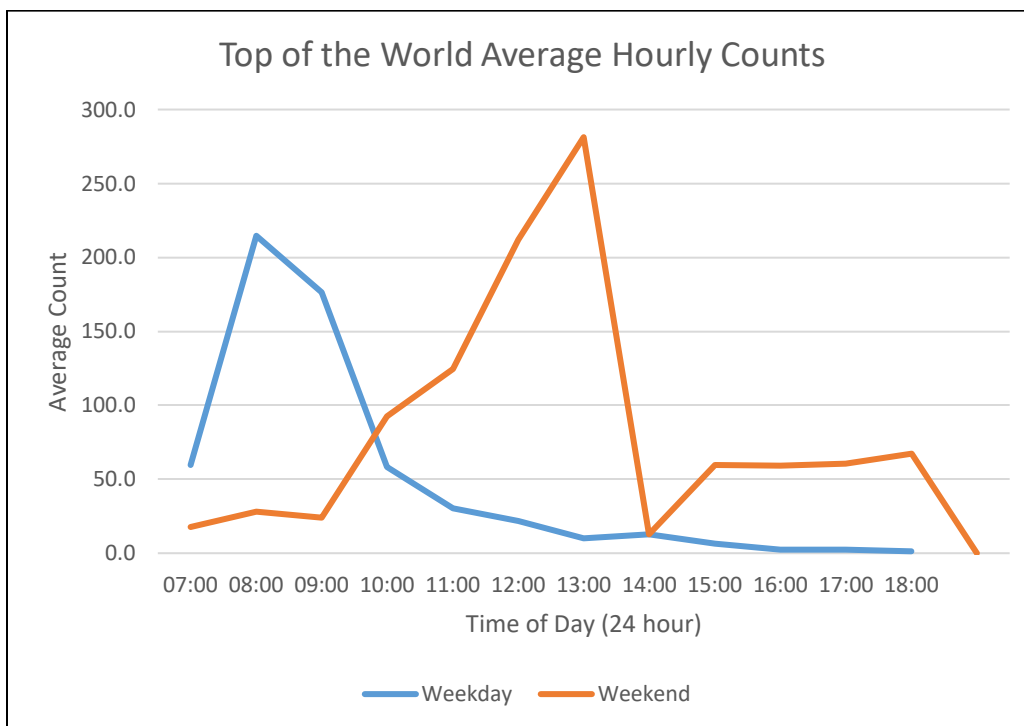
Figure A.32. *Hourly average visitor use at Top of the World, weekend versus weekday.*
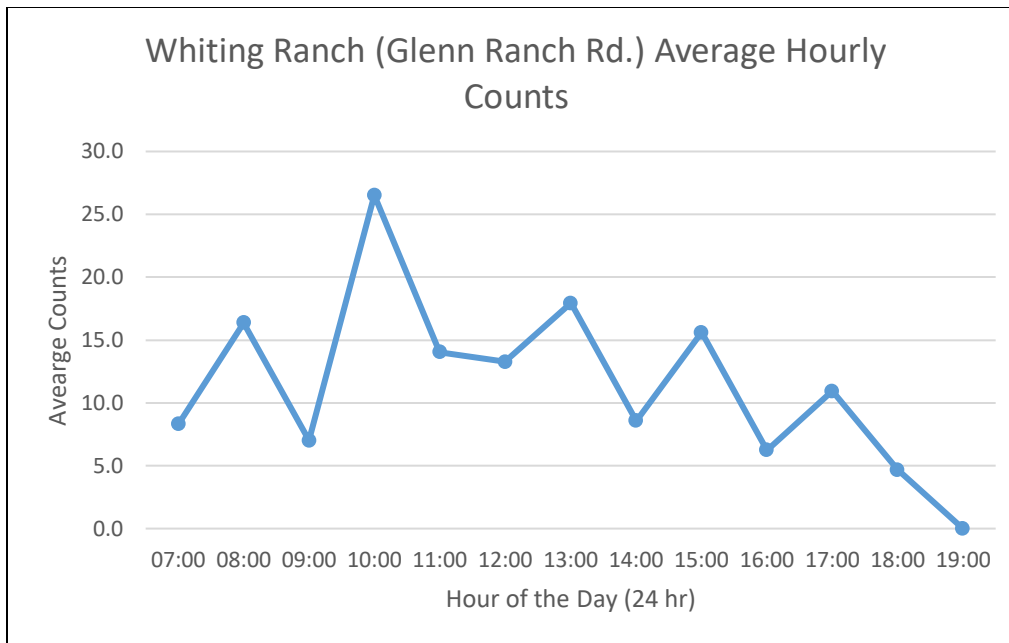
Figure A.33. *Hourly average visitor use at Whiting Ranch Wilderness Park, Glenn Ranch Rd. Entrance.*
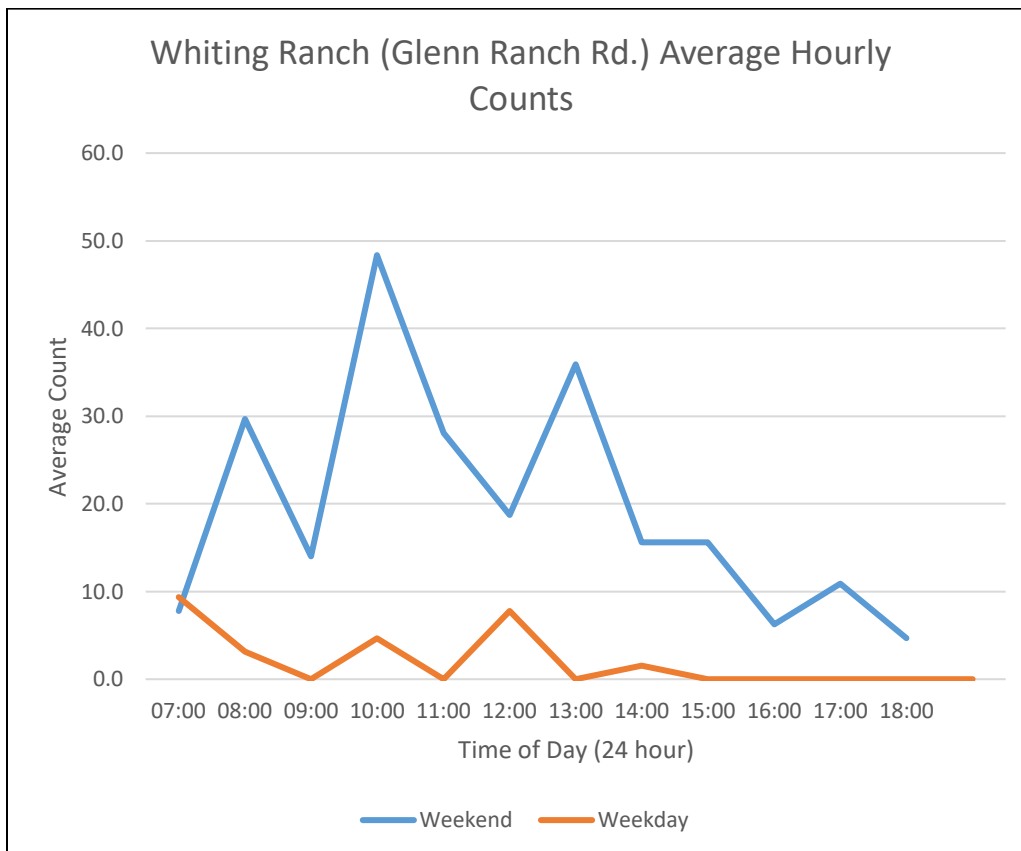
Figure A.34. *Hourly average visitor use at Whiting Ranch Wilderness Park, Glenn Ranch Rd. Entrance, weekend versus weekday.*
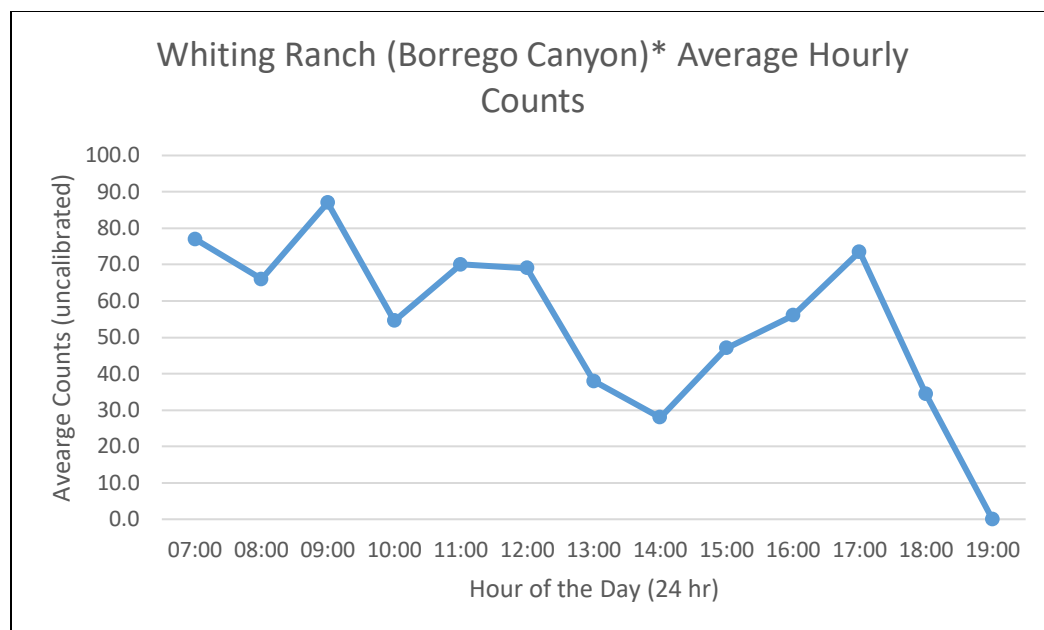
Figure A.35. *Hourly average visitor use at Whiting Ranch Wilderness Park, Borrego Canyon Entrance.*
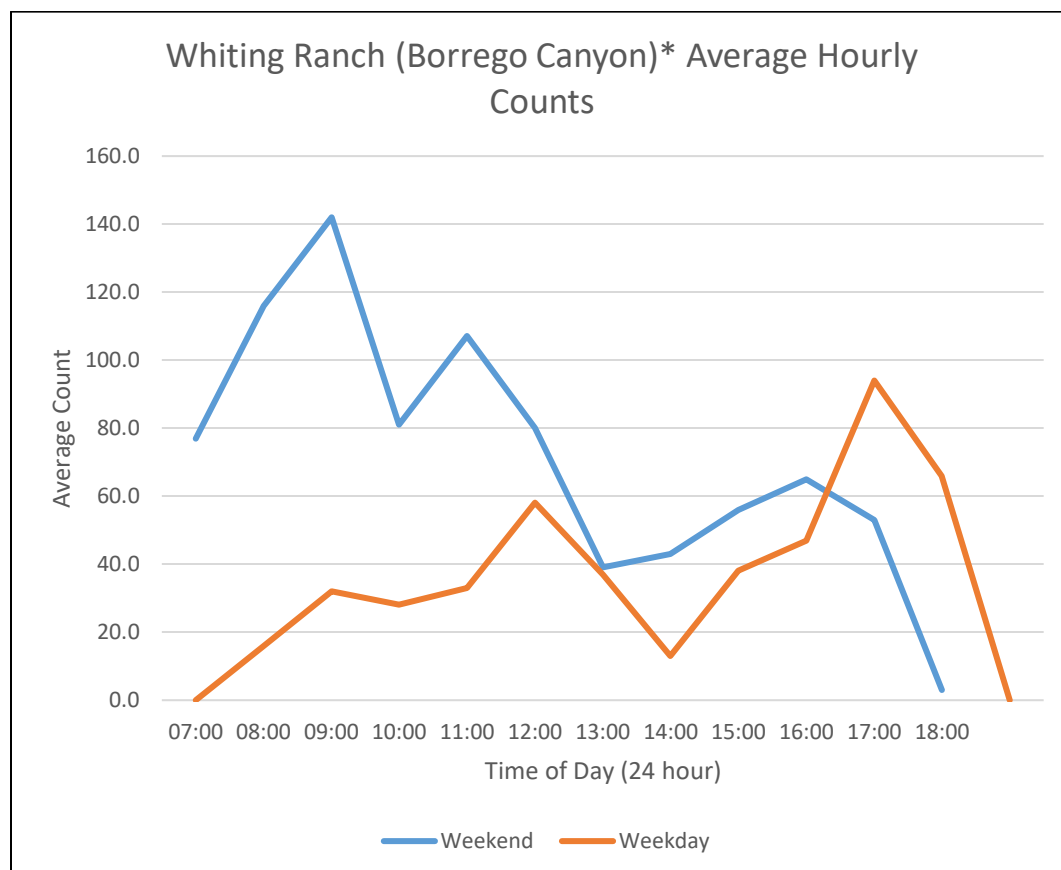
Figure A.36. *Hourly average visitor use at Whiting Ranch Wilderness Park, Borrego Canyon Entrance, weekend versus weekday.*

Figure A.37. *Hourly average visitor use at Whiting Ranch Wilderness Park, Serrano Creek (Wahoo's) Entrance.*

Figure A.38. *Hourly average visitor use at Whiting Ranch Wilderness Park, Serrano Creek (Wahoo's) Entrance, weekend versus weekday.*

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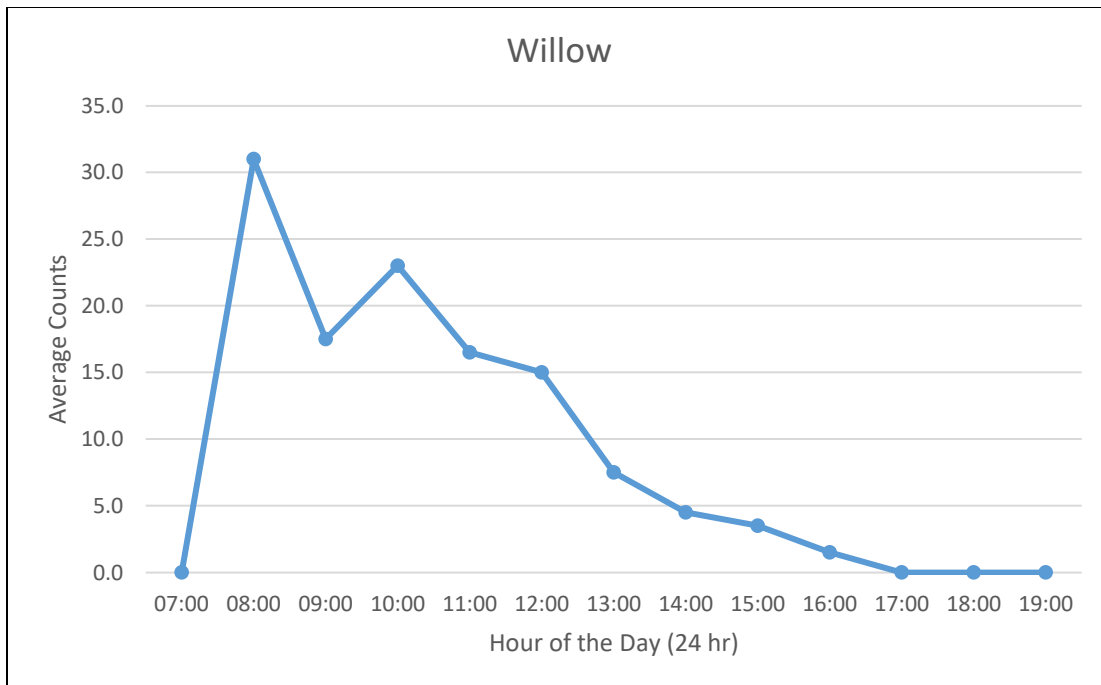
Figure A.39. *Hourly average visitor use at Willow Staging Area.*

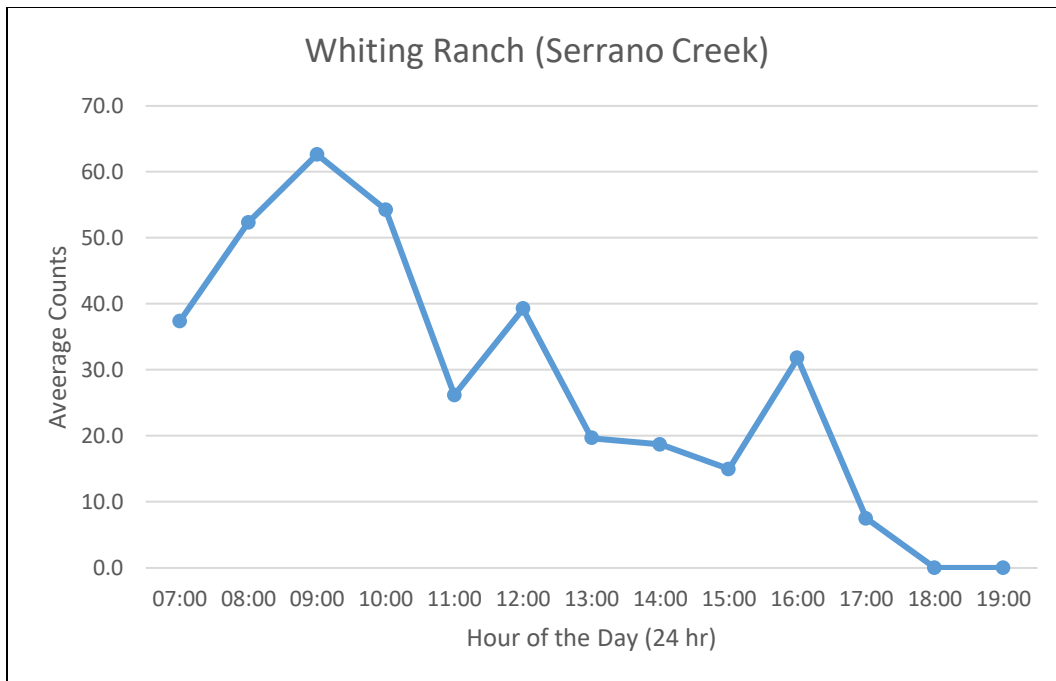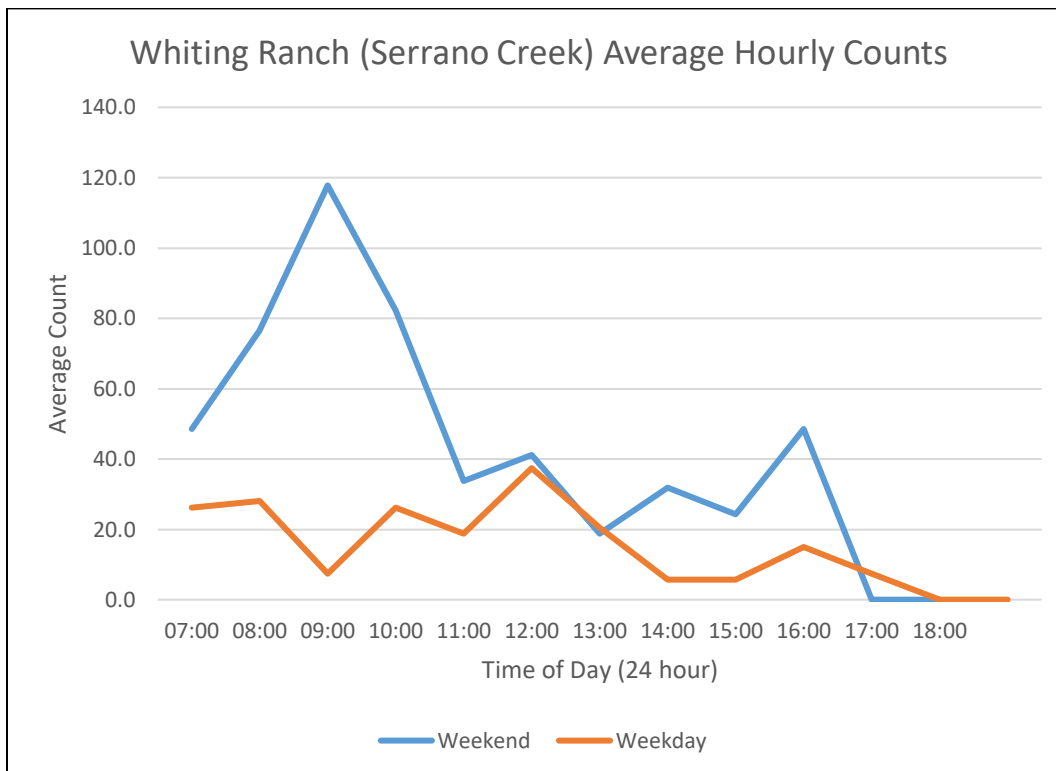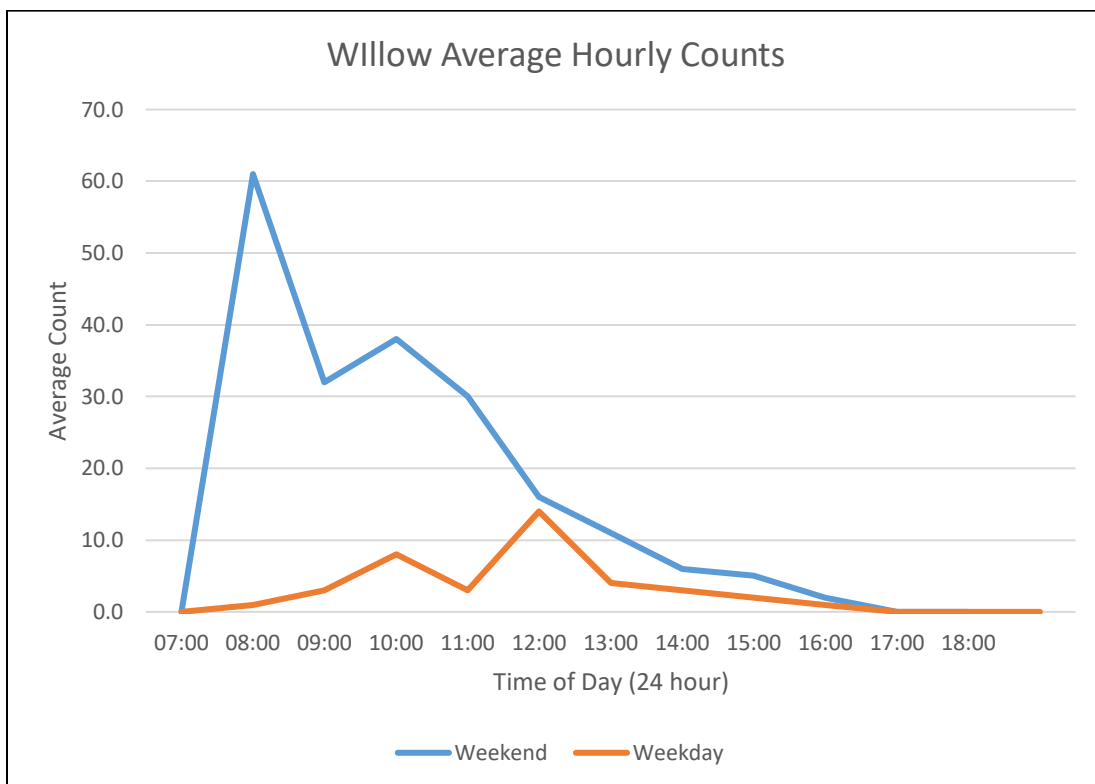**Figure A.40.** *Hourly average visitor use at Willow Staging Area, weekend versus weekday.*

2018

Automated trail counter data

Reserve units studied in 2018 were chosen due to consistently high use levels, as exhibited in the 2017 data. Automated counters were deployed over 4-5 consecutive days and kept in place overnight (counters were removed at park closing each day in 2017) allowing for an assessment of visitor use patterns both during and outside of park operating hours in 2018 (fig. A.41).
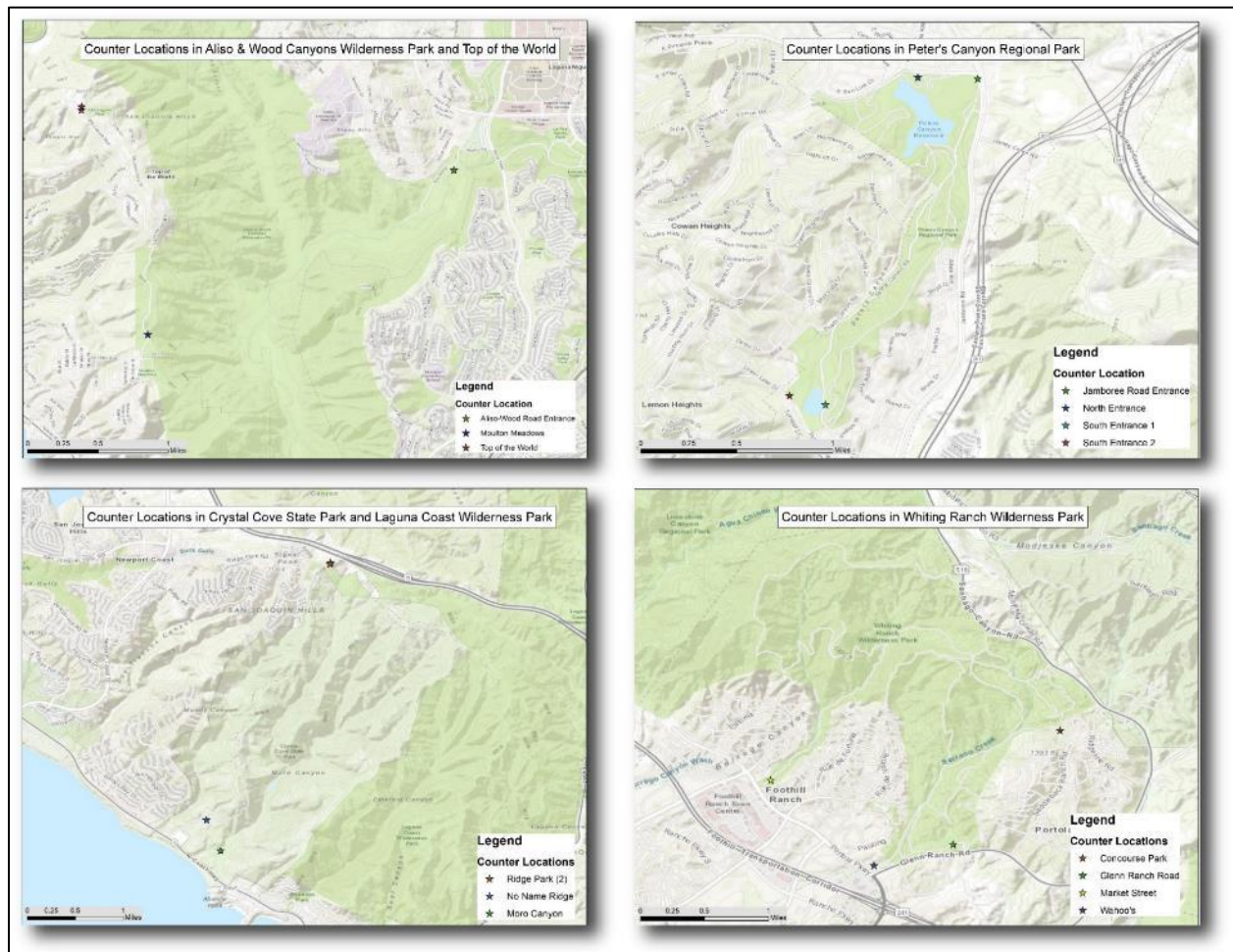
Figure A.41. *2018 trail counter locations.*

Figures A.42 – A.53 show summaries for average hourly trail counter use overall and broken into week days and weekend days. In 2018, as in 2017, Top of the World saw the highest average hourly use, while the Concourse Park entrance to Whiting Ranch Wilderness Park saw the lowest average hourly use. Average hourly use across all days of the week shows that peak use for all trailheads and Reserve Units (with the exception of the Lakeview trail at Peters Canyon Regional Park) occurred before noon. However, when only weekday use was examined, most Reserve Units showed a use pattern with multiple peaks, one occurring in the mid-morning, and one in the late afternoon-early evening. This pattern suggests that on weekdays, the vast majority of visitors are using Reserve Units before or after work. Results also illustrate that nearly all use is occurring during designated use hours for all Reserve Units, with the exception of Top of the World at Alta Laguna Boulevard, which sees, on average, 15-30

visitors between the hours of 10:00 pm (22:00) and 1:00 am consistently throughout the week (fig. A.42).
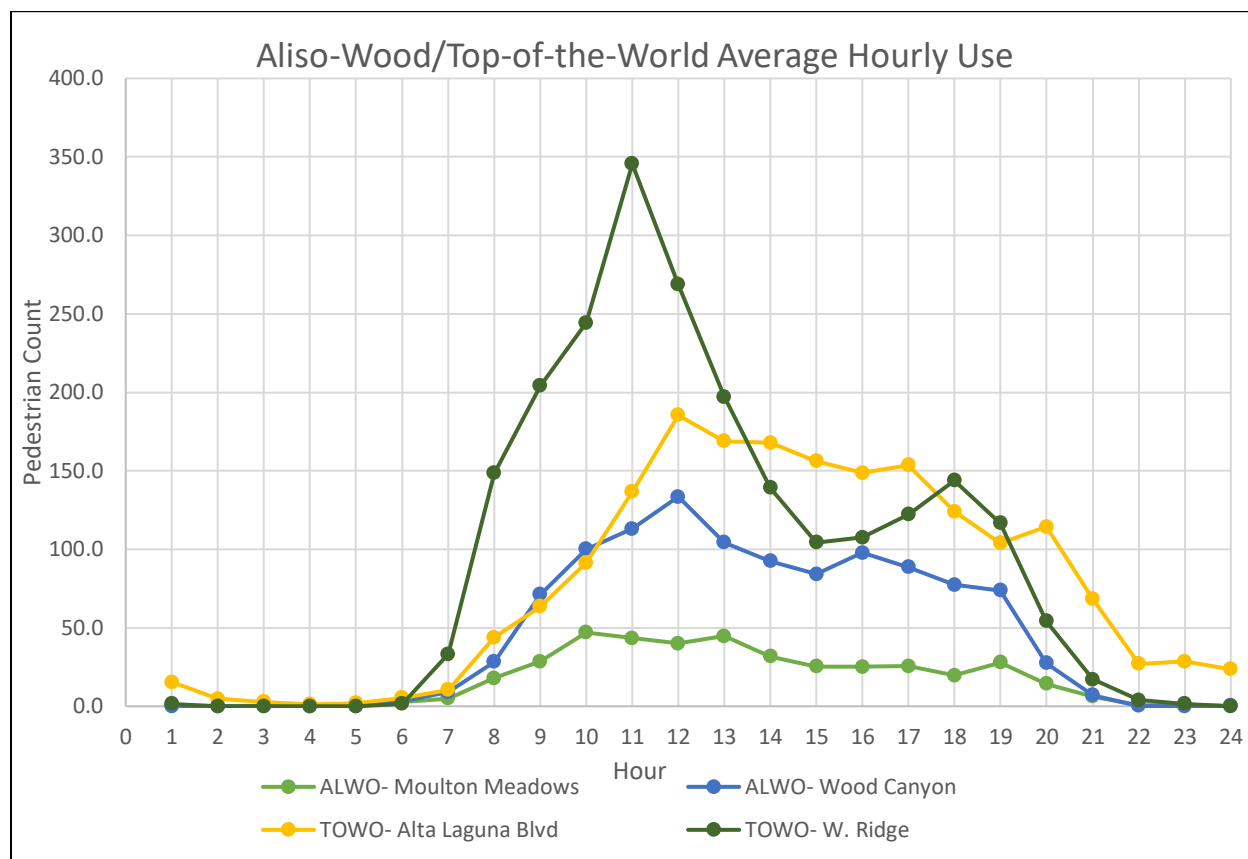
Figure A.42. *Average hourly visitor use at Aliso and Wood Canyons Wilderness park and Top of the World sampling locations.*
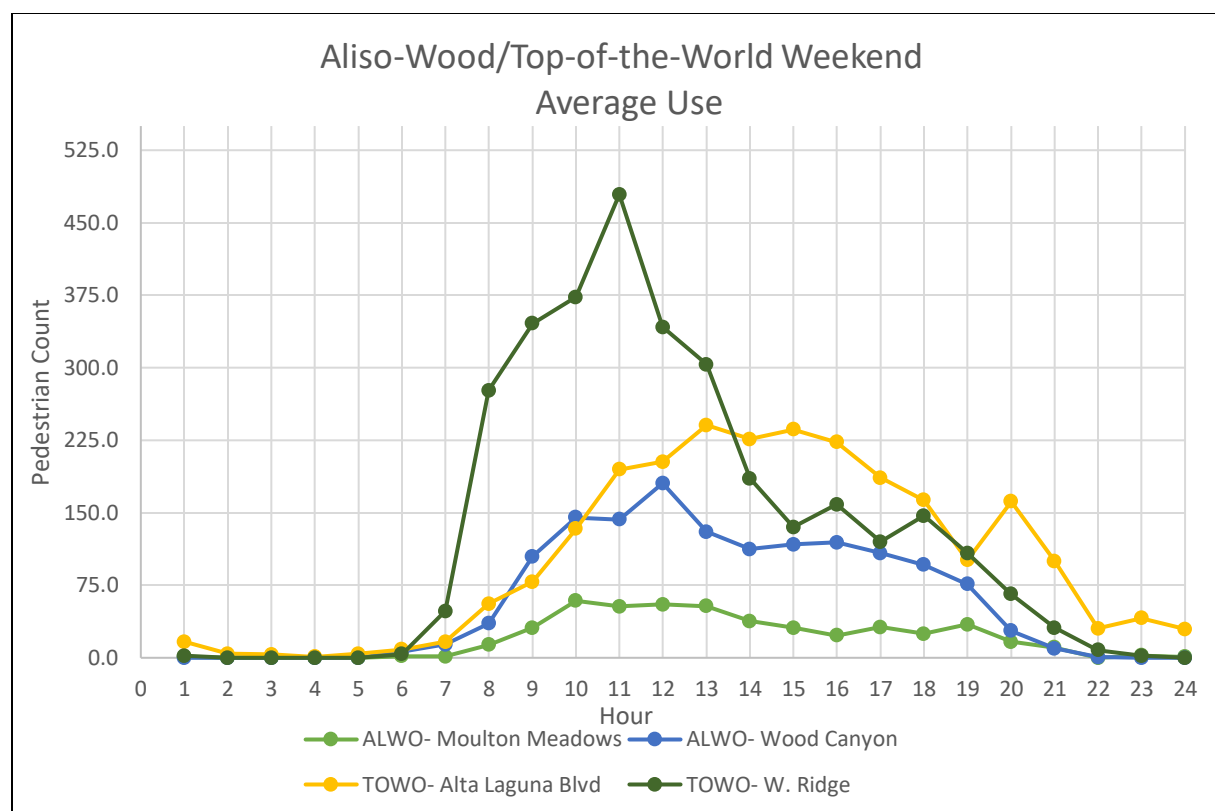
Figure A.43. *Average hourly weekend visitor use at Aliso and Wood Canyons Wilderness park and Top of the World sampling locations.*
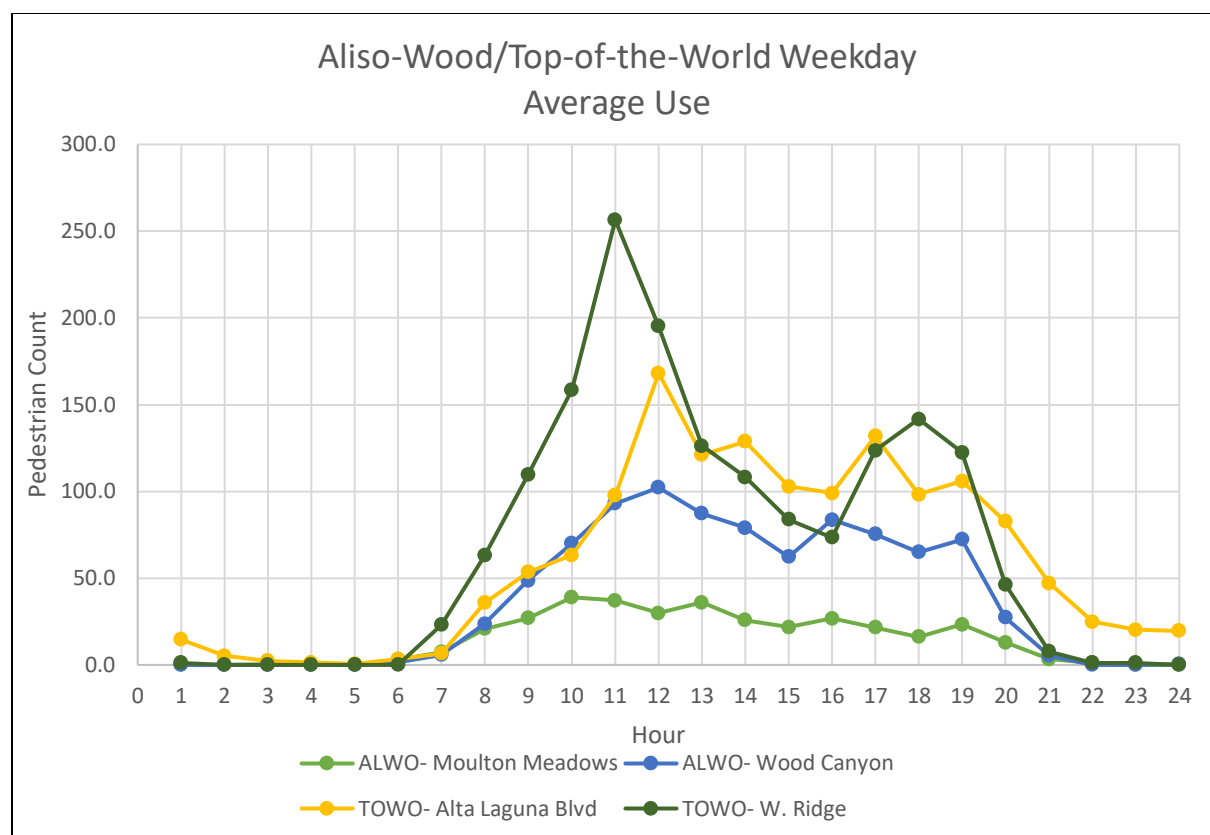
Figure A.44. *Average hourly weekday visitor use at Aliso and Wood Canyons Wilderness Park and Top of the World sampling locations.*
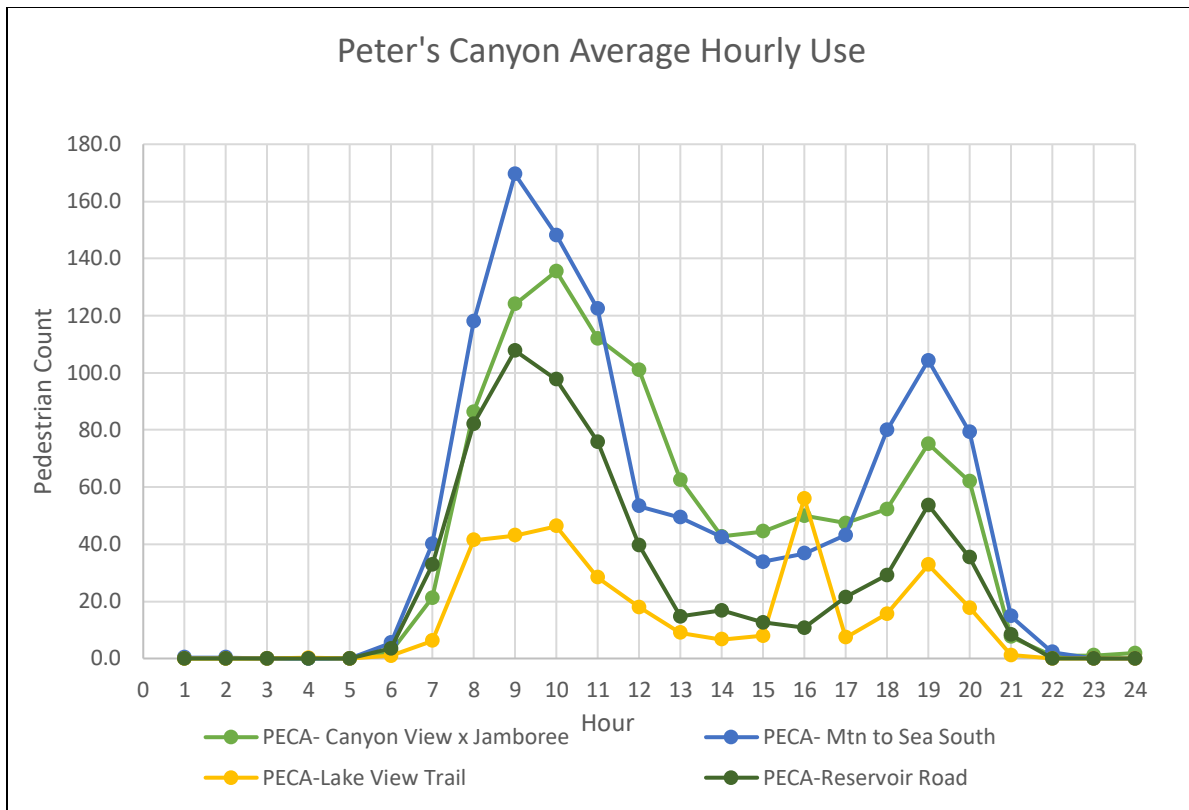
Figure A.45. *Average hourly visitor use at Peters Canyon Regional Park sampling locations.*
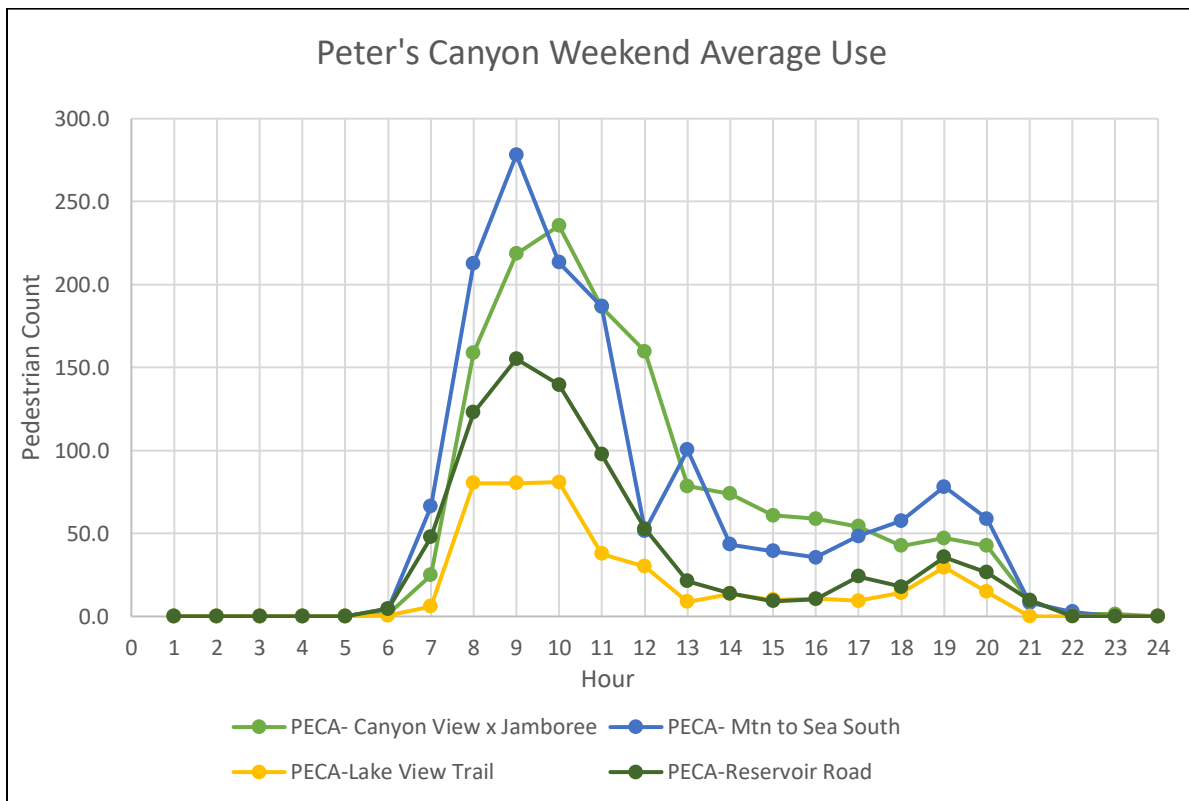
Figure A.46. *Average hourly weekend visitor use at Peters Canyon Regional Park sampling locations.*
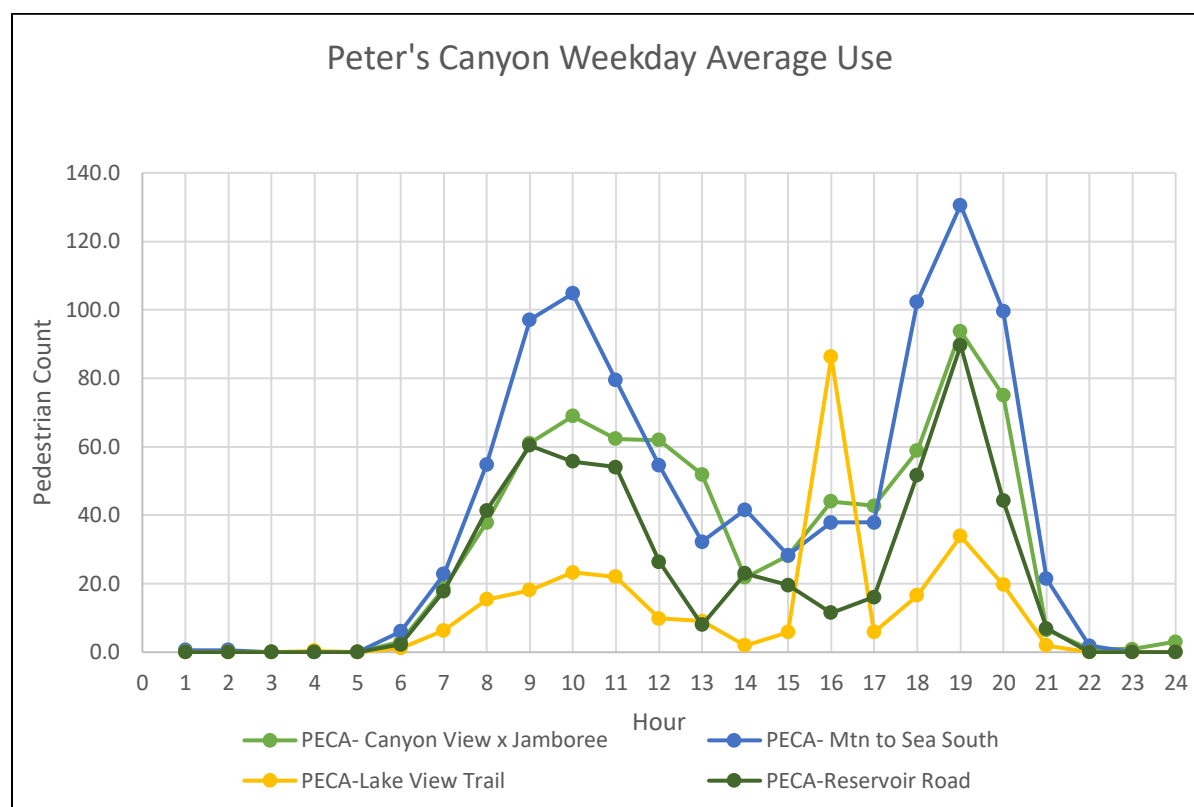
Figure A.47. *Average hourly weekday visitor use at Peters Canyon Regional Park sampling locations.*
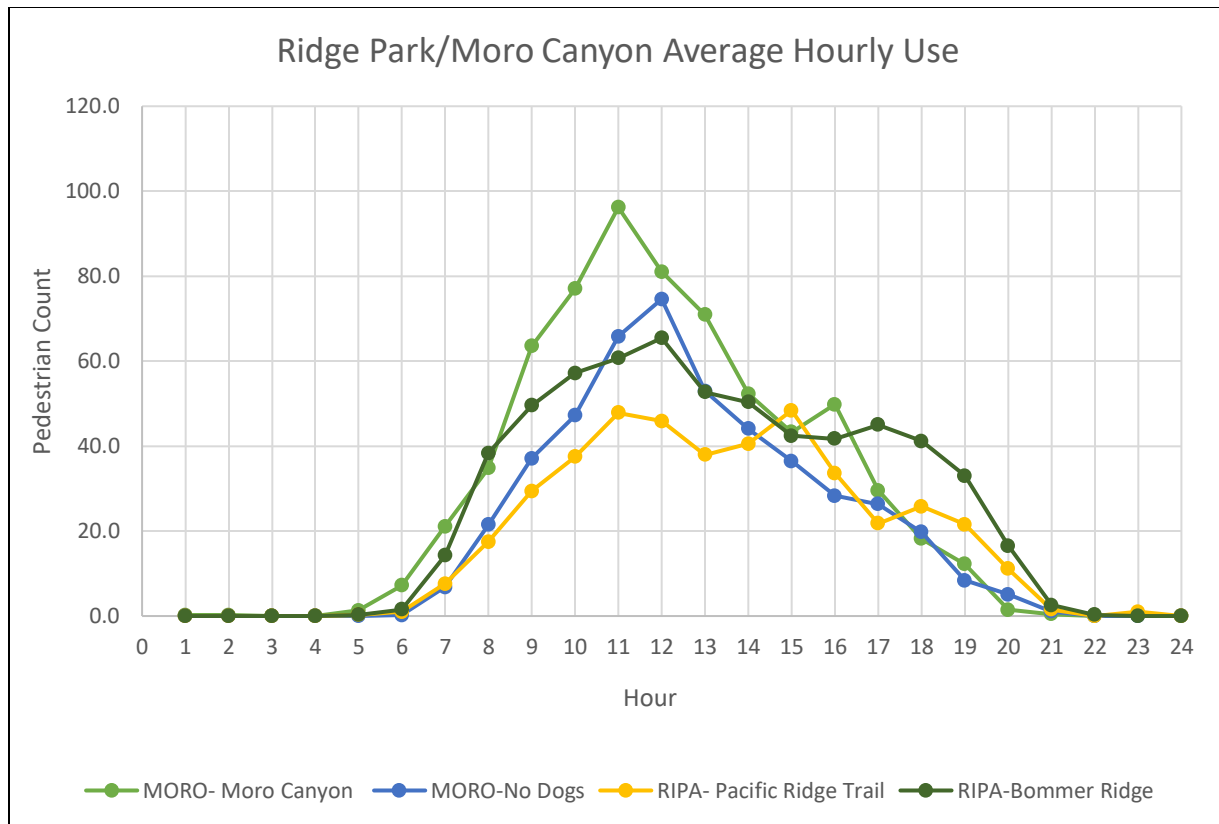
Figure A.48. *Average hourly visitor use at Ridge Park and Moro Canyon (Crystal Cove State Park) sampling locations.*
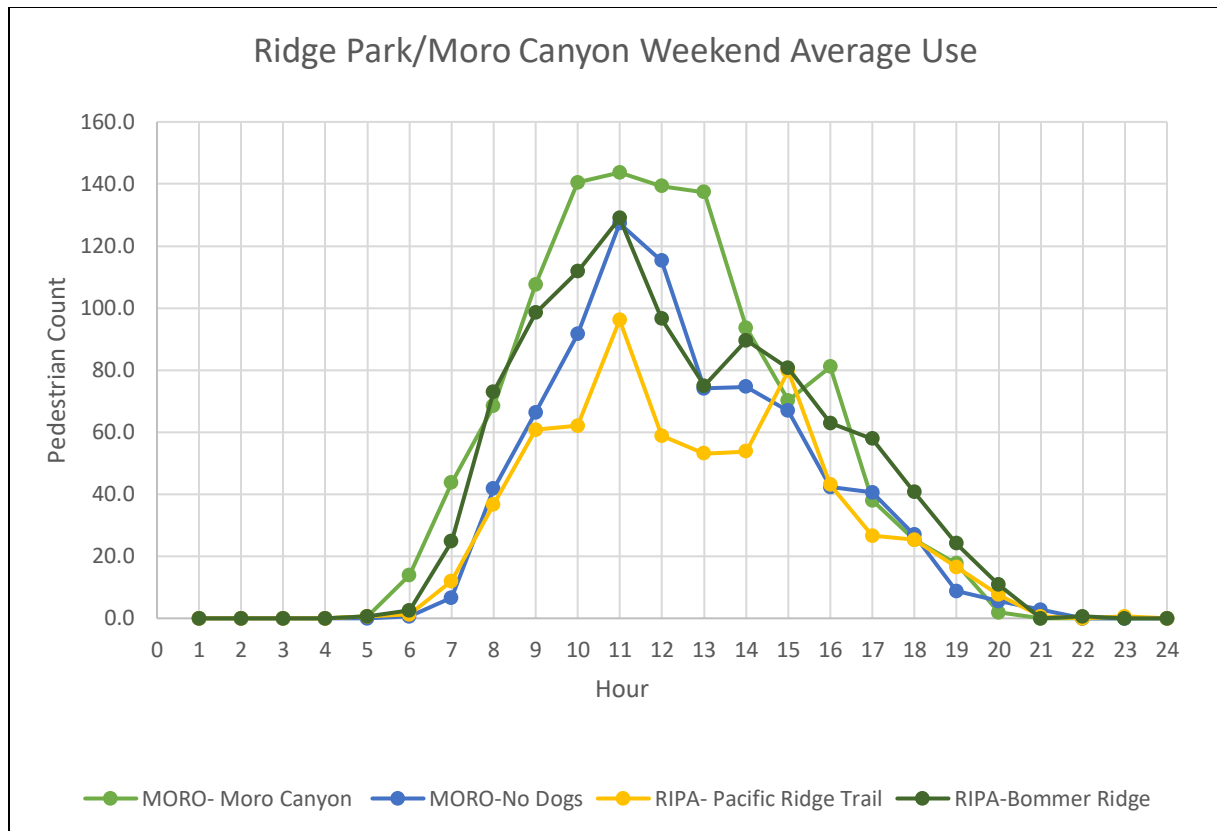
Figure A.49. *Average hourly weekend visitor use at Ridge Park and Moro Canyon (Crystal Cove State Park) sampling locations.*
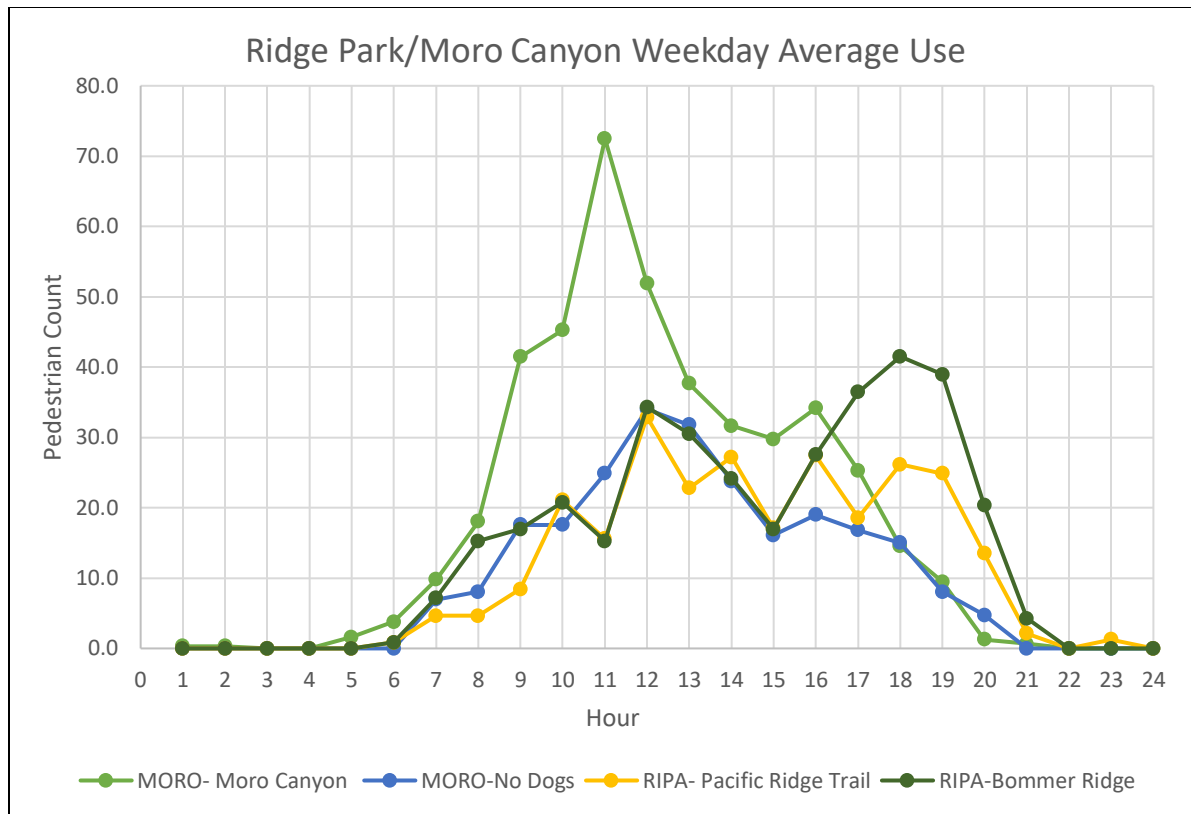
Figure A.50. *Average hourly weekday visitor use at Ridge Park and Moro Canyon (Crystal Cove State Park) sampling locations.*

Figure A.51. *Average hourly visitor use at Whiting Ranch Wilderness Park sampling locations.*
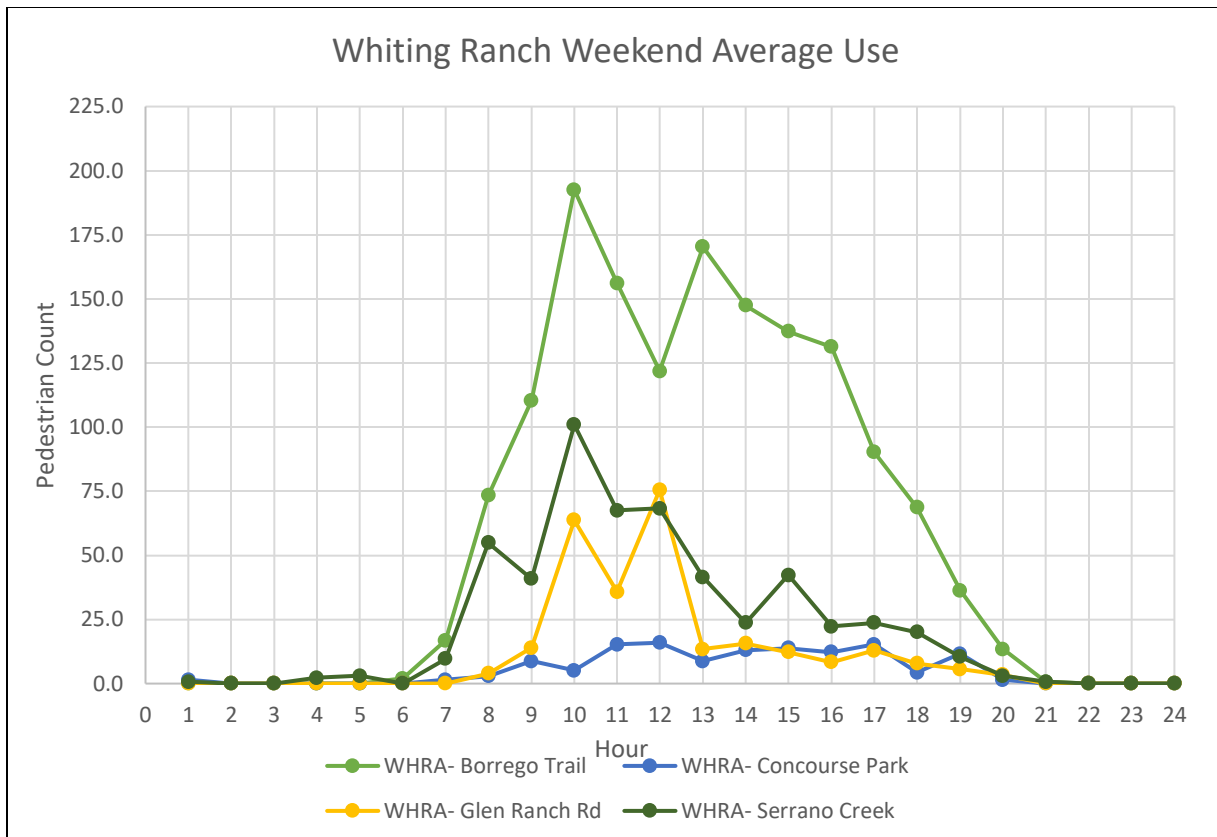
Figure A.52. *Average hourly weekend visitor use at Whiting Ranch Wilderness Park sampling locations.*
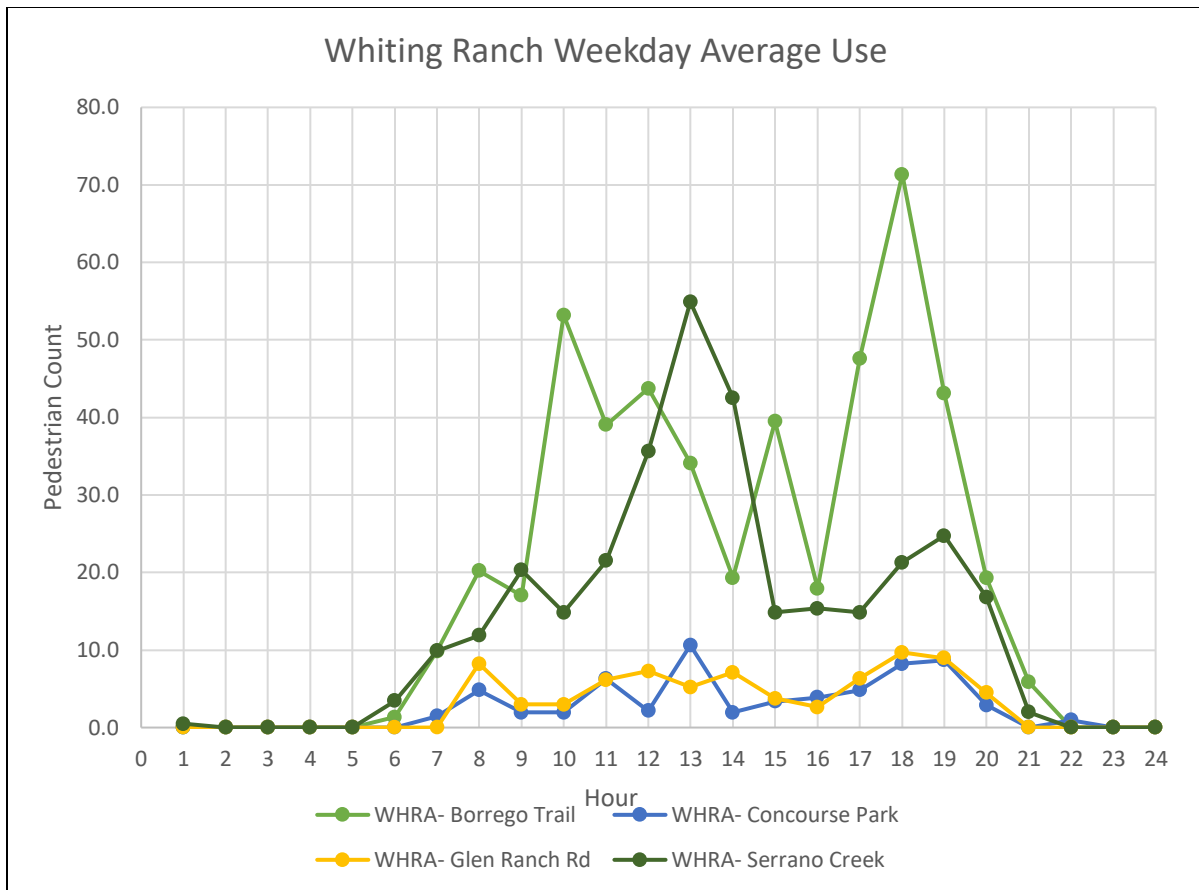
Figure A.53. *Average hourly weekday visitor use at Whiting Ranch Wilderness Park sampling locations.*

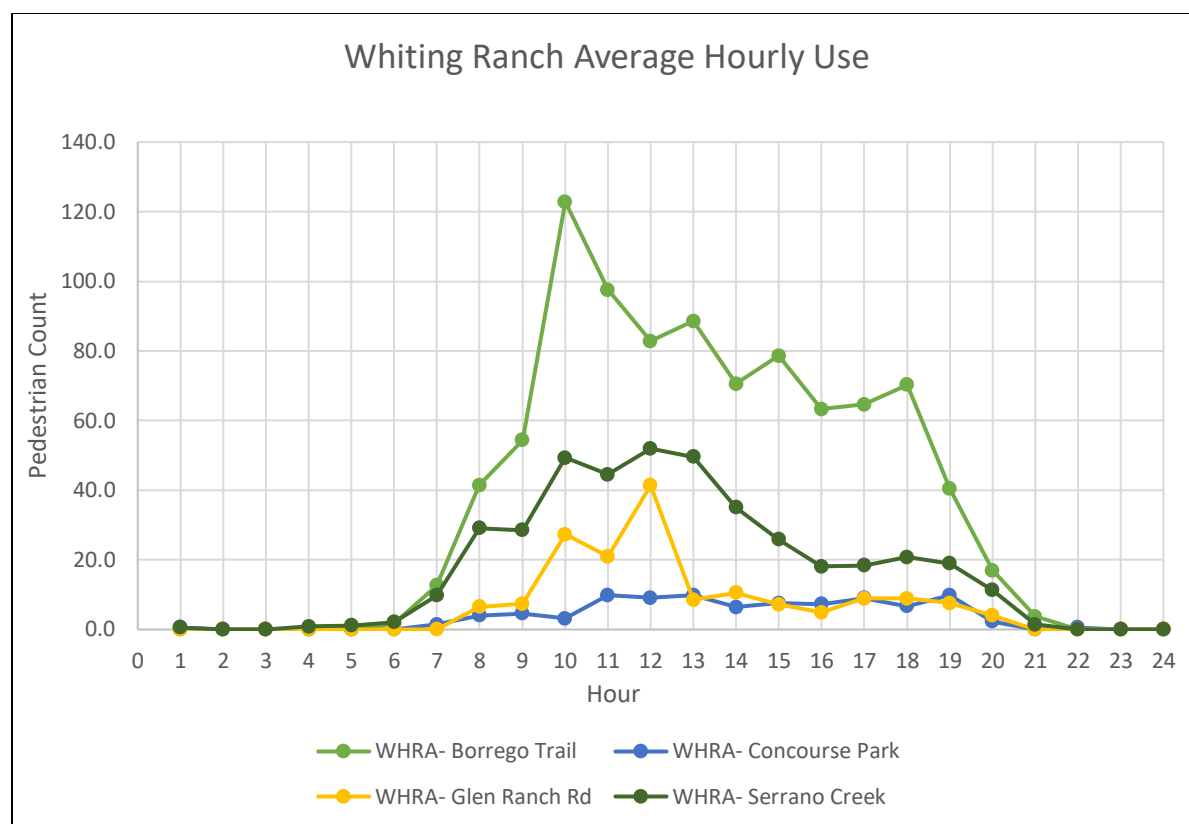# Appendix B – Additional Visitor GPS-Based Tracking and Survey Results

In both 2017 and 2018, GPS-based tracking and visitor surveys were conducted simultaneously to enable comparisons between visitor characteristics, motivations and other information collected in the survey instrument, with spatial data reflecting visitors' behavior patterns collected by the GPS devices. As such, the number of visitor surveys, GPS tracks and response rates are presented together in Table B.1. Figures B.1 – B.8 show the density of GPS points collected from visitors by sampling location.

2017

Table B.1. *Response rates of GPS tracks and surveys collected in 2017 by user group and sampling location.*

Sampling Location	Days Sampled	GPS tracks collected		Response rate		Surveys collected		Response rate	
		Biker	Hiker/ Runner	Biker	Hiker/ Runner	Biker	Hiker/ Runner	Biker	Hiker/ Runner
Peter's Canyon Regional Park	3	3	116	75%	82%	3	114	75%	78%
Top of the World	3	1	86	25%	75%	2	91	40%	73%
Willow/Nix Nature Center Staging Area (Laguna Coast Wilderness Park)	3	6	52	55%	78%	7	51	54%	70%
Irvine Ranch Open Space	1	0	8	N/A	80%	0	7	0%	64%
Aliso & Wood Canyons Wilderness Park	3	24	86	92%	75%	26	81	90%	70%
Bommer Canyon (City of Irvine)	3	8	53	53%	62%	8	61	53%	64%
Whiting Ranch Wilderness Park	7[a]	30	123	77%	77%	31	118	78%	73%
Whiting Ranch Wilderness Park—Borrego Canyon	3	13	68	77%	78%	13	65	77%	75%
Pacific Ridge Trailhead (LCWP/CCSP)	3	29	86	81%	74%	28	85	76%	73%
Black Star Canyon	1	1	32	100%	87%	1	31	100%	84%
Moro Canyon (Crystal Cove State Park)	3	7	90	78%	69%	6	96	67%	67%
Total	**33**	**109**	**732**	**75%**	**75%**	**112**	**735**	**73%**	**72%**

[a]Whiting Ranch Wilderness Park was sampled at three different entry points: Borrego Canyon (three days), Wahoo's Fish Tacos (two days) and Glenn Ranch Road (two days) to determine the entry with the highest level of use.

GPS-based tracking
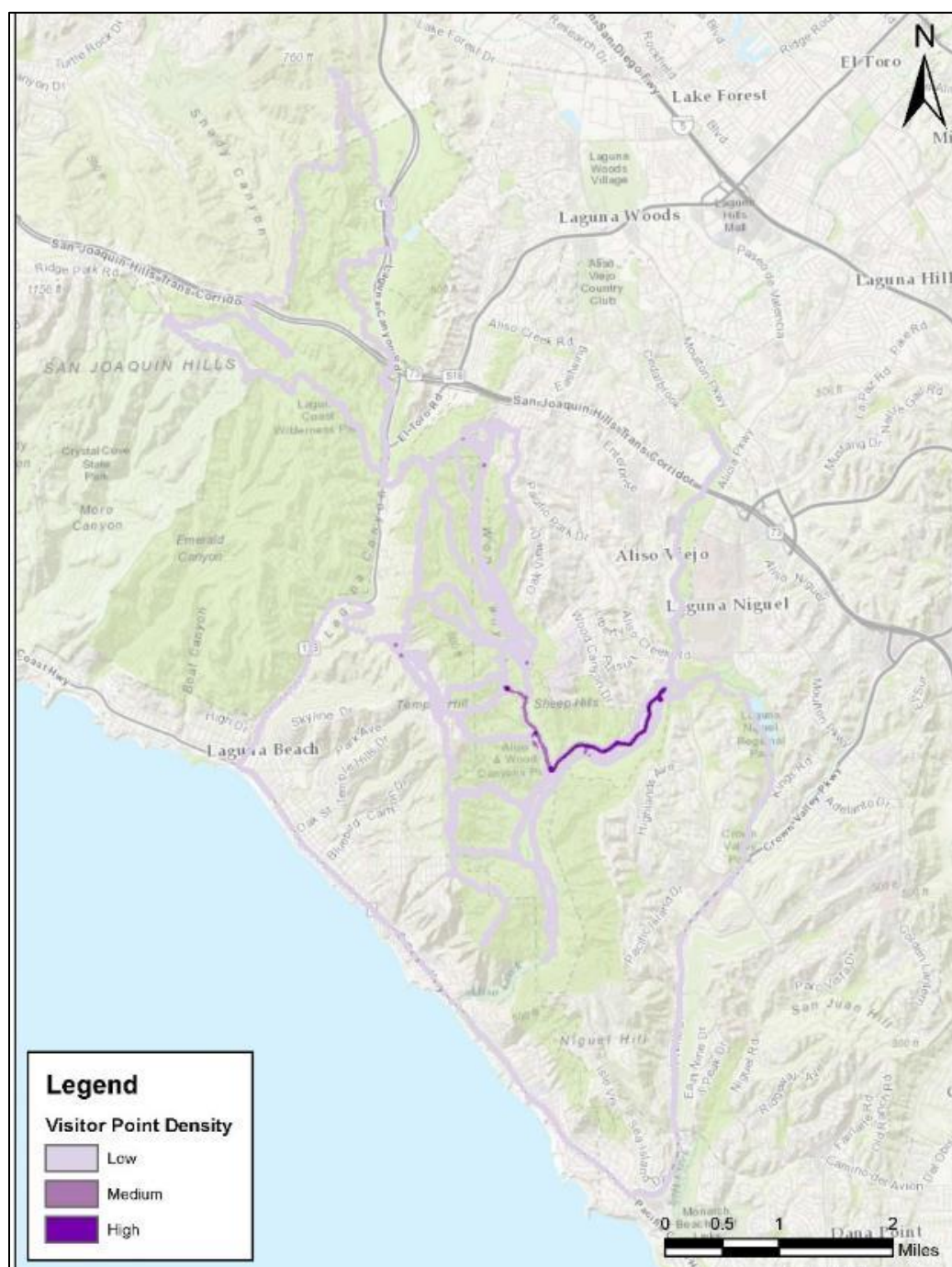
Figure B.1: *Visitor use density at Aliso and Wood Wilderness Park. (Expected counts for density layers: low = 0 - 4 points/m², medium = 5 - 12 points/m², high = 13 - 41 points/m²).*
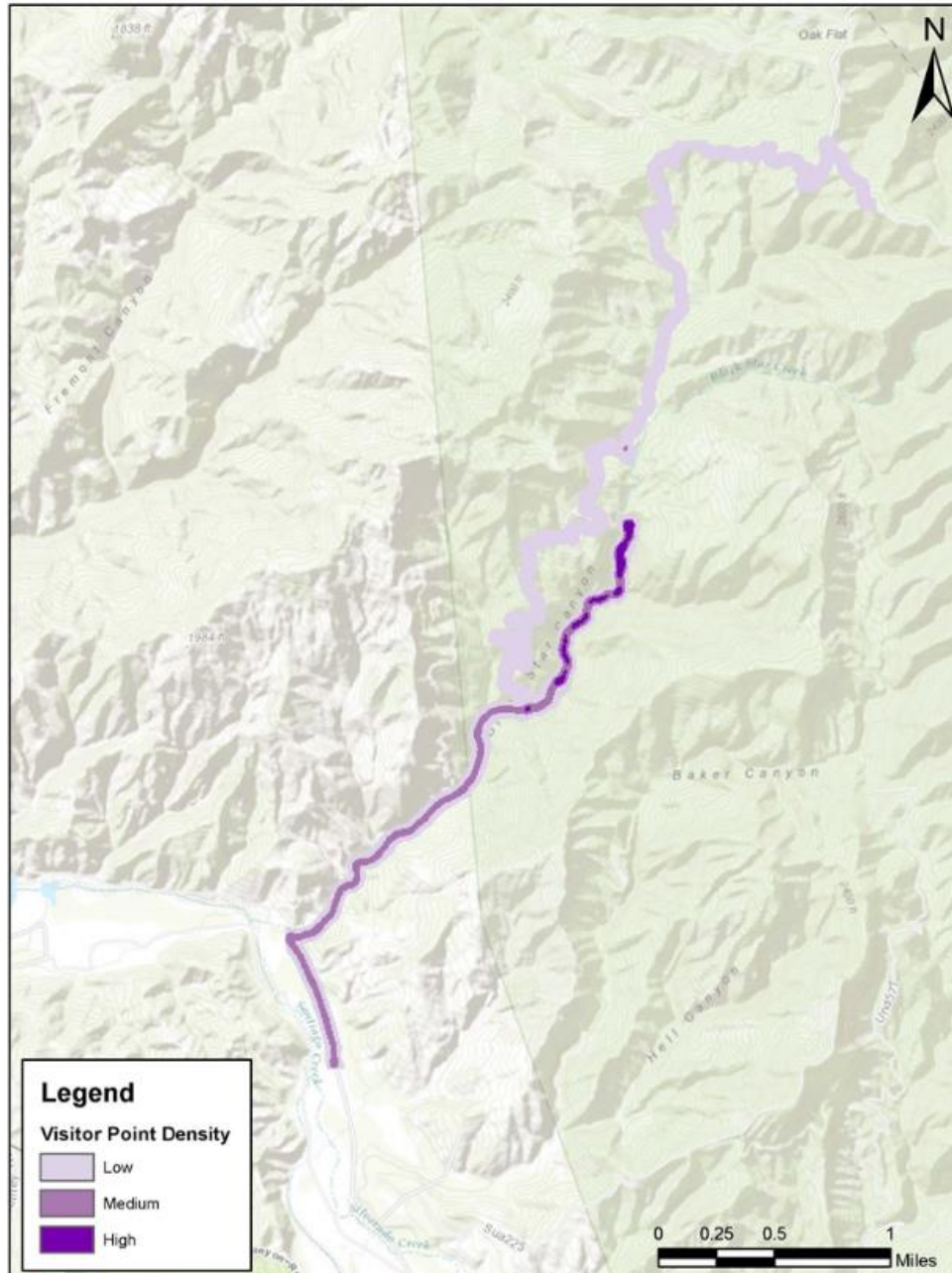
Figure B.2: *Visitor use density at Black Star Canyon Gate. (Expected counts for density layers: low = 0 - 3 points/m², medium = 4 - 10 points/m², high = 11 - 44 points/m²)*
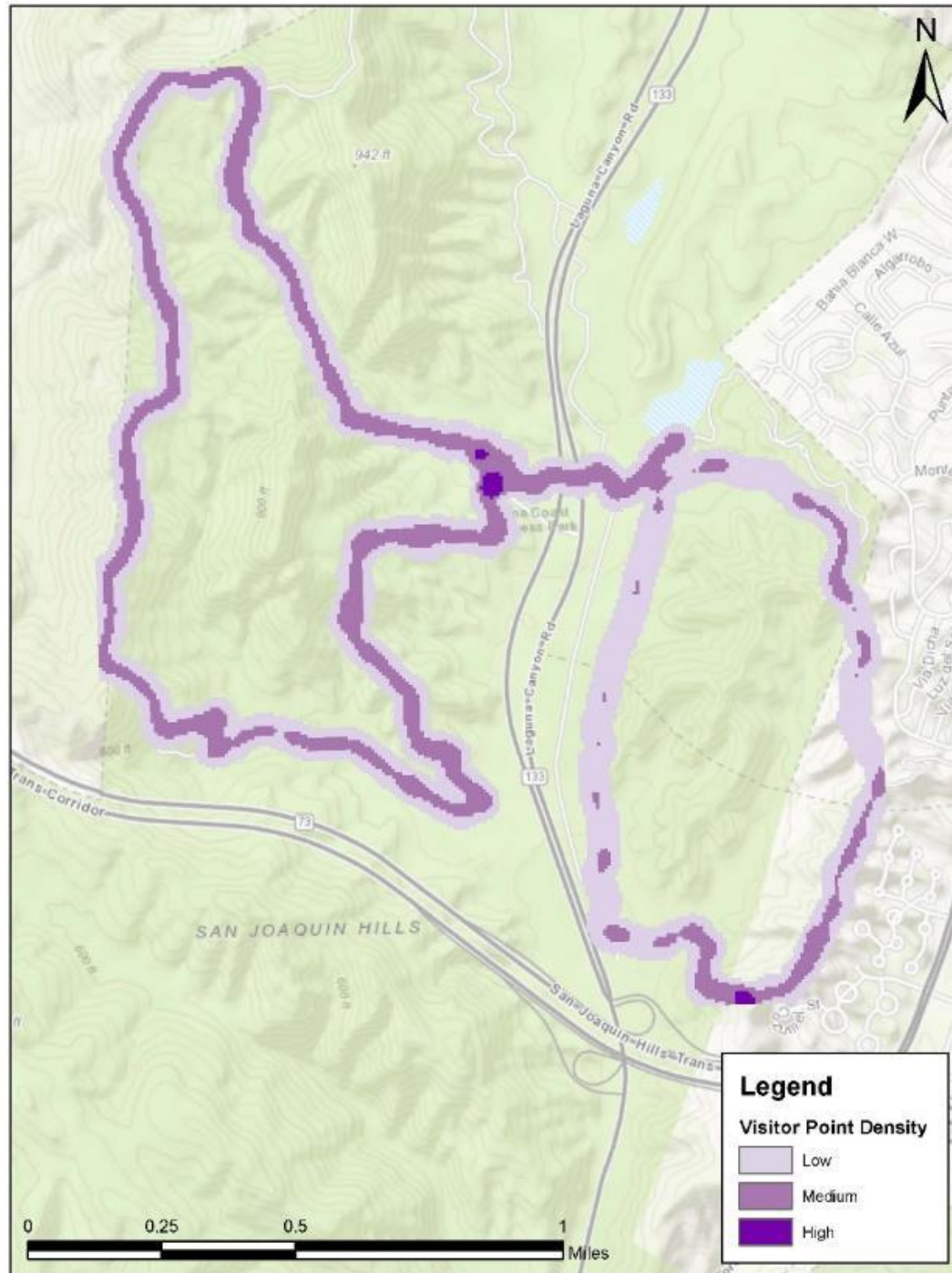
Figure B.3: *Visitor use density at Nix Nature Center, Laguna Coast Wilderness Park. (Expected counts for density layers: low = 0 - 1 points/m², medium = 1 - 2 points/m², high = 2 - 3 points/m²)*
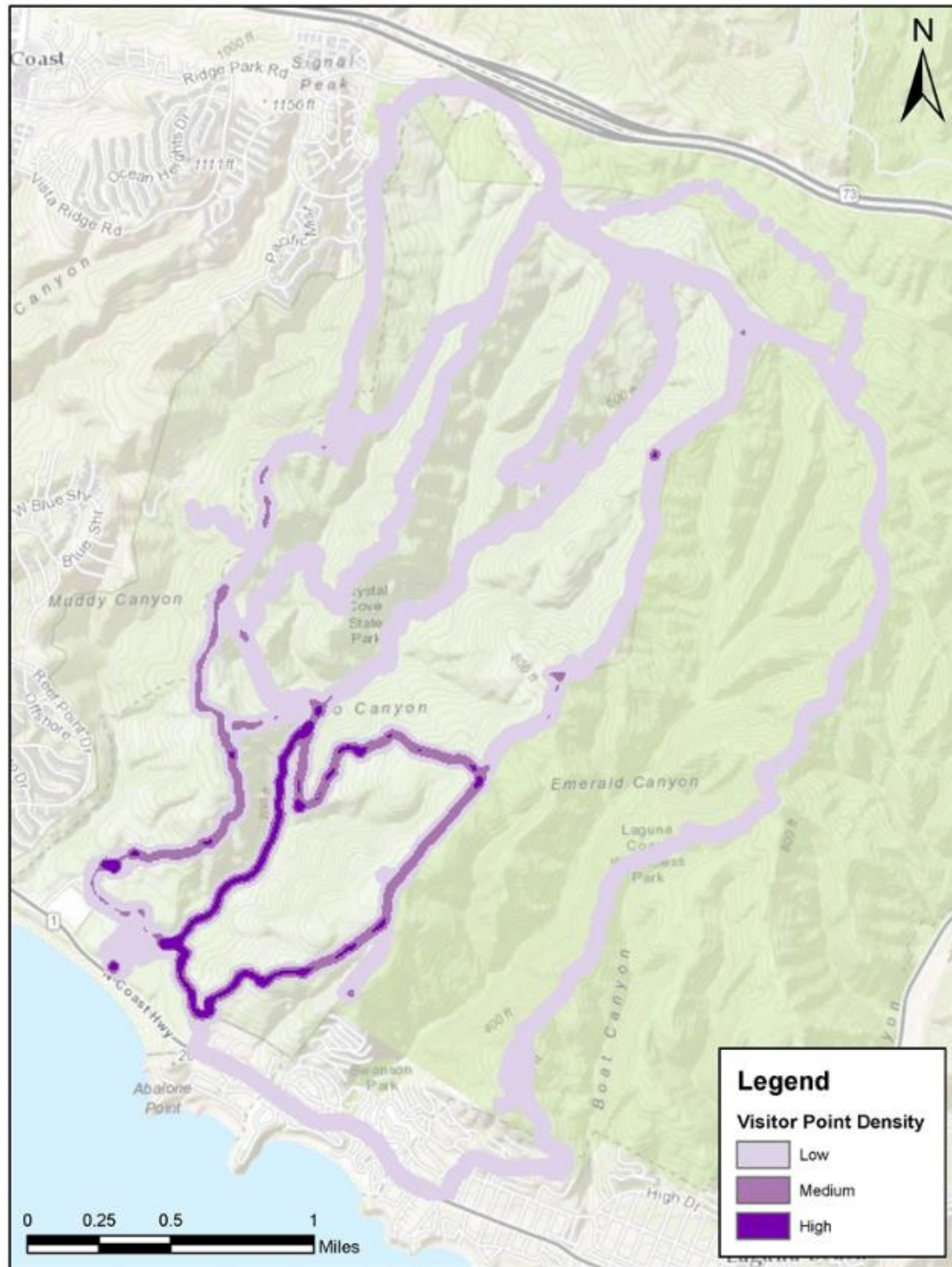
Figure B.4: *Visitor use density at Moro Canyon and No Dogs Trailheads, Crystal Cove State Park. (Expected counts for density layers: low = 0 - 2 points/m², medium = 3 - 5 points/m², high = 6 - 22 points/m²)*
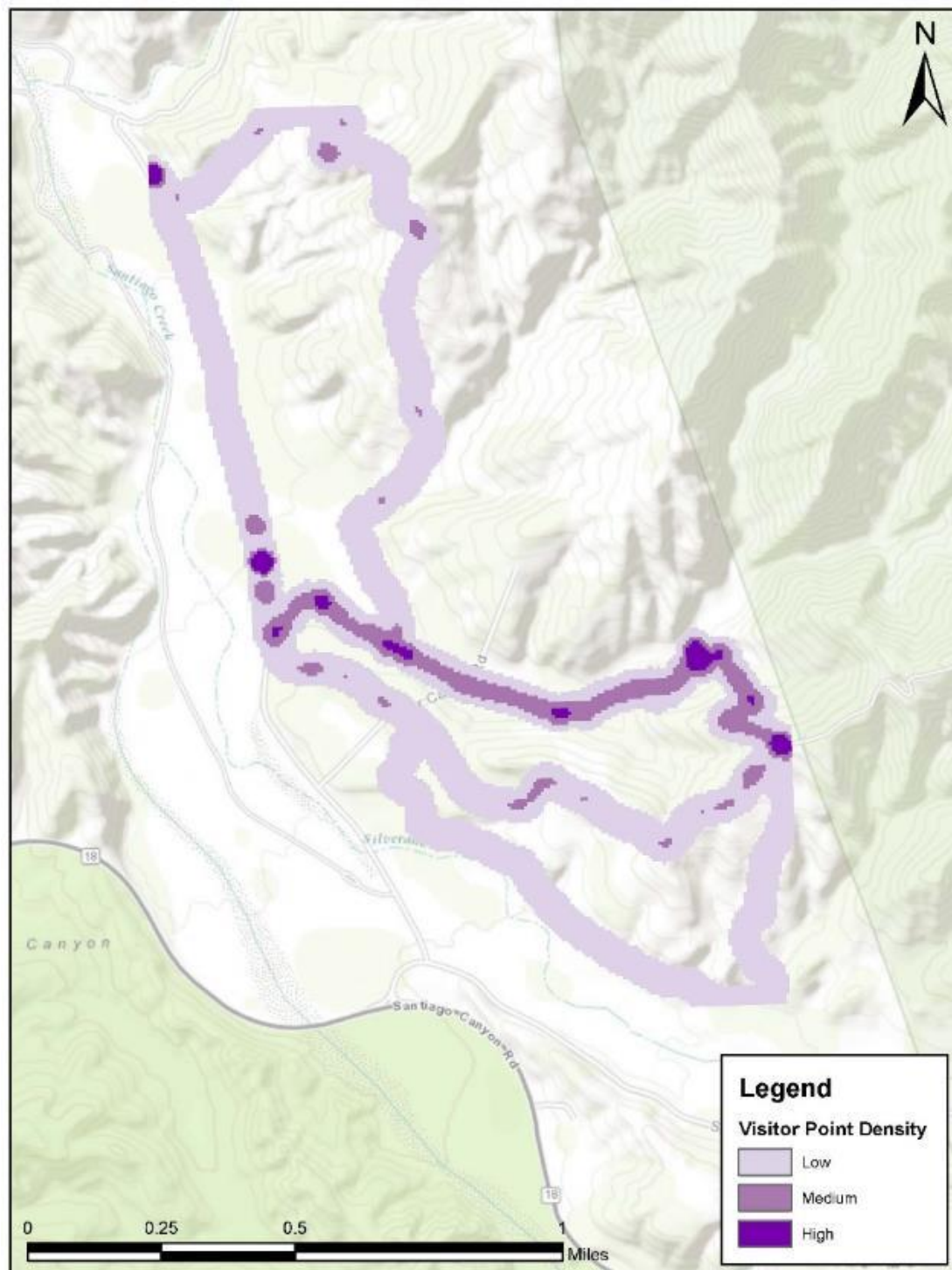
Figure B.5: *Visitor use density at Irvine Ranch Open Space, Baker Staging Area. (Expected counts for density layers: low = 0 - 1 points/m², medium = 1 - 2 points/m², high = 3 - 5 points/m²)*
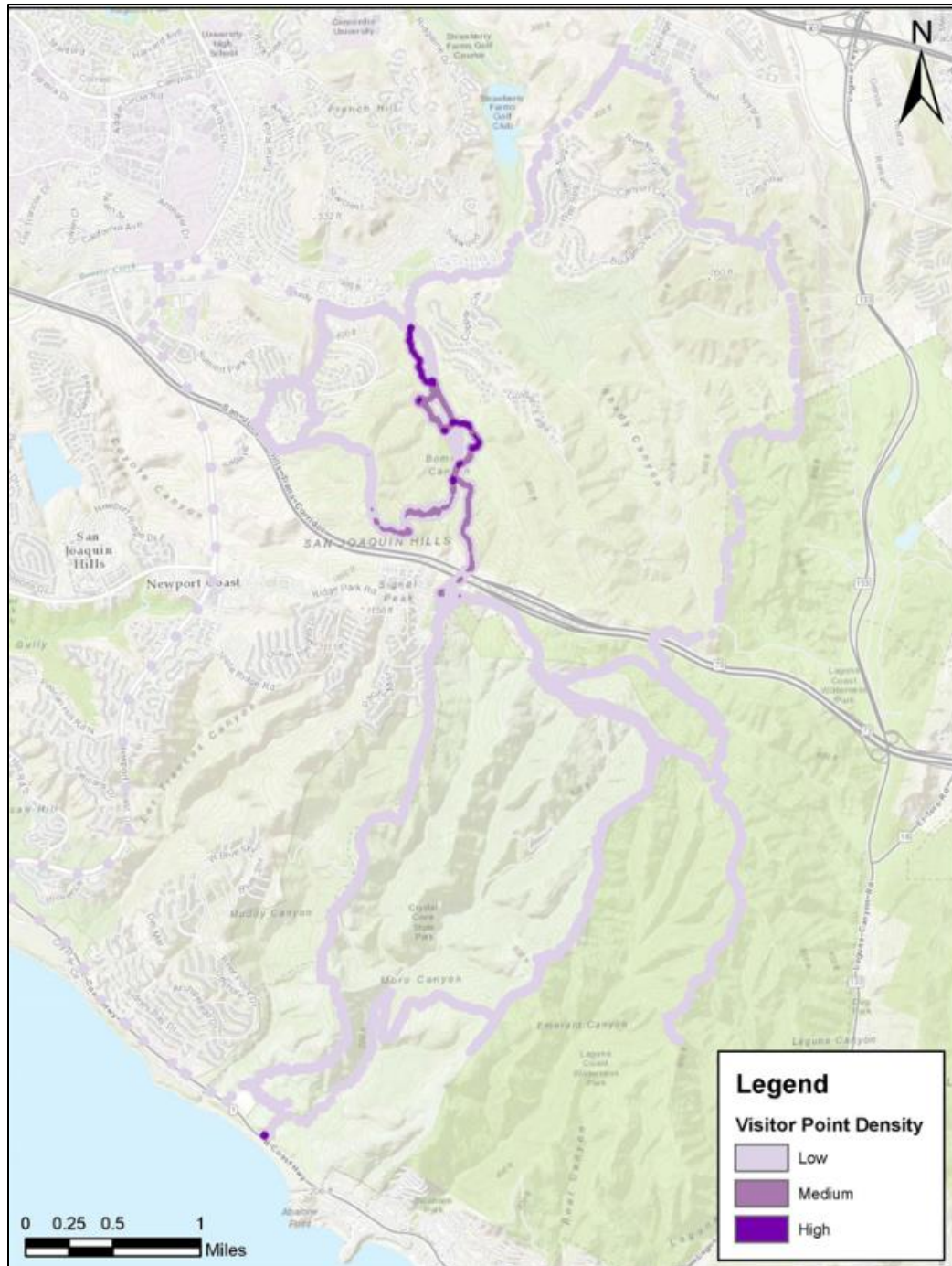
Figure B.6: *Visitor use density at Bommer Canyon (City of Irvine). (Expected counts for density layers: low = 0 - 2 points/m^2, medium = 3 - 7 points/m^2, high = 8 - 26 points/m^2)*
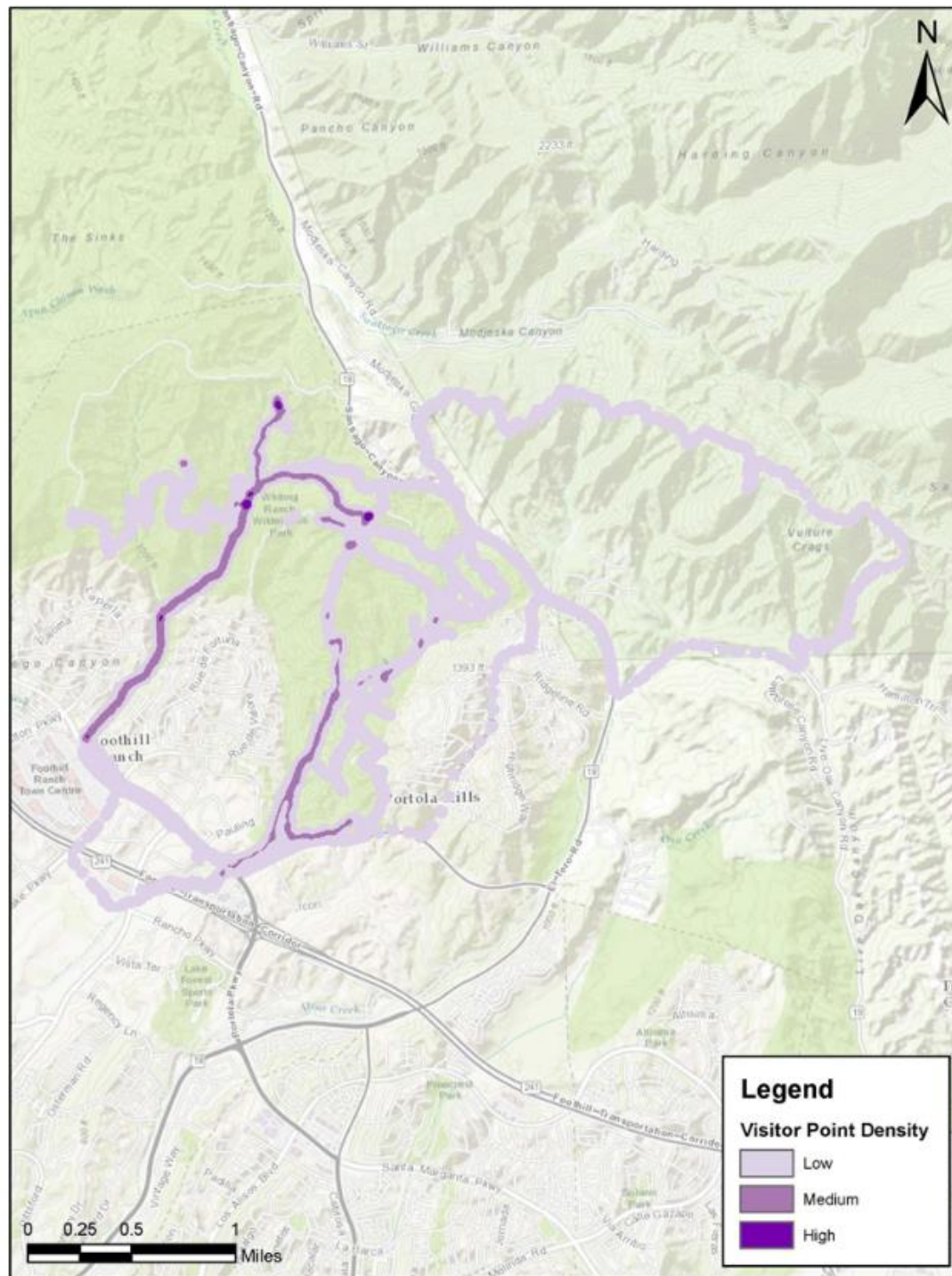
Figure B.7: *Visitor use density at Whiting Ranch Wilderness Park. (Expected counts for density layers: low = 0 - 5 points/m², medium = 6 - 20 points/m², high = 21 - 56 points/m²)*
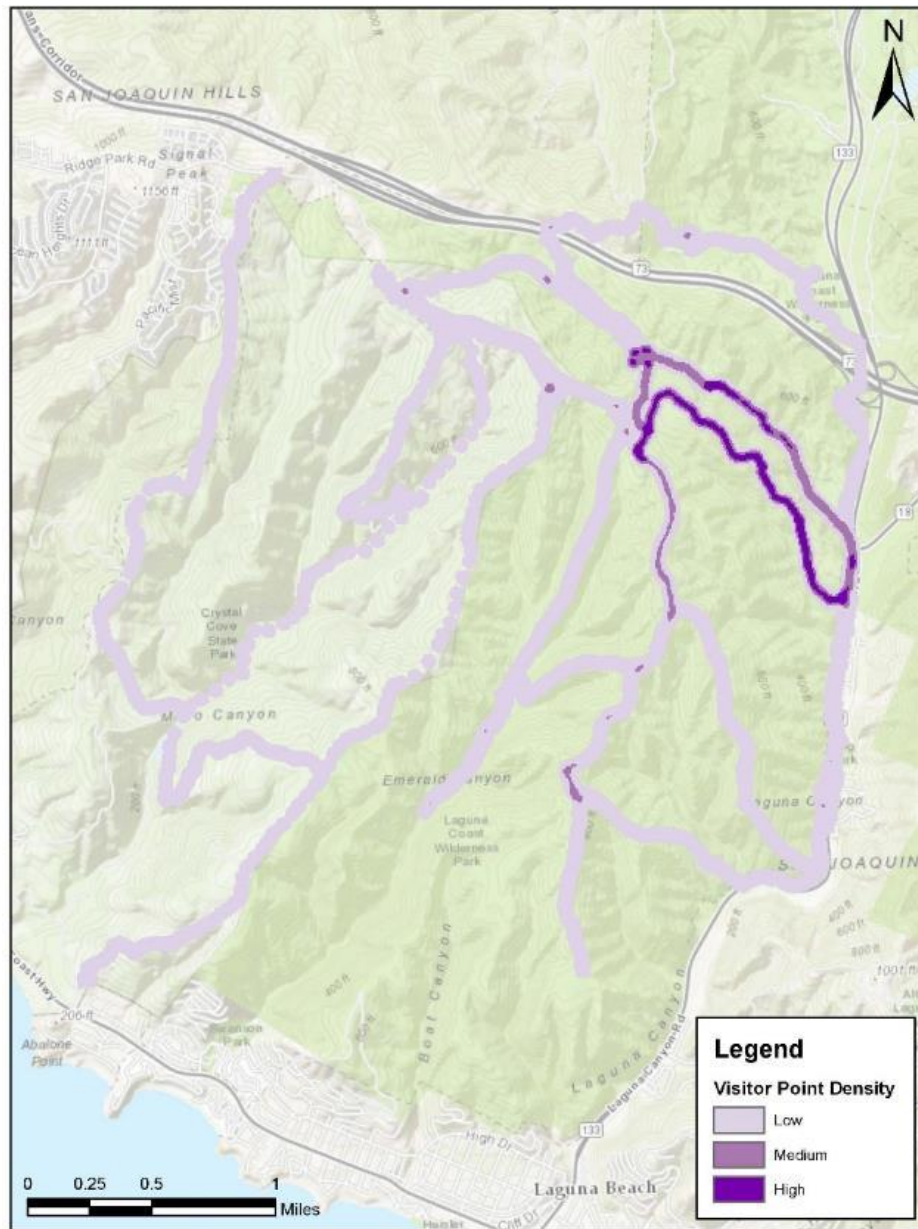
Figure B.8: *Visitor use density at Willow Staging Area, Laguna Coast Wilderness Park. (Expected counts for density layers: low = 0 - 1 points/m², medium = 2 - 4 points/m², high = 5 - 15 points/m²)*

Visitor surveys

The majority of visitors obtain updates and information about the park from friends (38%) or the park website (29%). Other sources of information include reserve staff, TV/radio/newspaper/magazines, other websites, social media, mobile apps, and other sources (fig. B.9).
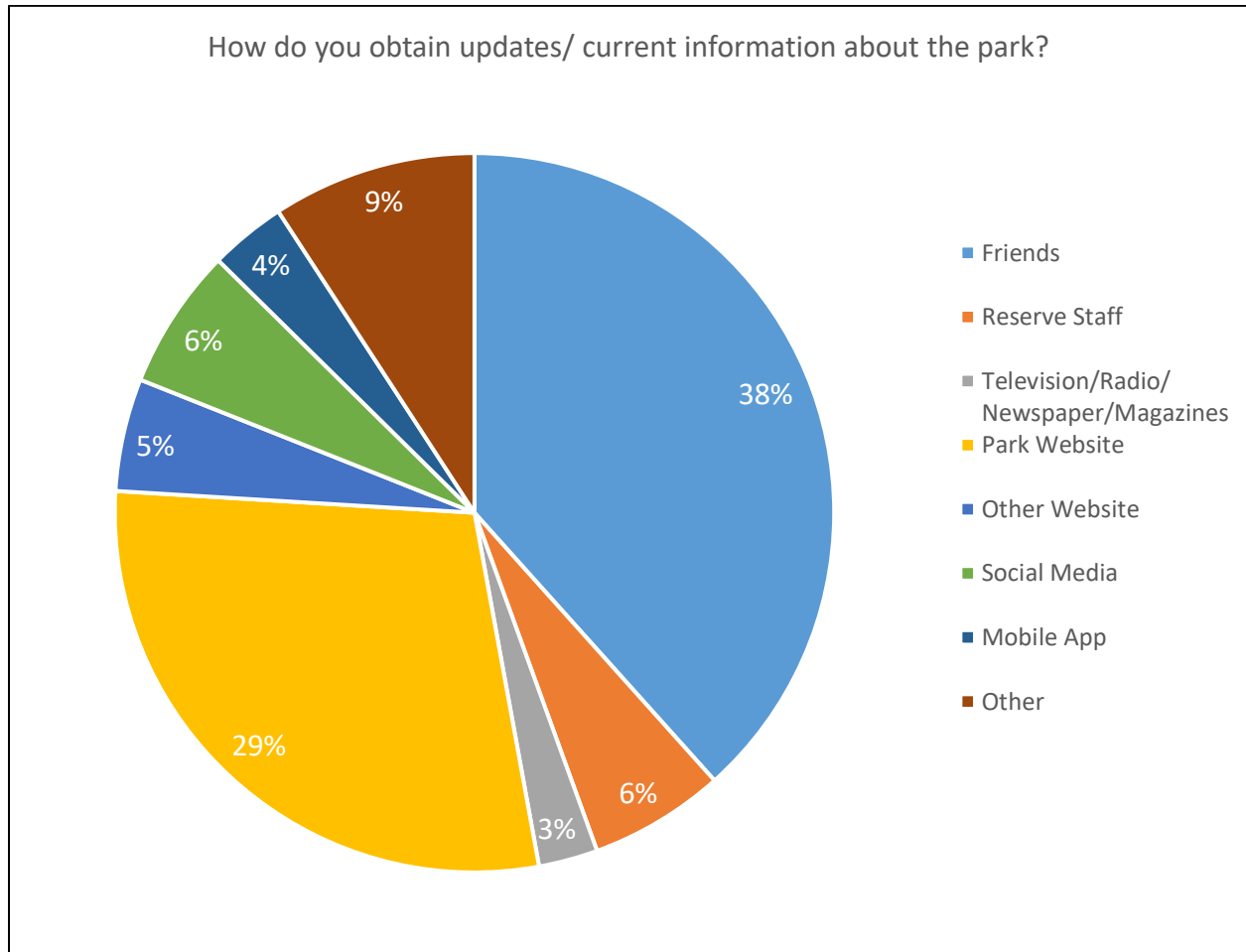
Figure B.9. *Visitor information sources.*

Additional analyses of survey data are presented below, and include visitor language spoken by location (fig. B.10), frequency of technology and app use by visitors across Reserve units (fig. B.11), visitor knowledge and agreement of Reserve goals (fig. B.12), and visitor conflict (figures B.13 -B.14). Across Reserve units, most visitors reported having some general knowledge of the goals of the Nature Reserve of Orange County (70.4%), and some knowledge of the conservation goals of the Nature Reserve of Orange County (69.8%). Just over 12% (12.4%) of visitors reported no knowledge of the general goals of the Reserve, and 25.3% reported no knowledge of the conservation goals of the Reserve. Similarly, 12.6% of visitors reported having expert knowledge of the general goals of the Reserve, while only 5% of visitors reported having expert knowledge of the conservation goals of the Reserve.
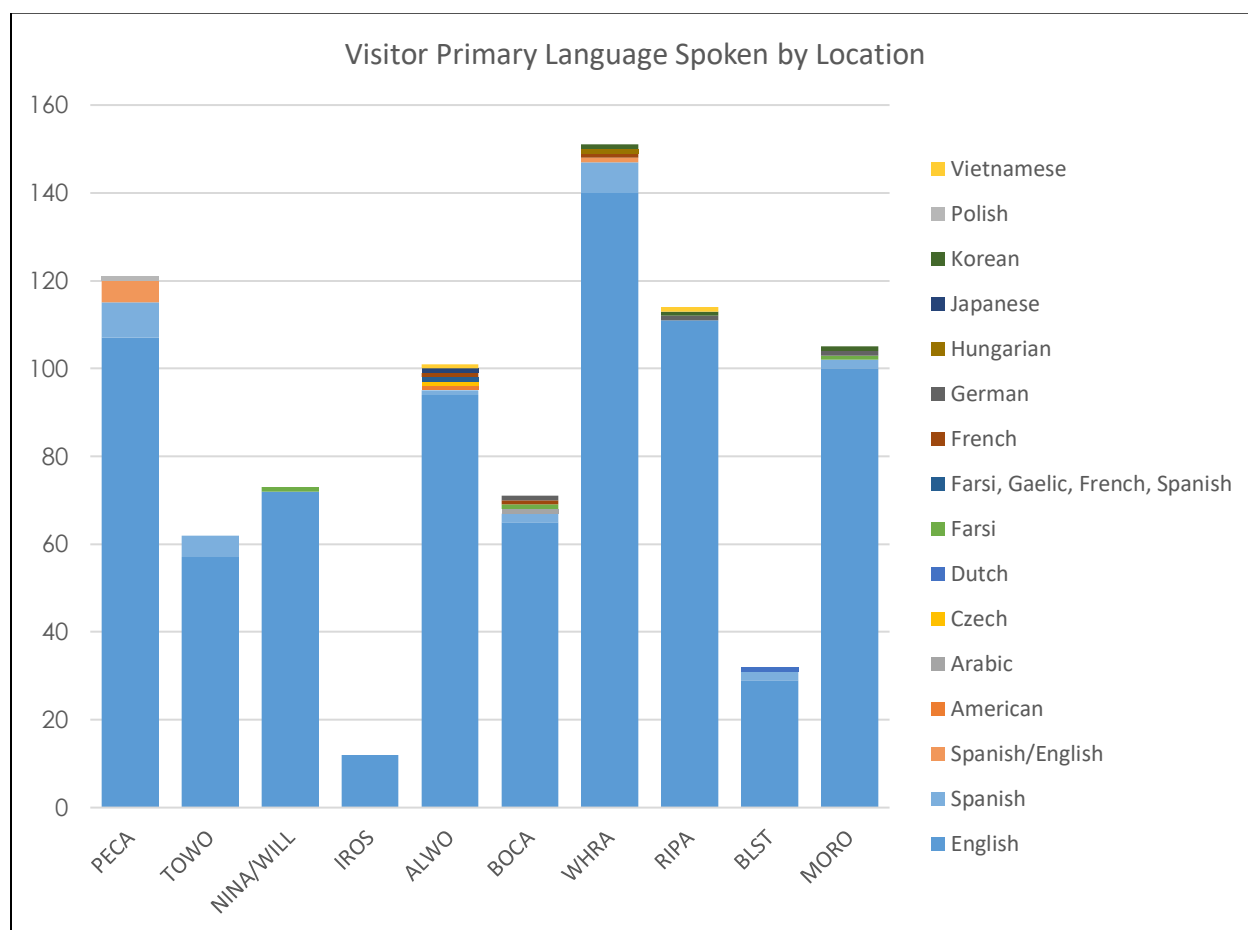
Figure B.10. *Visitor language spoken across all Reserve units.*
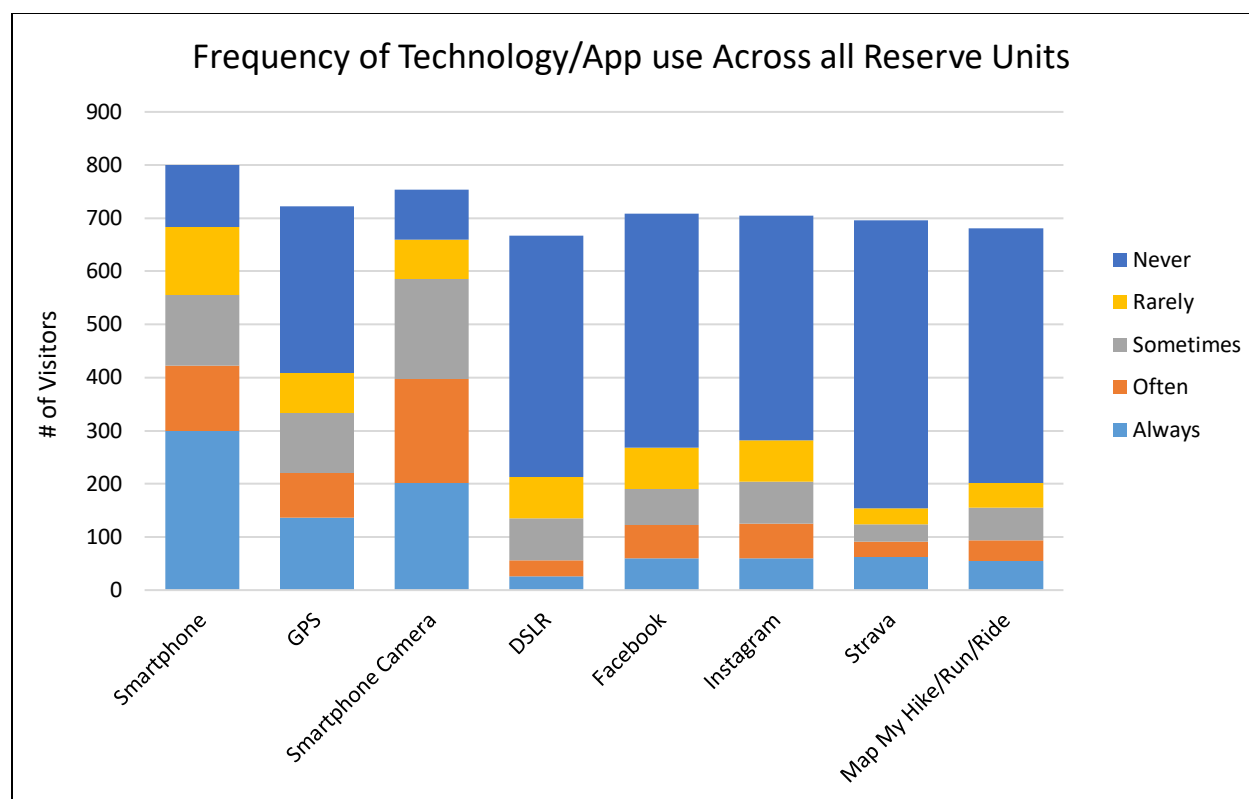
Figure B.11. *Frequency of technology and application (app) use across all Reserve units.*
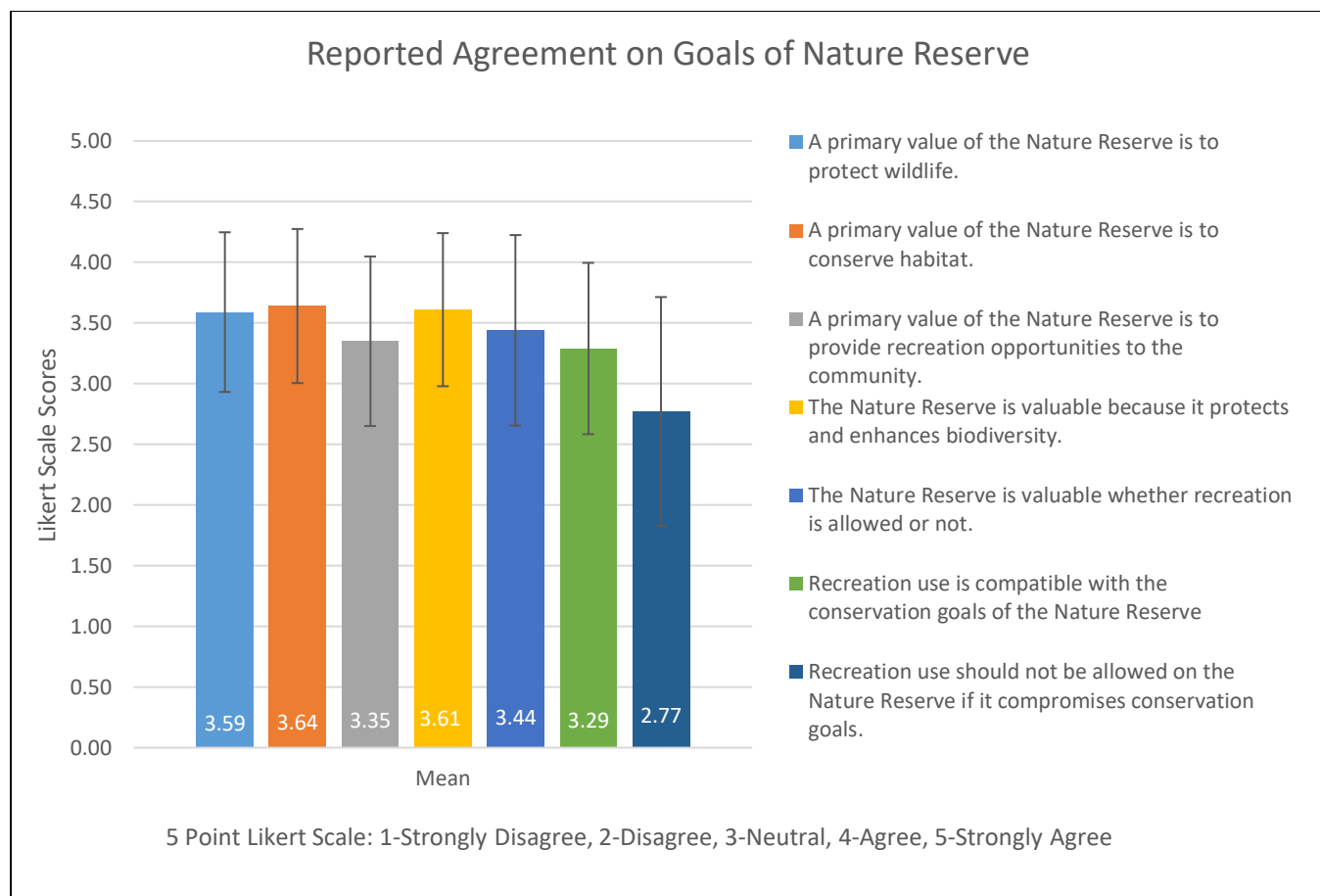
Figure B.12. *Mean visitor agreement on goals of the Nature Reserve of Orange County.*
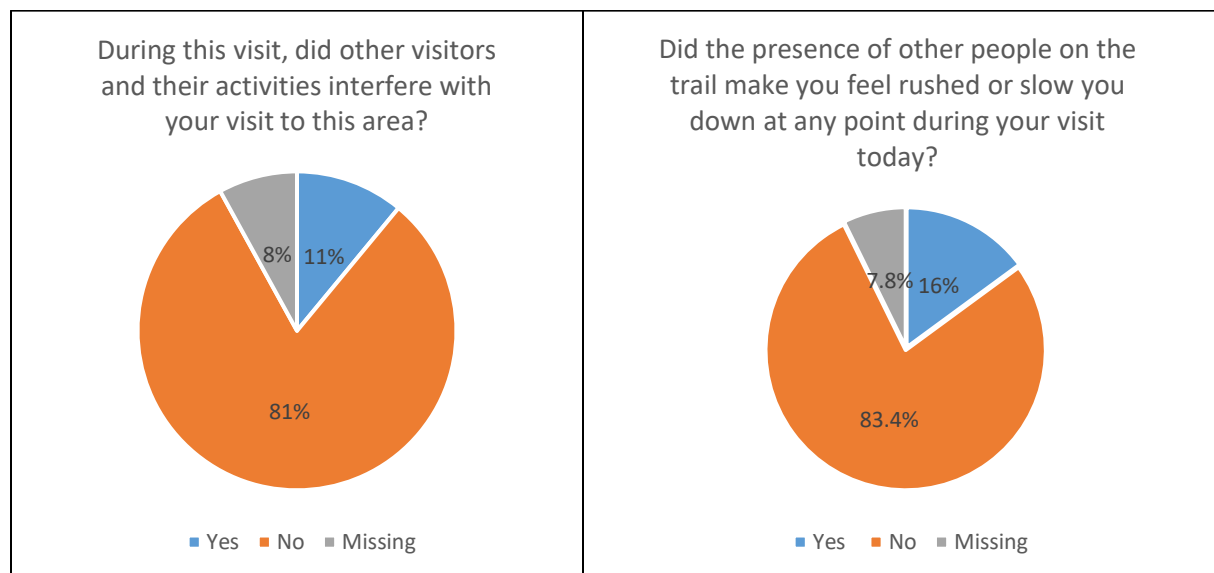
Figures B.13 and B.14. *Visitor conflict measures across all Reserve units.*
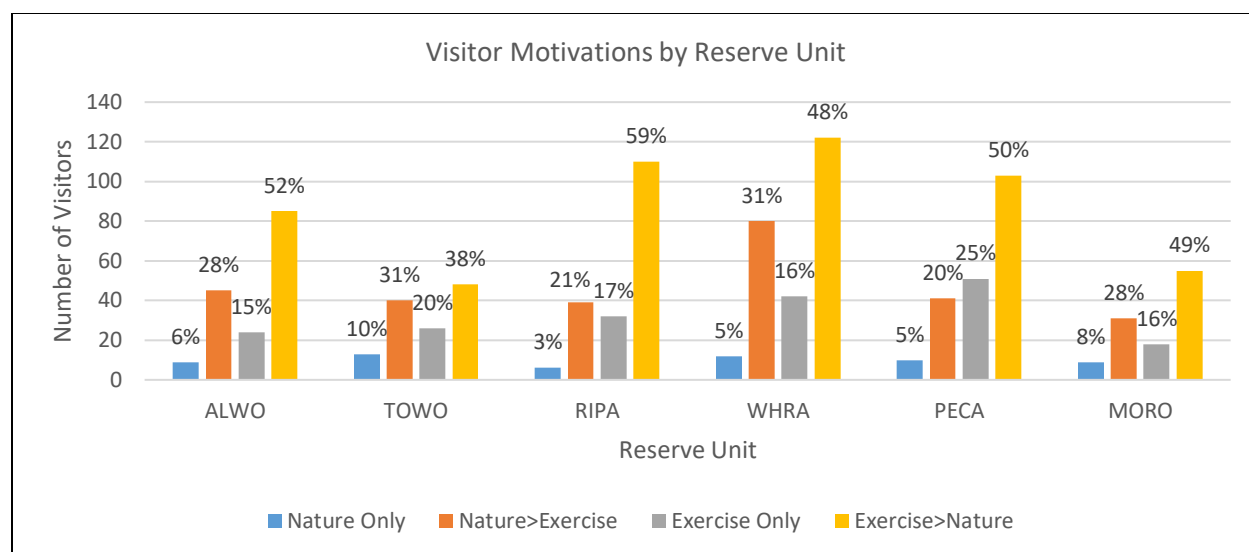
Figure B.15. *Frequency of visitor motivations by Reserve unit. Visitor motivation categories include nature only (blue), both nature and exercise, but more so nature (orange), exercise only (grey), and both nature and exercise but more so exercise (yellow).*

Table B.2. below has details of post hoc comparisons of an Analysis of Variance (ANOVA) examining differences between the visitor motivation factors (derived from the visitor motivation scale) of "Challenge" and "Safety" across all Reserve units. These two factors were the only factors that were statistically significantly different between different Reserve units. For the factor "Challenge", visitors to Peters Canyon Regional Park rated being more highly motivated by challenge than visitors to Top of the World and Bommer Canyon. There were no other significant differences between other units. For the factor "Safety", visitors to Peters Canyon Regional Park rated being more highly motivated by safety than visitors to Top of the World, Bommer Canyon, Whiting Ranch Wilderness Park, and Ridge Park. There were no other significant differences between other units.

Table B.2. *A comparison of factor mean scores between sampling locations.*

Factor	Sampling Location										ANOVA results	
	PECA	TOWO	NINA/ WILL	IROS	ALWO	BOCA	WHRA	RIPA	BLST	MORO	F	P
Challenge[1]	3.62[a]	3.07[b]	3.40[ab]	3.33[ab]	3.32[ab]	3.09[b]	3.44[ab]	3.44[ab]	3.48[ab]	3.31[ab]	2.651	.005
Safety[2]	3.33[a]	2.73[b]	2.78[ab]	2.62[ab]	2.86[ab]	2.72[b]	2.78[b]	2.80[b]	2.81[ab]	2.85[ab]	3.699	.000

Means followed by the same letter are not significantly different with the [1]Scheffe multiple comparison or [2]Games-Howell multiple comparison procedure at $p < .05$.

As with 2017 data, GPS-based tracking and visitor surveys in 2018 were conducted simultaneously to enable comparisons between visitor characteristics, motivations and other information collected in the survey instrument with spatial data reflecting visitors' behavior patterns collected by the GPS devices. The number of visitor surveys, GPS tracks and response rates are presented together in Table B.3. Figures B.16 – B.19 are supplementary analyses of GPS-based tracking results presented in the "Visitor Spatial Dynamics" and "Spatial Dynamics of Mountain Bikers" sections of the report. These figures illustrate the location and frequency of GPS-tracked mountain bike visitors' origin by zip code.

2018

Table B.3. *Response rates of GPS tracks and surveys collected by user group and sampling location in 2018.*

Sampling Location	Days Sampled	GPS tracks collected*	Response Rate	Surveys collected		Response rate	
		Biker	*Biker*	*Biker*	*Hiker*	*Biker*	*Hiker*
Peter's Canyon Regional Park	5	28	97%	31	171	92%	73%
Top of the World	3[a]	2	67%	4	122	80%	76%
Aliso & Wood Canyons Wilderness Park	4[a]	65	86%	66	98	85%	64%
Whiting Ranch Wilderness Park--Wahoos	4[b]	59	86%	59	68	86%	71%
Whiting Ranch Wilderness Park—Borrego Canyon	4[b]	14	82%	13	118	77%	63%
Pacific Ridge Trailhead (LCWP/CCSP)	4[c]	77	73%	78	109	74%	68%
Moro Canyon (CCSP)	3[c]	5	100%	6	107	86%	74%
Total	**33**	**250**	**82%**	**257**	**793**	**81%**	**70%**

*GPS tracks were only collected for bikers in 2018.
[a,b,c]Locations with the same letter were sampled over the same sampling period.

GPS-based tracking
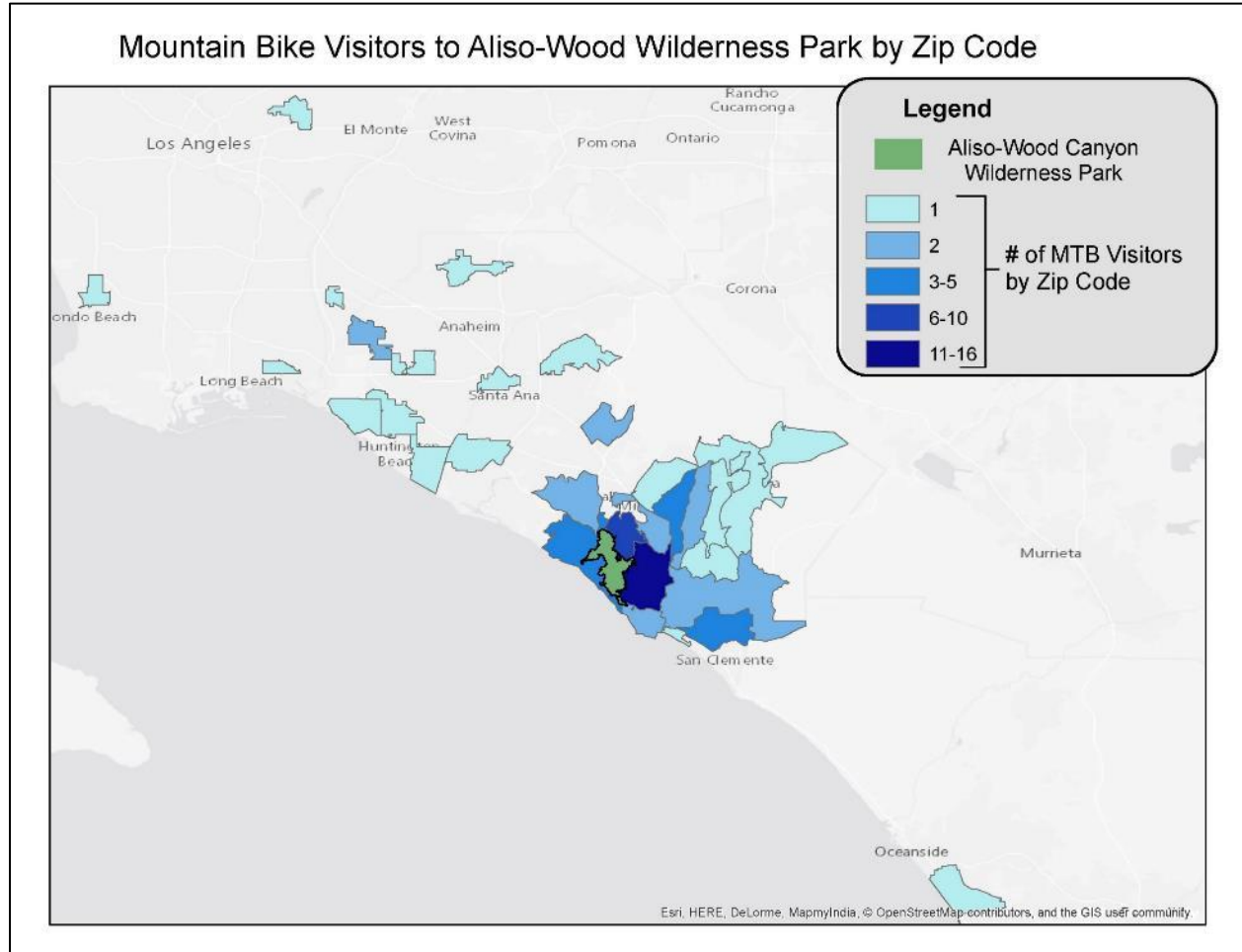
Figure B.16. *Location and frequency of mountain bike visitors' origin by zip code for Aliso and Wood Wilderness Park.*
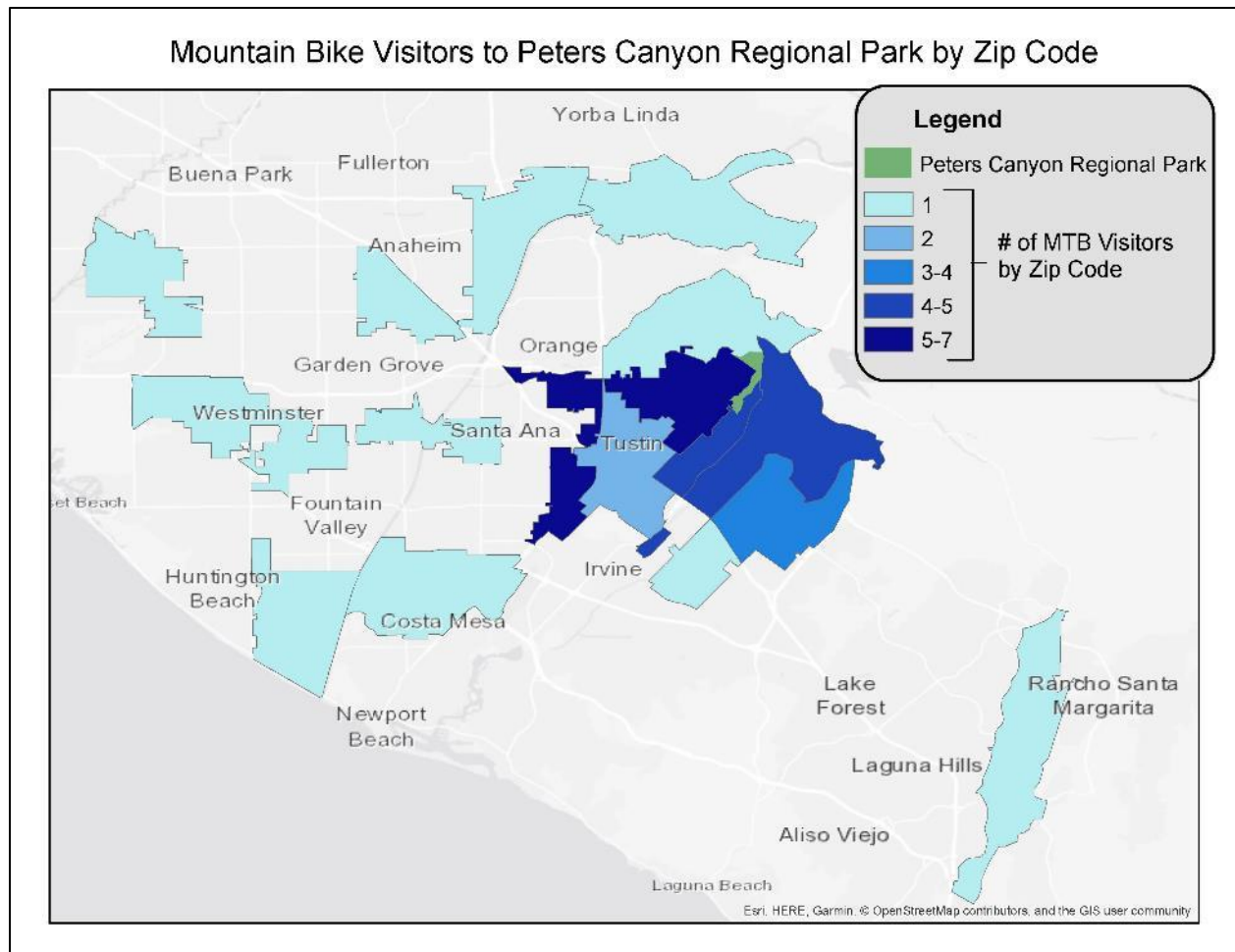
Figure B.17. *Location and frequency of mountain bike visitors' origin by zip code for Peters Canyon Regional Park.*
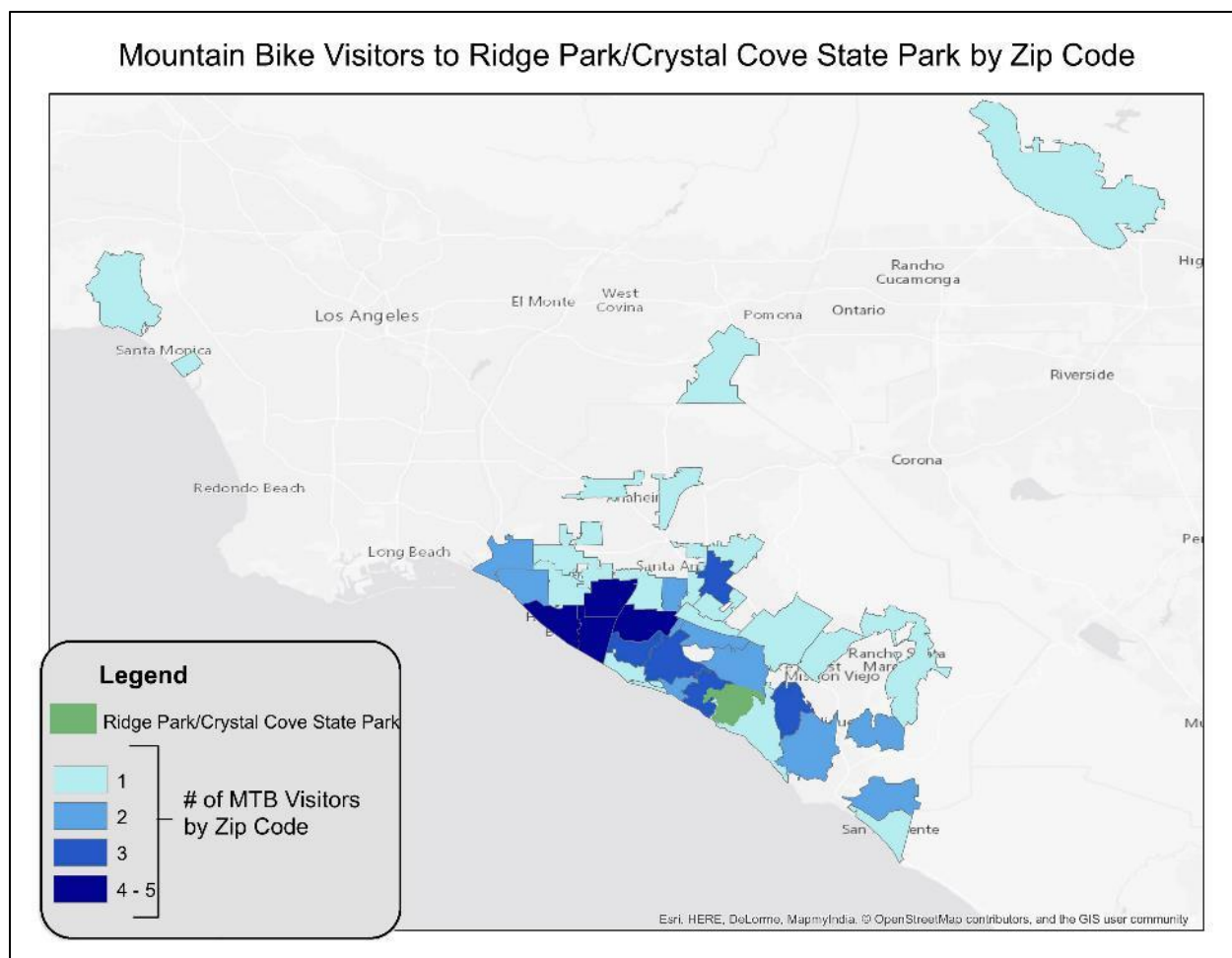
Figure B.18. *Location and frequency of mountain bike visitors' origin by zip code for Ridge Park/Crystal Cove State Park.*
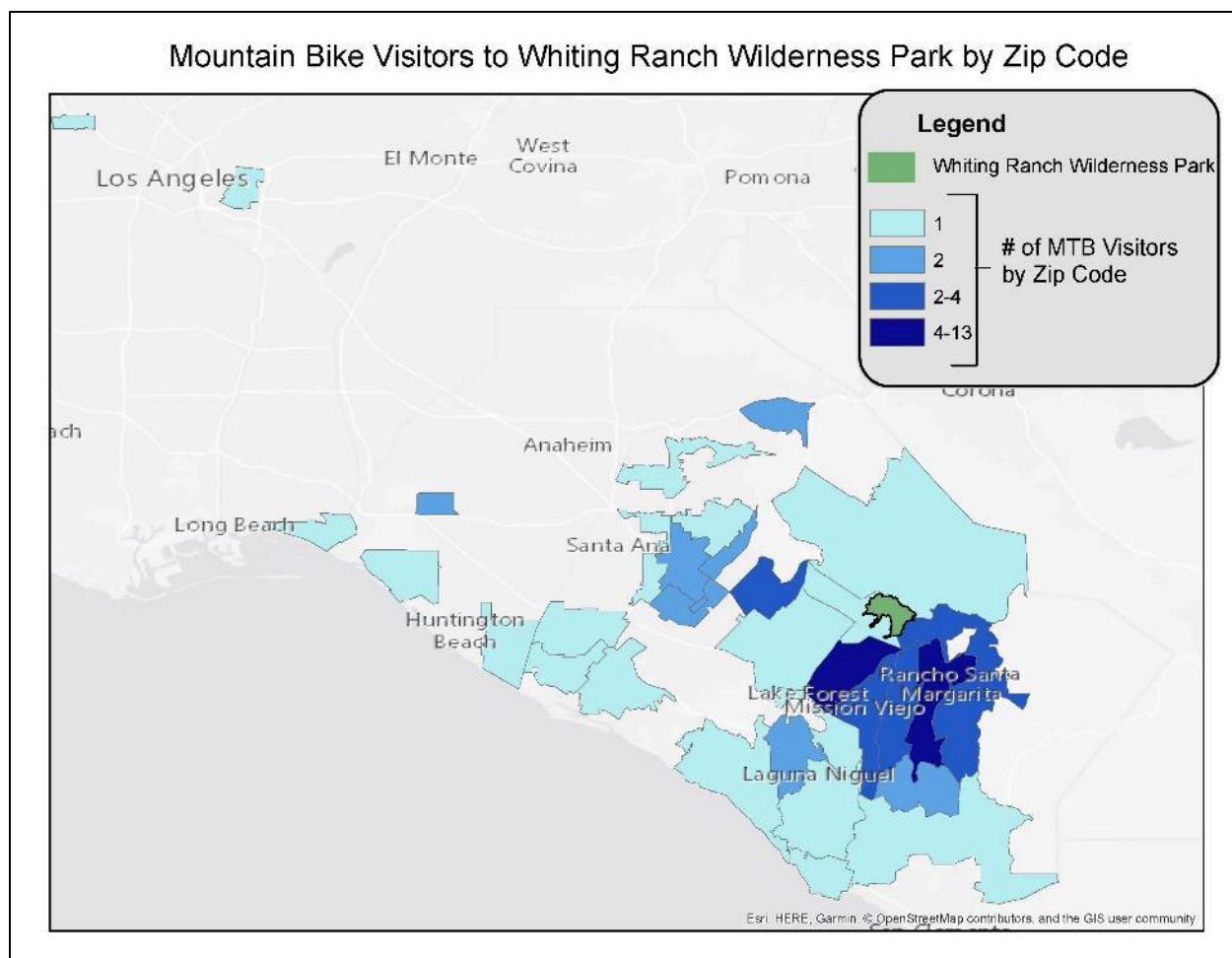
Figure B.19. *Location and frequency of mountain bike visitors' origin by zip code for Whiting Ranch Wilderness Park.*

Visitor surveys

The survey administered in 2018 was designed to enable visitors to Reserve Units in Orange County the opportunity to evaluate the quality of their recreation experience. As in 2017, questions used in the survey were derived from the National Park Service pool of vetted questions and were based on key variables frequently examined in recreation studies. These variables included several demographic questions (age, ethnicity, gender, etc.), activity type, park visited, experience use history, Leave No Trace knowledge, and several evaluative variables, including visitor satisfaction with their recreation experience, management and facility conditions, trail conditions and concerns, crowding, and safety and preparedness. Visitors on mountain bikes were asked an additional suite of questions pertaining to their use of mobile apps while recreating and off-trail behaviors. Response rates for the surveys ranged from 70-81%.

How visitors entered Reserve units varied by unit. At some locations, like Aliso and Wood Wilderness Park and Crystal Cove State Park, the vast majority of visitors entered from designated parking lots. However, at other locations, such as Ridge Park and Peters Canyon Regional Park, the majority of visitors entered the park from locations other than a designated parking lot (Table B.4). This may have

implications for park revenue if the majority of visitors are avoiding entering from designated parking lots where a fee is required to park.

Table B.4. *Percent of visitors entering Reserve units from designated parking lots or other locations.*

Park	Percent Entering from Paid/Designated Parking Lot	Percent Entering from other Location
Aliso & Wood	93%	7%
Whiting Ranch	58%	42% (36% from Wahoos)
Top of the World	65% (Alta Laguna Park)	35% (25% from Canyon Acres)
Moro Canyon (Crystal Cove SP)	87%	13% (Most from Pacific Coast Highway at Moro Ridge
Ridge Park (Pacific Ridge Trailhead)	19% (Coming from Crystal Cove State Park or Bommer Canyon)	81%
Peter's Canyon	26% (Canyon View Rd)	74% (61% from south side of Peters Canyon Rd. or adjacent neighborhoods)

The majority of visitors to all Reserve units sampled were walking (61%), running (12%) or biking (24%). A small number of visitors were visiting Reserve units to walk their dogs (2%) or engage in some other type of activity (1%, fig. B.20).

Primary Activity Type of Visitors--All Reserve Units

	Walking	Running	Biking	Dog Walking	Other	Total
Frequency	699	137	276	18	14	1144

(61%, 12%, 24%, 2%, 1%)
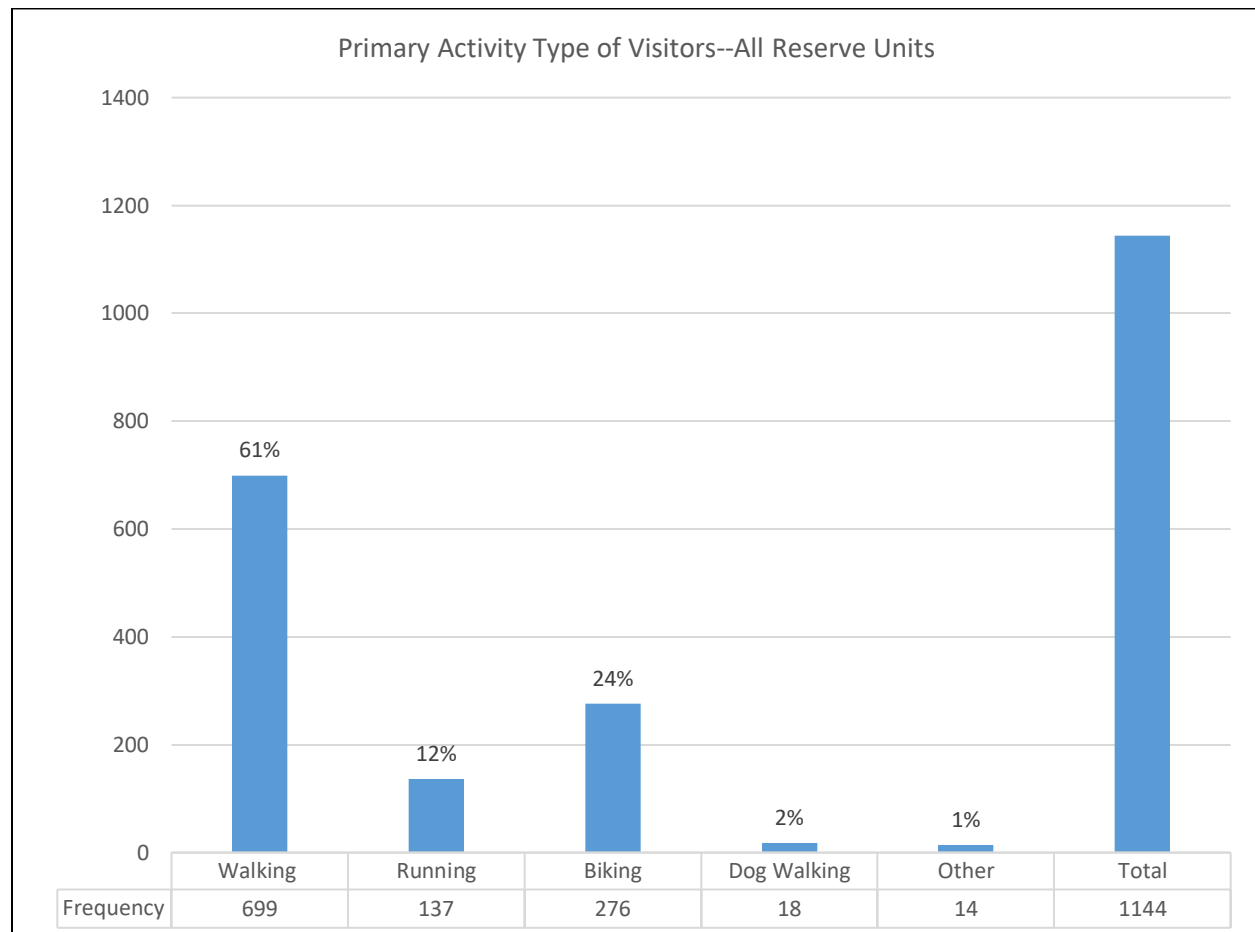
Figure B.20. *Activity types of visitors to all Reserve units sampled.*

When examined by Reserve unit, activity type varied, with Crystal Cove State Park (MORO) and Top of the World (TOWO) hosting more walking visitors (>80%), and Ridge Park (RIPA) and Aliso and Wood Canyon Wilderness Park (ALWO) hosting more mountain bikers (>40%) comparatively (fig. B.21).
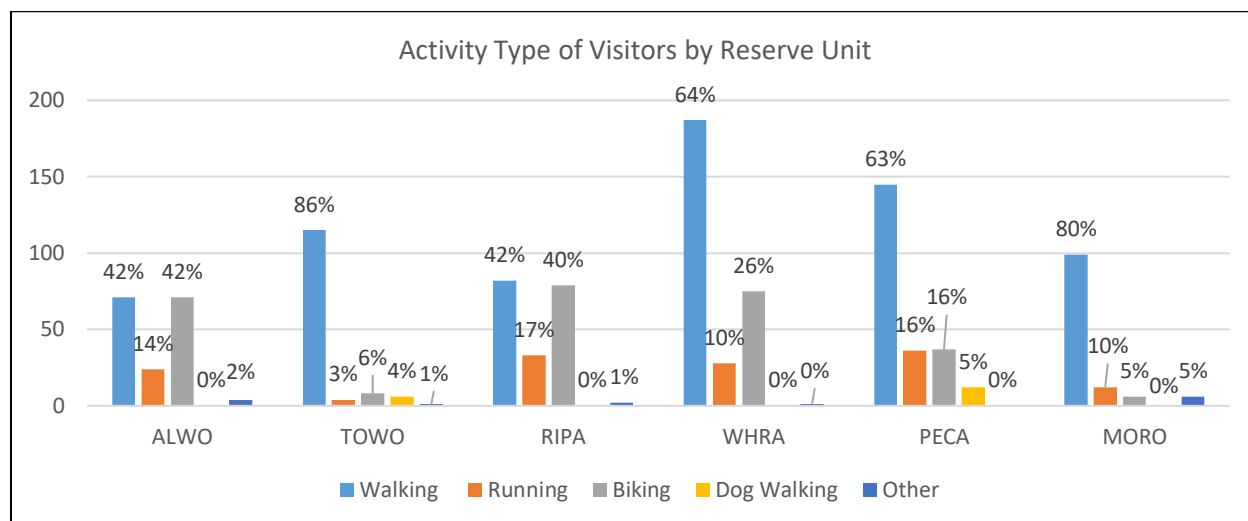
Figure B.21. *Visitor activity type by Reserve unit.*

Most visitors to the different Reserve units sampled participate in their primary activity more than 51 days per year (figures B.22 – B.23). However, fewer visitors to MORO and TOWO visit these units more than 51 days per year compared to other Reserve units sampled (fig. B.23). The vast majority of visitors (81%) stated that their experience level in their primary activity was intermediate or higher, indicating an experienced body of recreators across Reserve units (fig. B.24). When experience level is compared across activity types, visitors engaging in the activity of walking were the least experienced (25% beginner or novice) while visitors engaging in all other activities had experience levels of beginner or novice of 15% or below (fig. B.25).
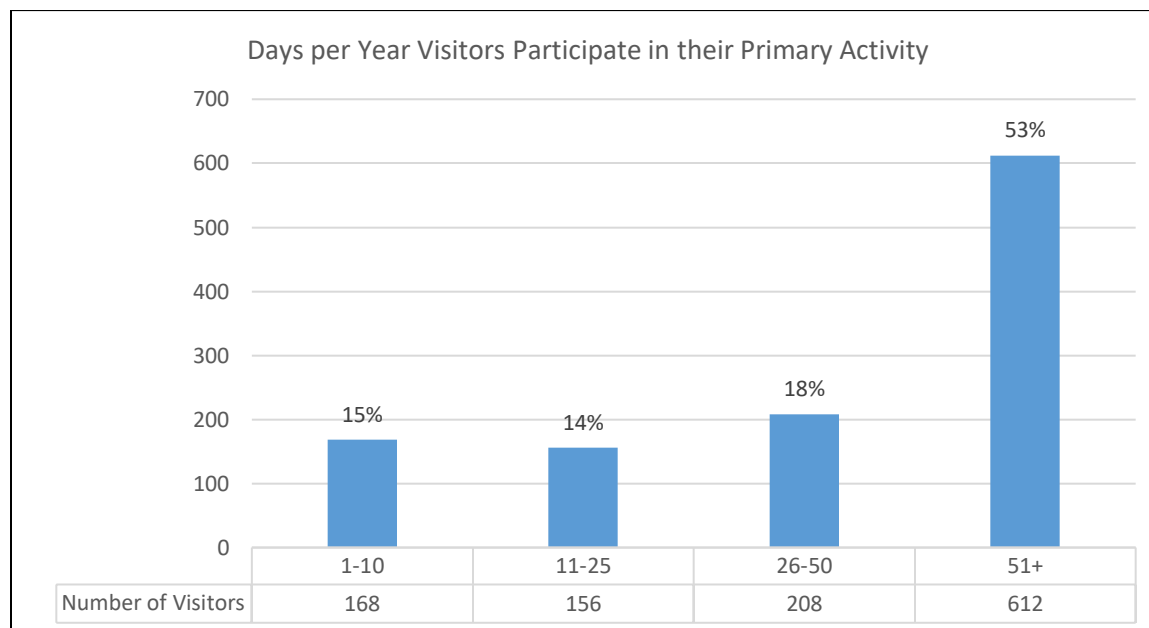
Figure B.22. *Frequency of visitor participation in their primary activity across all Reserve units.*

Figure B.23. *Frequency of visitor participation in their primary activity by Reserve unit.*

Figure B.24. *Visitor experience level in their primary stated activity across all Reserve units.*
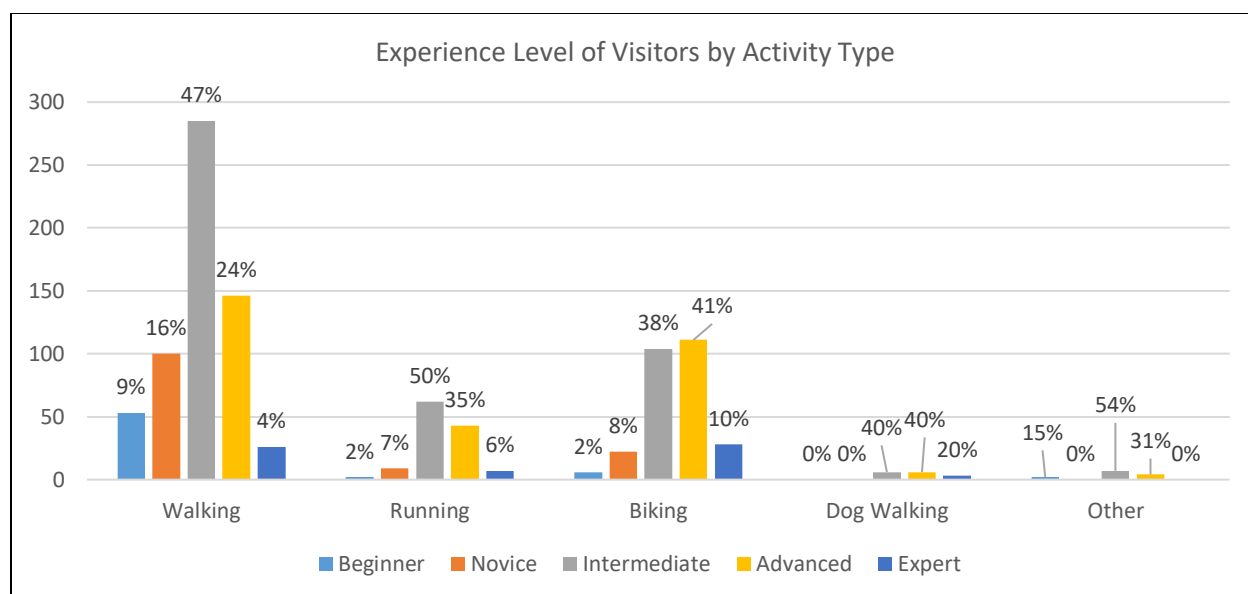
Figure B.25. *Visitor experience level in their primary stated activity across all Reserve units by activity type.*

Visitors were also asked a suite of questions relative to their perception of various management conditions of Reserve units. Questions were asked on a five-point Likert style scale, where 1=Strongly Disagree, 2=Disagree, 3=Neither Agree or D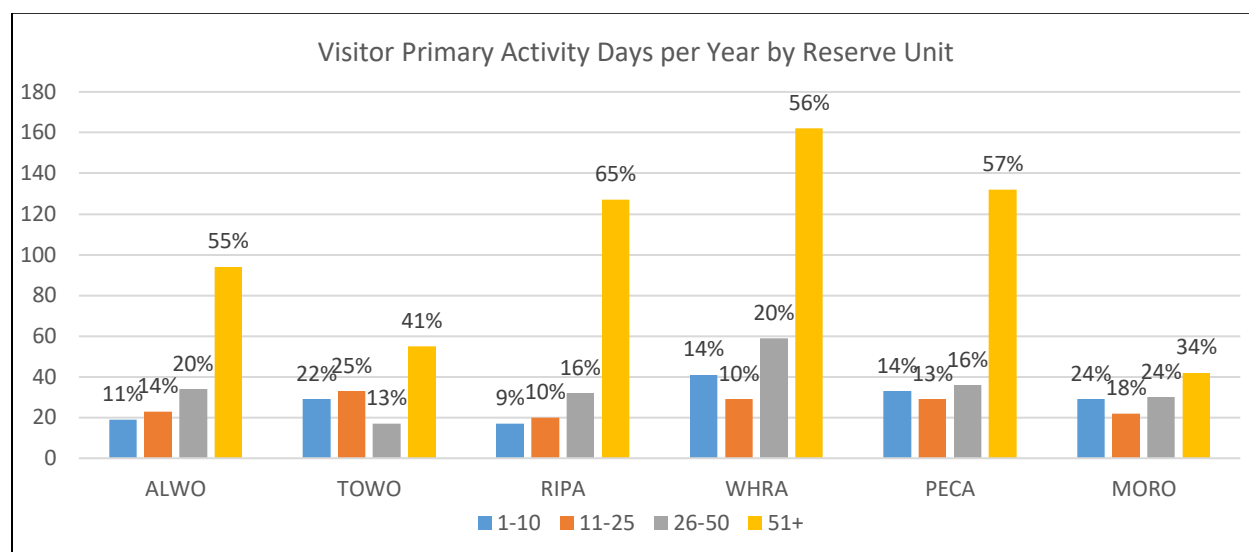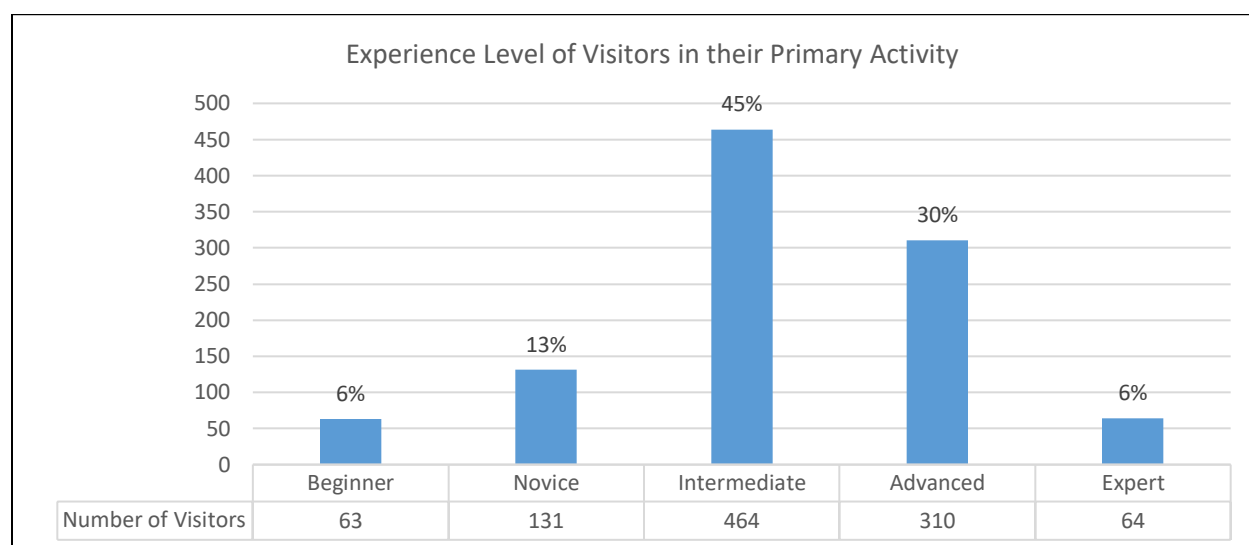isagree, 4=Agree, and 5=Strongly Agree. These management-related concerns include availability of parking, presence of signage, amount of available trails, rules and regulations, and information provided to visitors regarding various components of their experience. Across all Reserve units, mean values for all management concerns were greater than 3, indicating that visitors tended to agree that management conditions were sufficient. Values for information about plants and animals, information about the historical and cultural significance of the area, and information about conservation initiatives were below 3.5 and were more neutral than other management concerns (fig. B.26).

When management conditions were examined by Reserve unit, some differences become apparent for visitors perceptions of management at individual units (Table B.4). For example, visitors more strongly agreed that there is enough parking at the Moro Canyon trailhead at Crystal Cove State Park (MORO) than other units. Visitors to Aliso and Wood Canyon Wilderness Park (ALWO) most strongly agreed that there is enough information about historical and cultural significance of the area, while visitors to Peters Canyon Regional Park (PECA) slightly disagreed that there is enough of the same information.
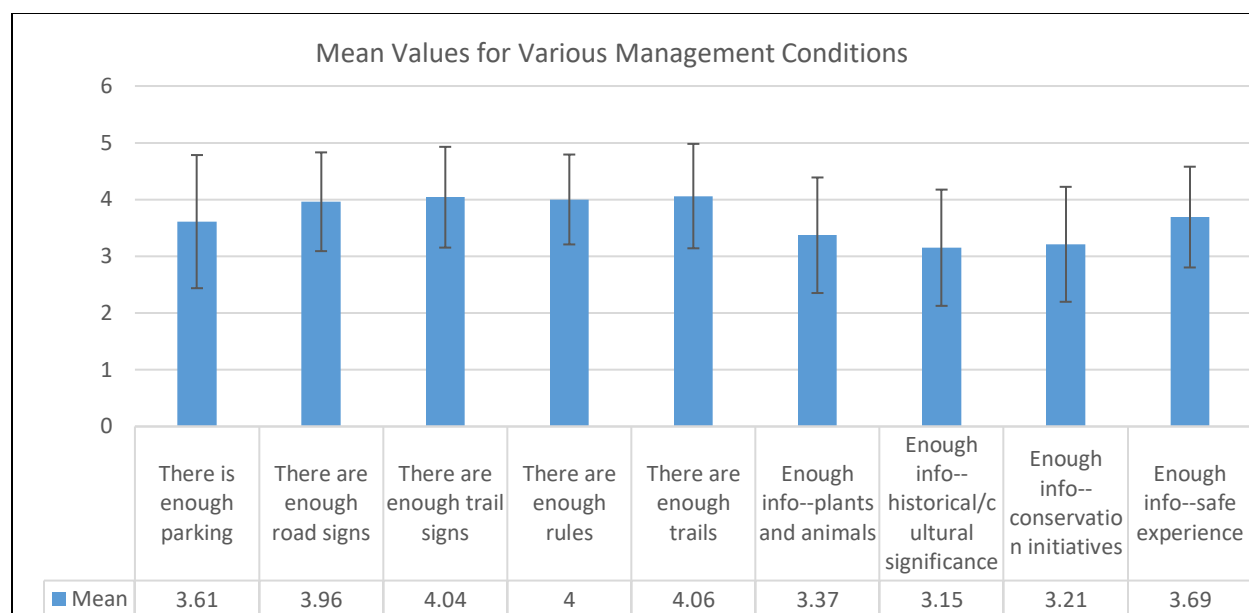
Figure B.26. *Mean values for management conditions across all Reserve units. Scale used was a Likert-style scale, where 1 = Strongly Disagree and 5 = Strongly Agree.*

Table B.4. *Mean values for management conditions across all Reserve units. Scale used was a Likert-style scale, where 1 = Strongly Disagree and 5 = Strongly Agree.*
*Significant differences between Reserve units exist in an Analysis of Variance (ANOVA). P<.05

	There is enough parking*	There are enough road signs*	There are enough trail signs*	There are enough rules*	There are enough trails*	Enough info--plants and animals*	Enough info--historical/cultural significance*	Enough info--conservation initiatives*	Enough info--safe experience
ALWO	3.32	3.91	3.98	3.98	4.06	3.67	3.62	3.46	3.75
TOWO	3.79	3.74	3.75	3.83	4.05	3.18	3	3.1	3.58
RIPA	3.92	4.15	4.19	4.14	4.05	3.5	3.28	3.34	3.74
WHRA	3.24	3.81	4.09	4.02	4.1	3.28	3	3.08	3.7
PECA	3.52	3.92	3.97	3.94	3.87	3.17	2.88	3.03	3.58
MORO	4.3	4.35	4.26	4.05	4.37	3.48	3.29	3.37	3.79

Visitors were also asked if they would like to see more, less, or the same amount of facilities in Reserve units, including trails for hiking, biking, and equestrian use, as well as trails for universal access and any other facilities that they wanted to list that were not listed. Across all Reserve units, the majority of visitors felt the amount of facilities was adequate (fig. B.27). The top "other" categories listed by visitors included activity-specific (e.g. bike only) trails, dog specific trails, water fountains, bathrooms, interpretive signs, and trash cans.

Visitors were asked a suite of questions relative to their concerns about conditions of trails at Reserve units. Questions were asked on a five-point Likert style scale, where 1=Not a Problem, 2=Slight Problem, 3=Moderate Problem, 4=Serious Problem, and 5= Extreme Problem. Across Reserve units, average scores for each concern were less than 2, indicating that each of these concerns were viewed as, at most, a slight problem. The most problematic concern (with a mean score of 1.9) across all Reserve units was "too many people/large groups on trails", followed closely by "too many mountain bikers" (mean of 1.81, fig. B.28).

Figure B.27. *Visitor perceptions of the amount of trails and other facilities across Reserve units.*

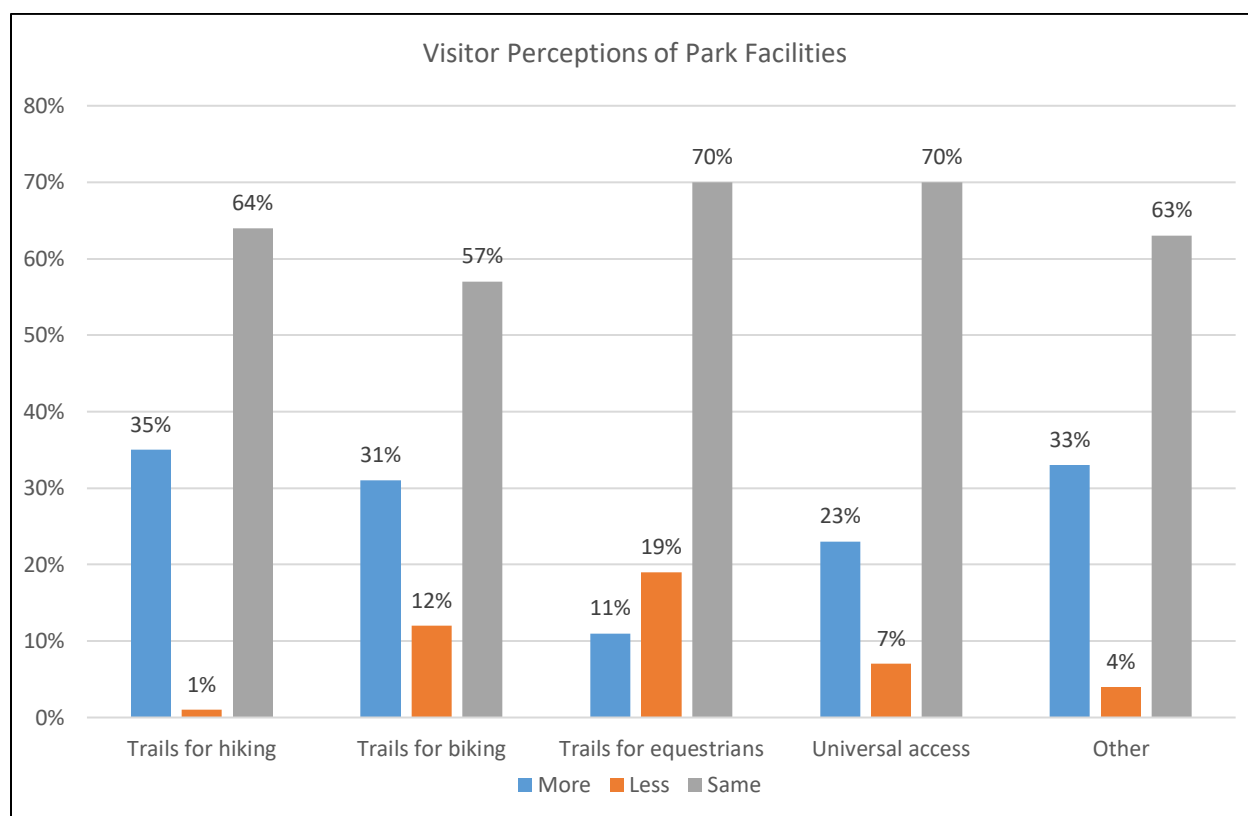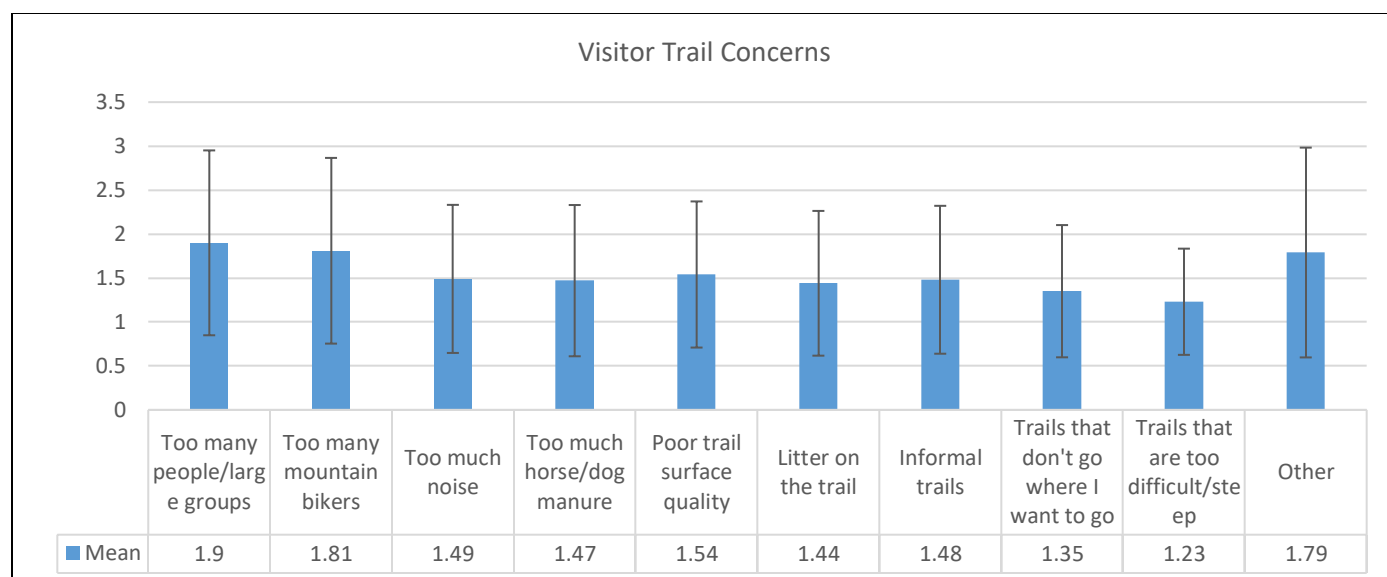**Figure B.28.** *Visitor trail concerns across all Reserve units. Scale used was a Likert-style scale where 1=Not a Problem and 5=Extreme Problem.*

When visitor trail concerns were examined by Reserve unit, several differences emerged. For example, visitors to Peters Canyon Regional Park (PECA) were more concerned by the amount of horse and/or dog manure on trails than other locations (dogs are only allowed at PECA and TOWO). Visitors to Whiting Ranch Wilderness Park (WHRA) were least concerned about the surface quality of trails, while visitors to PECA and Top of the World (TOWO) were most concerned about litter on the trail. Visitors to WHRA were least concerned about informal trails (illegal, visitor-created trails), and visitors to TOWO and PECA were most concerned about trails not going where they wanted, while visitors to WHRA were least concerned about that issue. Finally, visitors to ALWO and TOWO were most concerned about the difficulty/steepness of trails (Table B.5).

Table B.5. *Visitor trail concerns by Reserve unit. Scale used was a Likert-style scale where 1=Not a Problem and 5=Extreme Problem.*
Significant differences between Reserve units exist in an Analysis of Variance (ANOVA). P<.05

	Too many people/large groups	Too many mountain bikers	Too much noise	Too much horse/dog manure*	Poor trail surface quality*	Litter on the trail*	Informal trails*	Trails that don't go where I want to go*	Trails that are too difficult/steep*	Other
ALWO	1.92	1.87	1.42	1.37	1.54	1.29	1.56	1.35	1.3	1.53
TOWO	1.86	1.89	1.53	1.51	1.68	1.66	1.59	1.53	1.32	1.92
RIPA	1.91	1.79	1.59	1.49	1.6	1.49	1.52	1.37	1.22	1.92
WHRA	1.9	1.9	1.49	1.32	1.36	1.29	1.3	1.22	1.14	1.96
PECA	2.03	1.67	1.53	1.75	1.65	1.7	1.65	1.42	1.28	1.79
MORO	1.65	1.7	1.33	1.37	1.5	1.22	1.32	1.31	1.18	1.61

Visitor trail concerns were also examined by activity type. The only concerns that resulted in significant differences were "too many people/large groups" and "too many mountain bikers," with bikers finding too many people more of a problem, and walkers and runners finding too many mountain bikers more of a problem than other groups (Table B.6).

Visitors were asked whether there were places or times they avoided when they recreated due to poor conditions. When examined both by Reserve unit (fig. B.29) and activity type (fig. B.30), the vast majority of visitors stated that they did not avoid recreating at specific places or times due to the conditions. Of those that *did* avoid recreating at specific places or times due to the conditions, the most common reason given was crowding (too many visitors) after work (in the evenings) and on weekends (fig. B.31).

Table B.6. *Visitor trail concerns by activity type. Scale used was a Likert-style scale where 1=Not a Problem and 5=Extreme Problem.*
Significant differences between Reserve units exist in an Analysis of Variance (ANOVA). P<.05

|	Too many people/large groups*	Too many mountain bikers*	Too much noise	Too much horse/dog manure	Poor trail surface quality	Litter on the trail	Informal trails	Trails that don't go where I want to go	Trails that are too difficult/steep	Other
Walking	1.71	1.93	1.48	1.43	1.49	1.45	1.43	1.33	1.22	1.6
Running	1.87	1.94	1.58	1.52	1.52	1.55	1.59	1.34	1.23	2.07
Biking	2.31	1.46	1.45	1.54	1.66	1.36	1.56	1.43	1.25	2.3
Dog Walking	2.27	1.8	1.47	1.67	1.6	1.67	1.47	1.21	1.13	~
Other	2.07	1.85	1.92	1.38	1.77	1.46	1.75	1.46	1.38	1.5
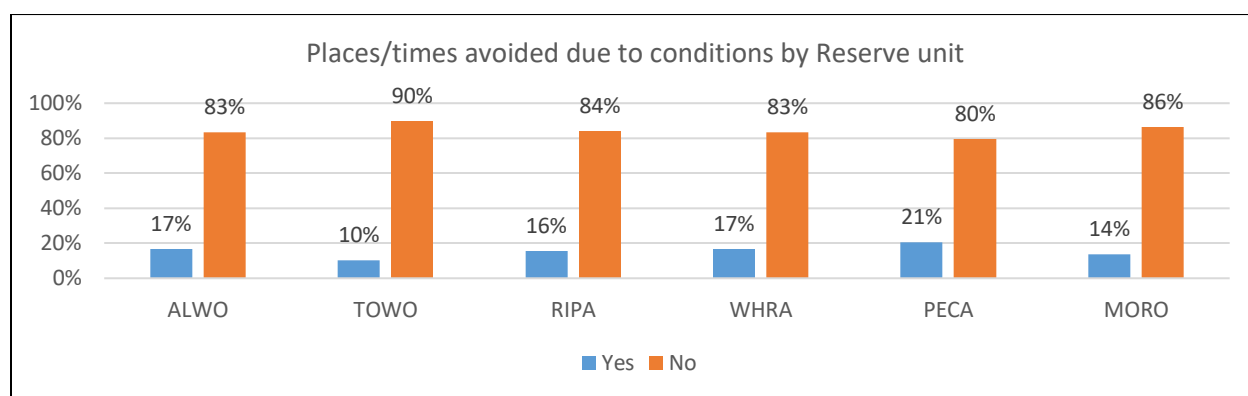
Figure B.29. *Visitor responses to question, "Are there places or times you avoided due to conditions you encountered in the past?", by Reserve unit.*
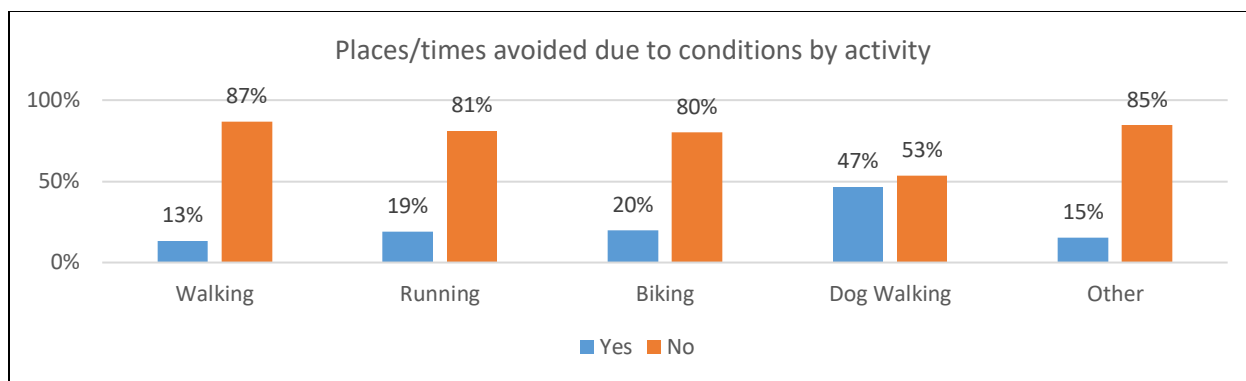
Figure B.30. *Visitor responses to question, "Are there places or times you avoided due to conditions you encountered in the past?", by activity type.*
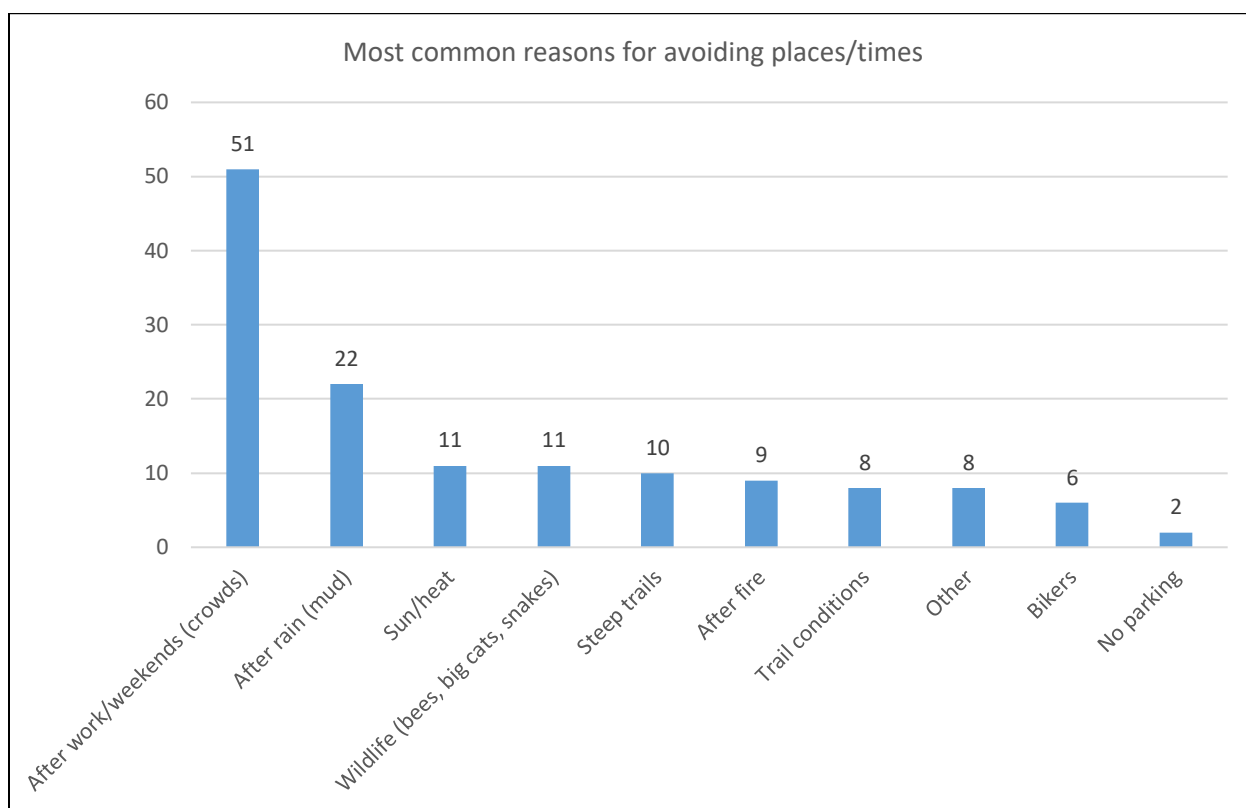

Figure B.31. *Visitor reasons provided for why they avoided places or times due to conditions encountered in the past.*

When asked whether anything affected their ability to recreate safely, across Reserve units 96% of visitors responded "no", while 4% responded "yes". When this question was examined by Reserve unit, the response of "yes" varied from 2-7% and was highest at Peters Canyon Regional Park and lowest at Ridge Park (Pacific Ridge Trailhead). When examined by activity type, 5% or less of all visitors responded "yes," with the exception of the dog walker group, of which 13% (n=2) responded "yes."

Visitors were also asked about how crowded they felt while engaging in their primary activity within the Reserve unit where they were surveyed. Questions were asked using a Likert-style scale with 1=Not at all crowded, 2=Slightly crowded, 3=Moderately crowded, 4=Very crowded, and 5=Extremely crowded. When examined by Reserve unit, only slight crowding was reported, with visitors to Ridge Park (RIPA) reporting feeling the least crowded, and visitors to TOWO reporting feeling the most crowded (fig. B.32).
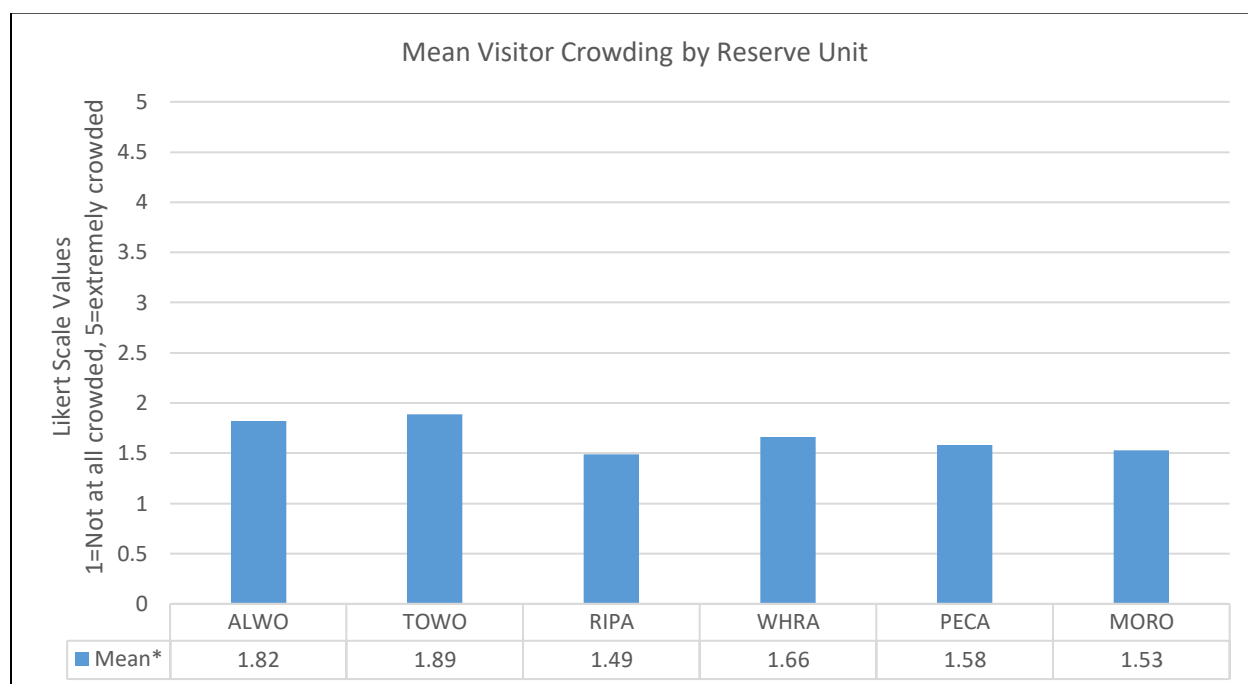

Figure caption and chart data:

Mean Visitor Crowding by Reserve Unit

	ALWO	TOWO	RIPA	WHRA	PECA	MORO
Mean*	1.82	1.89	1.49	1.66	1.58	1.53

Figure B.32. *Average visitor crowding by Reserve unit.*
Mean differences were statistically significant at P<.05 across Reserve units when examined using an Analysis of Variance (ANOVA).

An examination of mean visitor crowding by visitor motivation revealed that those visitors motivated by nature experienced a mean crowding score of 1.73, whereas those motivated by exercise experienced a mean crowding score of 1.61.

Visitors were asked several questions relating to their perception of safety and risk of injury while recreating. Across Reserve units, the majority of visitors (81%) reported that they did not feel that the number of other people around them increased their risk of injury (fig. B.33). Further, most visitors reported that they felt prepared for common safety situations (fig. B.34).
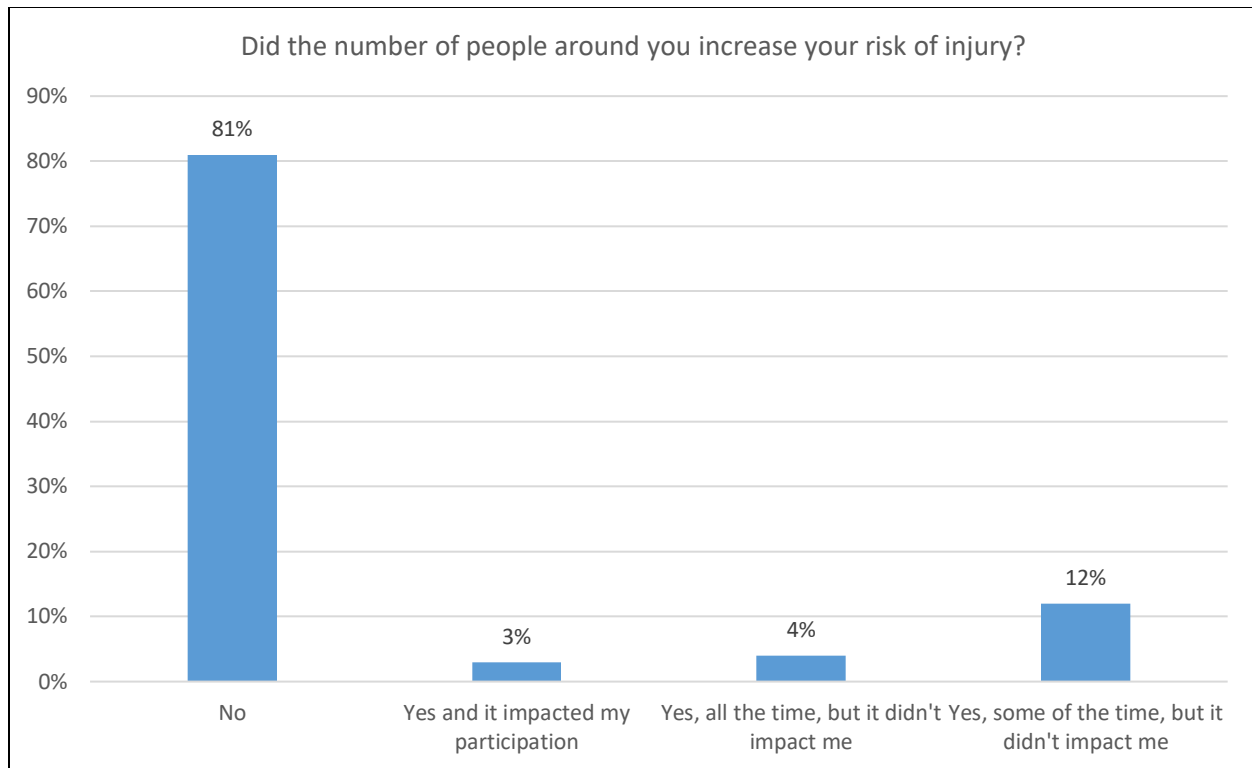
Figure B.33. *Visitor perception of risk of injury due to crowding, across all Reserve units.*
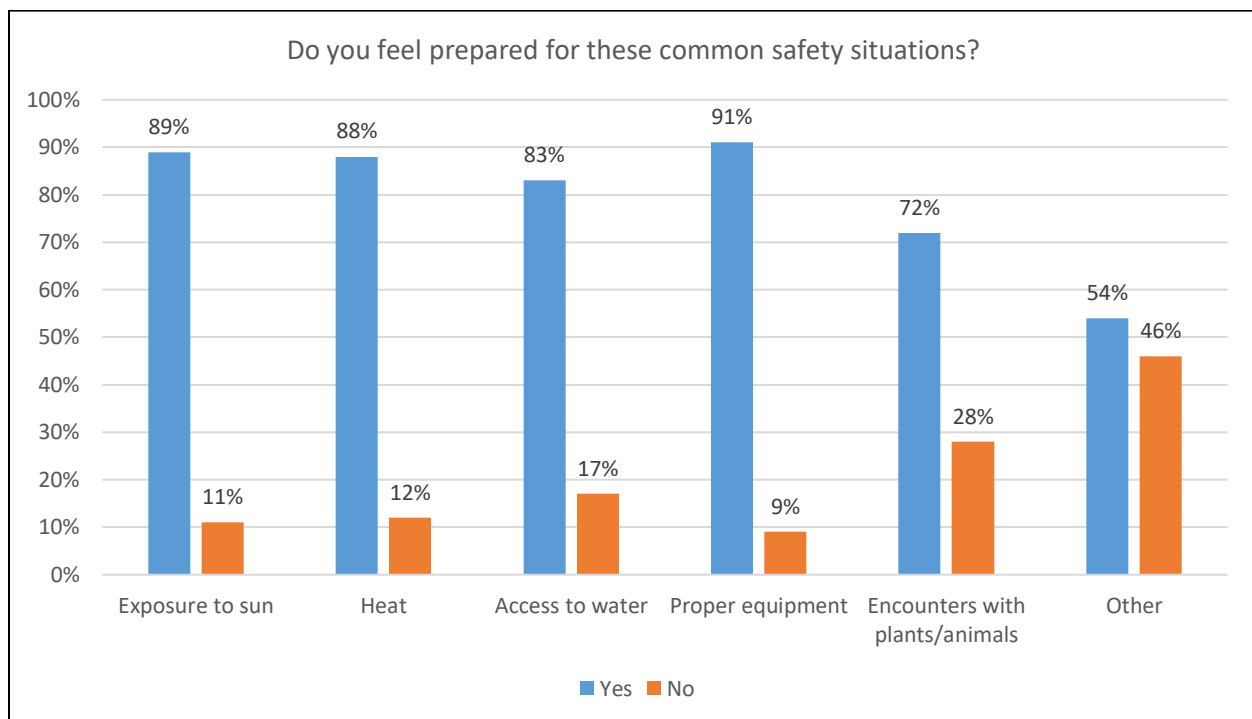

Figure B.24. *Visitor perception of preparation for common safety situations across all Reserve units.*

Visitors were also asked several questions about ecological knowledge, Leave No Trace, and perception of the environmental impact of other recreationists. Across all Reserve units, visitors, on average, were somewhat familiar (or less) with all components of ecological knowledge (fig. B.35).

On a six-point scale of Leave No Trace knowledge (1=No knowledge, 2=Very limited knowledge, 3=Limited knowledge, 4=Fair knowledge, 5=Above average knowledge, and 6=Extensive knowledge) most visitors to different Reserve units reported "fair" levels of Leave No Trace Knowledge, with visitors to PECA feeling the least informed, and visitors to RIPA feeling the most informed (Table B.7). When examined by activity type, visitors walking and dog walking reported lower levels of Leave No Trace knowledge than other user types (Table B.8). There was no statistically significant difference in Leave No Trace knowledge when examined by visitor off-trail behavior (whether visitors reported travelling off the designated trail) or by visitor motivation type (whether visitors fell into the "nature" or "exercise" motivation category).
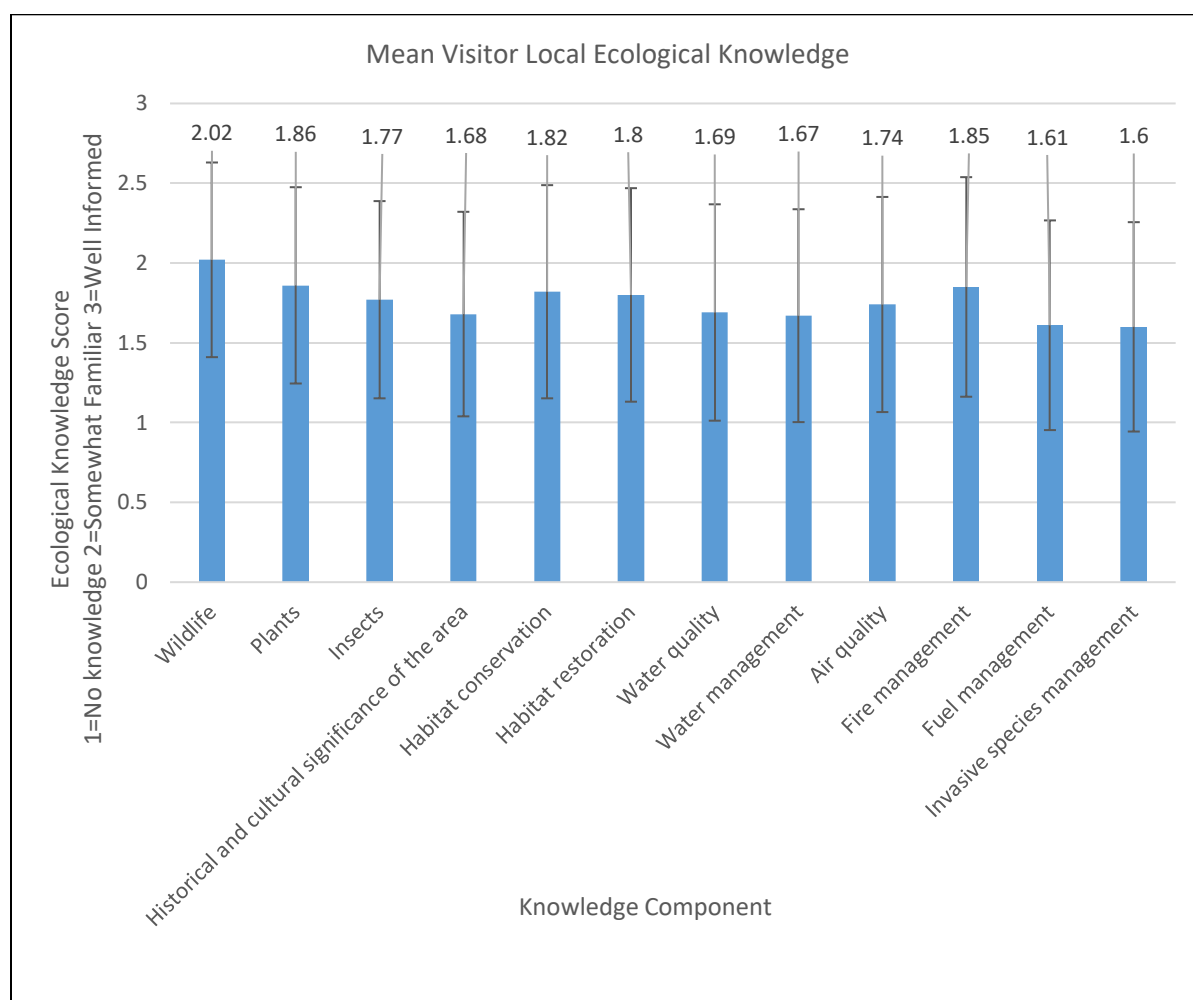

Figure B.35. *Mean visitor knowledge of various ecological topics. Scale used was a three-point scale, where 1=No knowledge, 2=Somewhat familiar, and 3=Well informed.*

Table B.7. *Visitor mean Leave No Trace knowledge by Reserve unit.*
*Mean differences were statistically significant at P<.05 across Reserve units when examined using an Analysis of Variance (ANOVA).

	ALWO	TOWO	RIPA	WHRA	PECA	MORO
Mean*	4.19	3.9	4.38	4.32	3.54	4.27

Table B.8. *Visitor mean Leave No Trace knowledge by activity type.*
*Mean differences were statistically significant at P<.05 across activity types when examined using an Analysis of Variance (ANOVA).

	Walking	Running	Biking	Dog Walking	Other
Mean*	3.92	4.15	4.48	3.73	4.69

Perceptions of Ecological Impact

In our 2018 survey, respondents were asked to rate the ecological impact of the following activities : Hiking, Hiking-Off Trail, Mountain Biking, Mountain Biking Off-Trail, Bird Watching, Camping, Dog Walking, Horseback Riding, and Photography. These impacts were a five-point Likert-style scale, with 1=No impact, 2=Slight impact, 3=Moderate impact, 4=High impact, and 5=Extreme impact.
Across all Reserve units, visitors assessed various recreational activities as having slight to high impact. Mean impact scores ranged from 1.6 to 3.56 (fig. B.36)
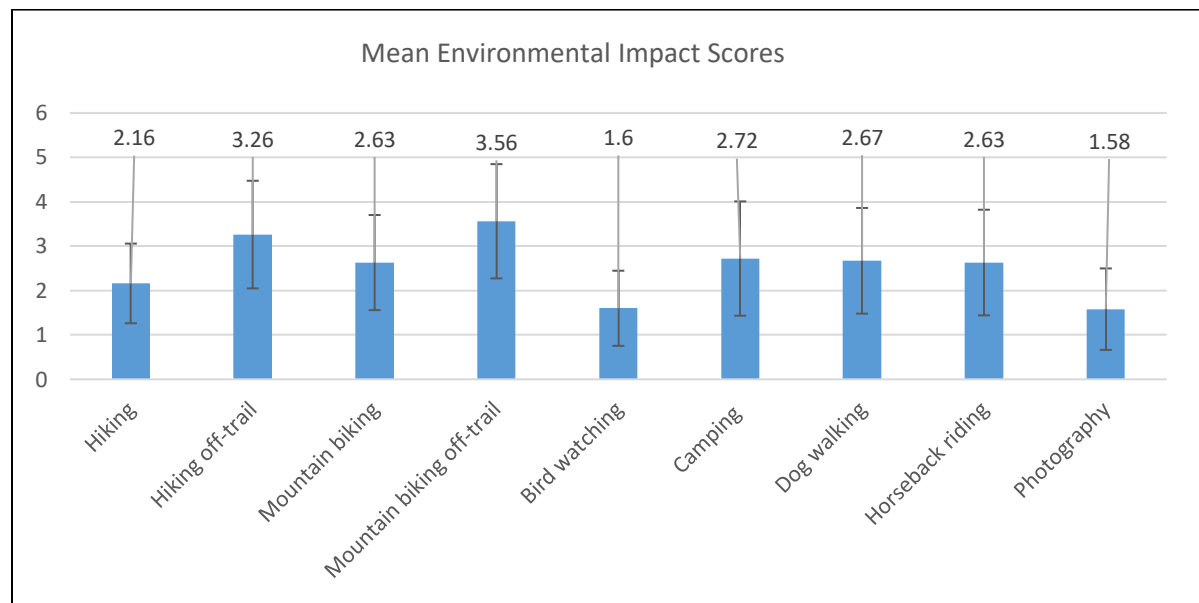

Figure B.36. *Mean environmental impact scores of various recreational activities across all Reserve units.*

When activity impact was examined by activity type, the only significant difference between perceptions of impacts of different activity types was that bikers reported a significantly lower impact score for biking than other visitors (Table B.8). Responses were then analyzed against two independent variables, the primary activity type of the respondent and whether they used Strava while recreating (Tables B.9).A Kruskall-Wallis H test was run to determine if there were differences in evaluating the ecological impacts of different use types between how respondents reported their primary activity for their visit. Possible activity type responses were categorical, either walking, running, biking, dog walking, horseback riding, or other. Distributions of CWWS scores were dissimilar between activity types for perceptions of ecological impact for mountain biking, mountain biking off-trail, and horseback riding.

Subsequently, pairwise comparisons were performed with a Bonnferoni correction for multiple comparisons, with adjusted p-values presented below. For perceptions of impact of mountain biking, statistically significant differences were observed between bikers and walkers (p<0.001), bikers and runners (p<0.0001), and biking and dog walking (p=0.015). For perceptions of ecological impact for mountain biking off trail, statistically significant differences were observed between bikers and runners (p=0.036). No statistically significant between group differences were found for perceptions of impact of horseback riding.

Next, a Mann-Whitney U test was run to determine if there were differences in evaluating the ecological impacts of use types between respondents who reported using Strava and those who did not. Distributions for perceptions of ecological impact between the two groups were dissimilar and returned statistically significant differences for the following perceptions of use-impacts: Mountain Biking, Bird-Watching, Camping and Photography (Table B.10). For all of these evaluations, Strava users' perceptions of ecological impact were lower than those who did not use Strava.

Table B.8. *Mountain bike visitor perceived mean environmental impact of various activity types.*
Mean differences were statistically significant at P<.05 when examined using an Analysis of Variance (ANOVA).

	Walking	Running	Biking	Dog Walking	Other
Mean*	2.76	2.78	2.24	3.2	2.85

Table B.9. *Differences in evaluation of ecological impacts by use type.*

	Mean Rank					χ²(3)	Asymptotic Sig. (2-sided test)
	Walking	Running	Biking	Dog Walking	Other		
Mountain Biking	527.93	535.11	394.22	625.77	554.85	49.750	P<.0001
Mountain Biking Off-Trail	490.20	551.82	462.17	594.30	592.88	12.307	P=0.015
Horseback Riding	464.61	525.22	510.19	550.54	558.50	9.742	P=0.045

Table B.10. *Mann-Whitney U Test Results for differences in perceptions of Ecological Impact for Use-Types between Strava and Non-Strava Users respondents.*

	Mean Rank		Mann-Whitney U	Z	Asymptotic Sig. (2-sided test)
	Strava	Non-Strava			
Mountain Biking	388.28	496.57	47,154.000	-.4.586	P<.0001
Bird Watching	440.59	484.44	55,053.500	-2.033	P=0.42
Camping	407.54	470.49	48,769.500	-2.695	P=0.007
Photography	438.72	484.15	54,482.500	-2.157	P=.031

Visitors were also asked about their knowledge of rules concerning off-trail travel at Reserve units. When examined by activity type, the vast majority of visitors (75% or more) responded that, to their knowledge, Reserve units *did* have rules regarding off-trail travel (fig. B.37). Visitor responses to rules regarding off-trail travel were also examined by visitor motivation type. While most visitors in both motivation types (nature and fitness) did recognize that Reserve units did have rules about going off-trail, there was a statistically significant difference between the frequency of responses of these groups (fig. B.38). Additionally, visitors were also asked about their *actual* off-trail behaviors (i.e. whether they traveled off-trail during their visit). The majority of visitors to all Reserve units across all activity types reported that they did not travel off-trail (fig. B.39). Visitors who were walking at Whiting Ranch Wilderness Park most frequently reported that they did travel off-trail during their visit.

Does the Reserve unit have any rules about going off-trail?

	Walking	Running	Biking	Dog Walking	Other
Yes	75%	81%	85%	100%	62%
No	4%	7%	3%	0%	23%
I'm not sure	21%	11%	12%	0%	15%
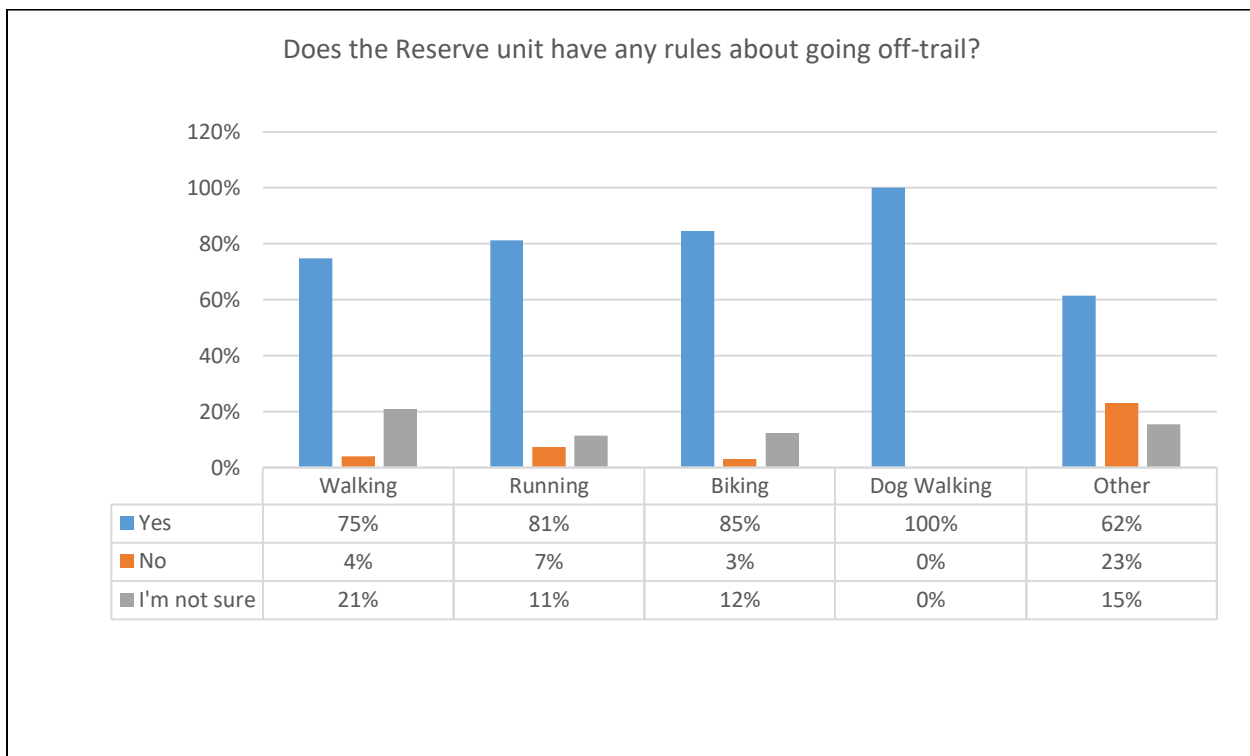
Figure B.37. *Visitor knowledge of rules regarding off-trail travel across all Reserve units, by activity type.*
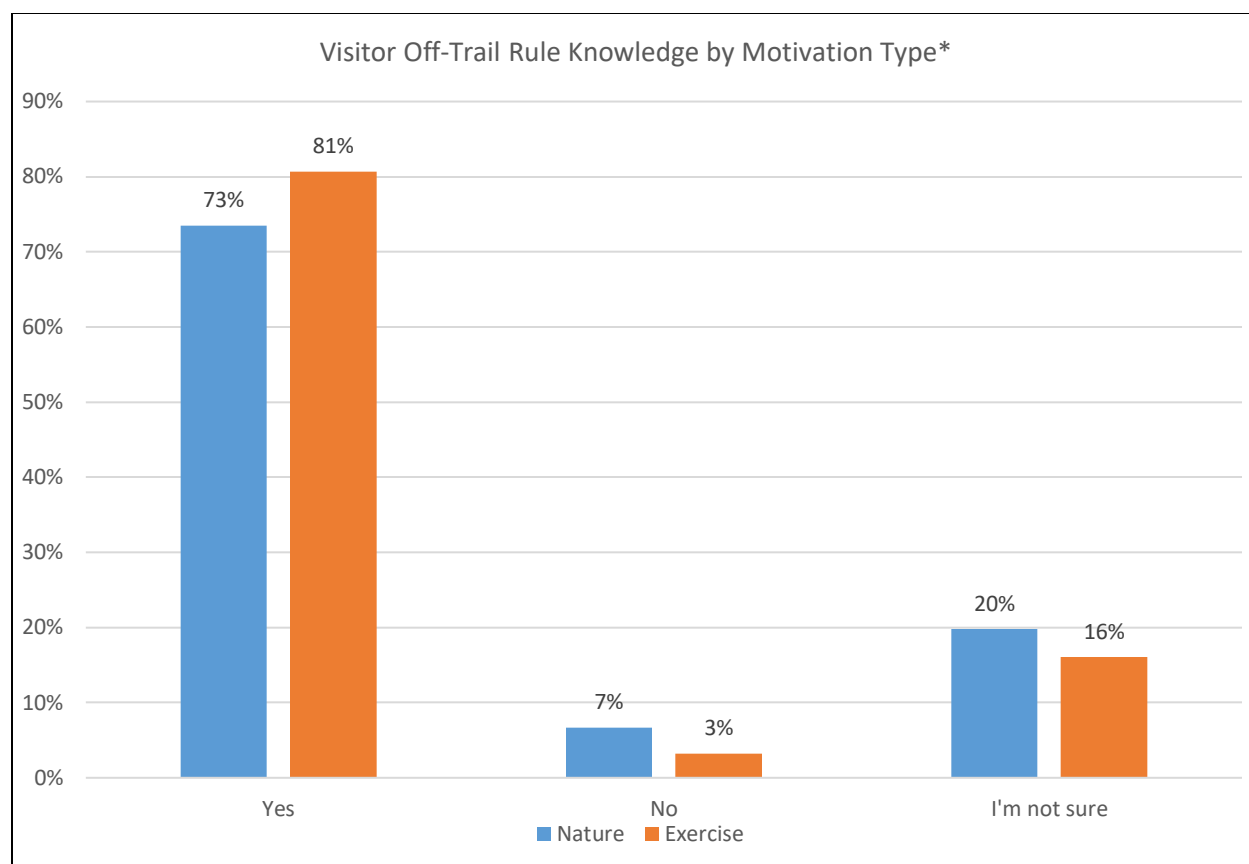
Figure B.38. *Visitor knowledge of off-trail rules by motivation type.*
*Responses of visitors in different motivation types are statistically significant (p<.05) using a chi-squared analysis.
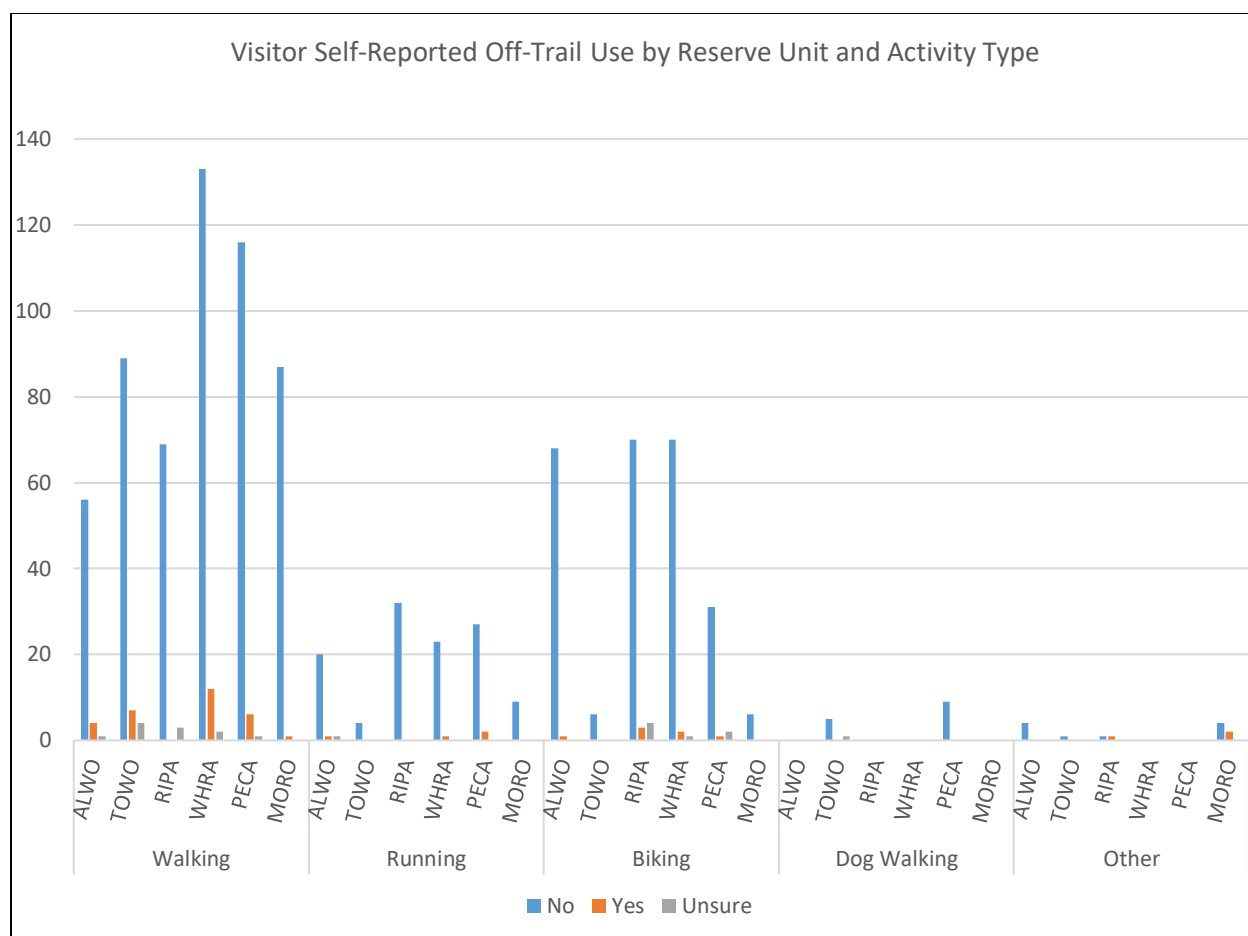
Figure B.39. *Visitor self-reported off-trail travel during their visit, by activity type and Reserve unit.*

Visitors were asked how they used their smartphone during their visit. The majority of visitors reported that they did not use their smartphone at all (57.9%, fig. B.40). Of those that responded that they did use their smartphone, responses were analyzed by activity type across the different Reserve units (figures B.41 – B.46). Bikers across all units tended to use Strava more than any other application. Walkers tended to use Instagram, Snapchat, their camera and music applications most frequently, and runners most frequently used music applications, Strava, health/pedometer applications, and MapMyRun. Visitor smartphone use was also compared for different visitor motivation types (nature or fitness). Statistically significant differences were found for use of several applications between groups (fig. B.47). Notably, exercise-motivated visitors tended to use music, health, GPS/mapping, text or email, Snapchat and Strava apps more than nature-oriented visitors.
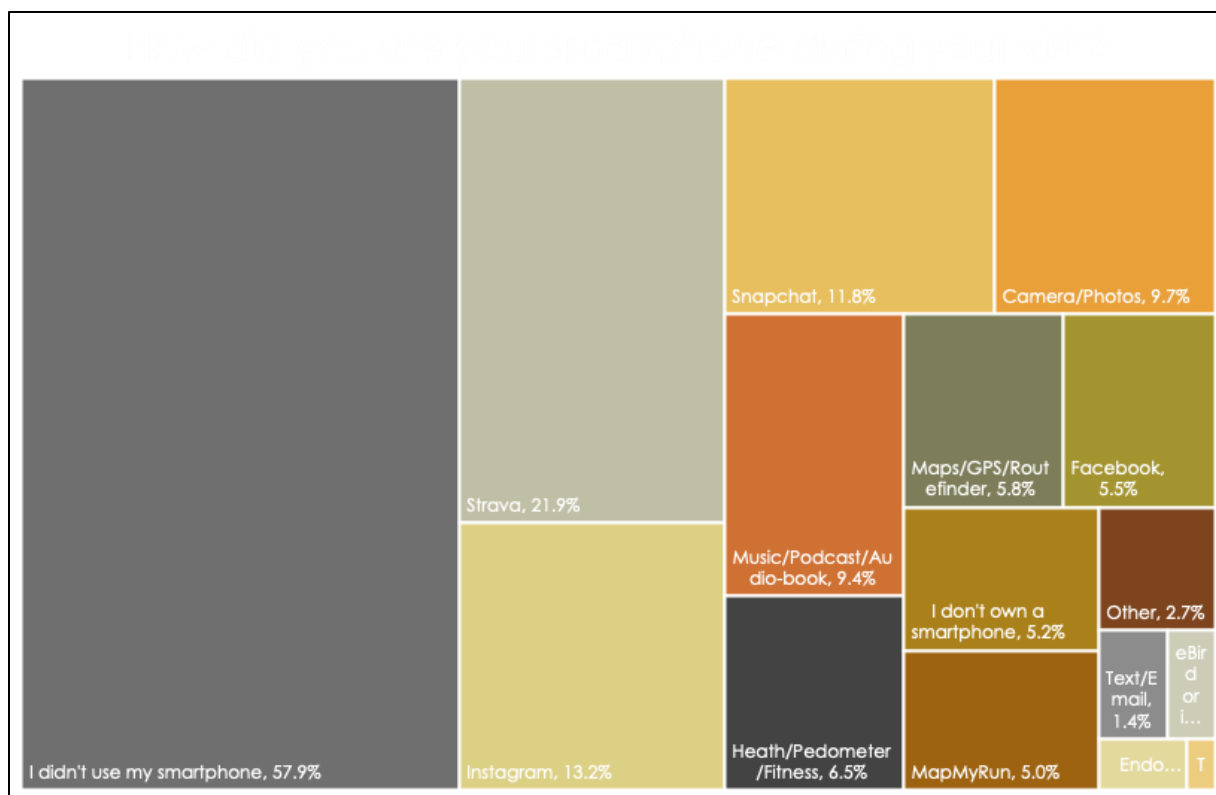
Figure B.40. *Visitor smartphone use during their visit, across all Reserve units.*
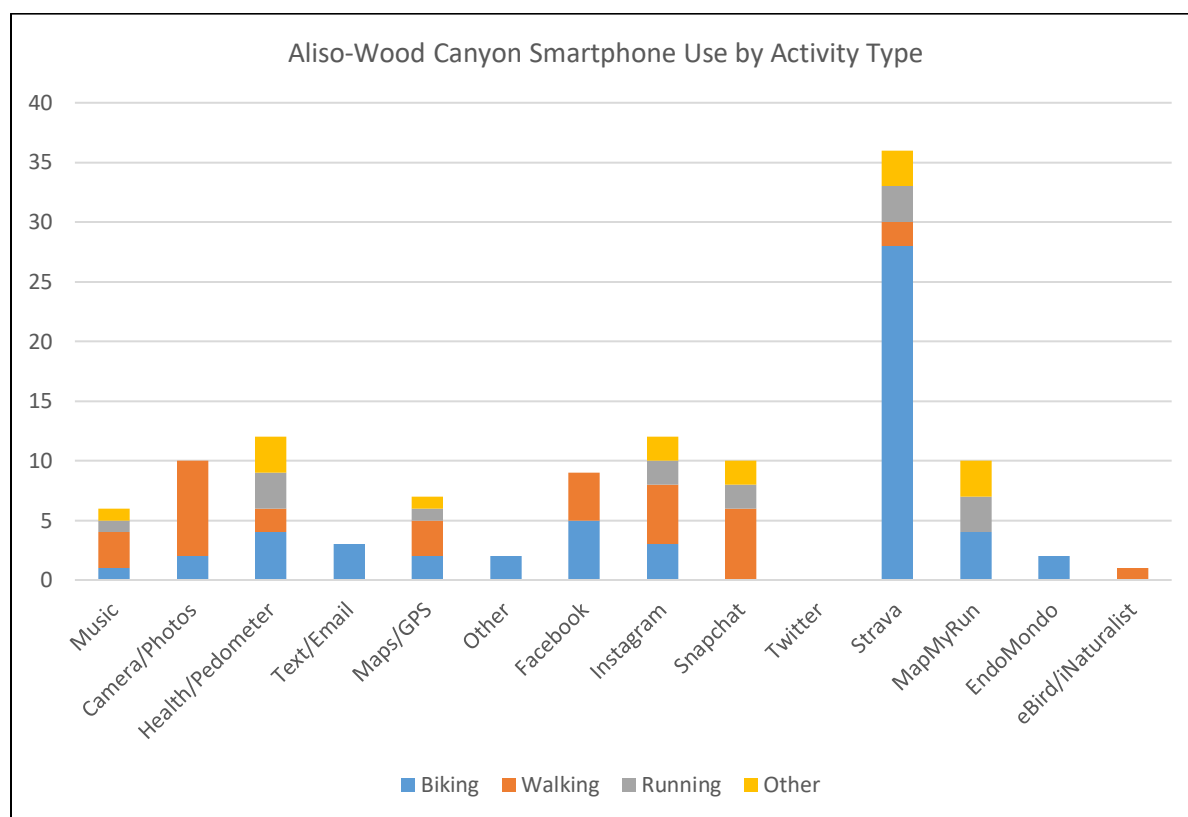
Figure B.41. *Visitor smartphone use for Aliso and Wood Wilderness Park by activity type.*
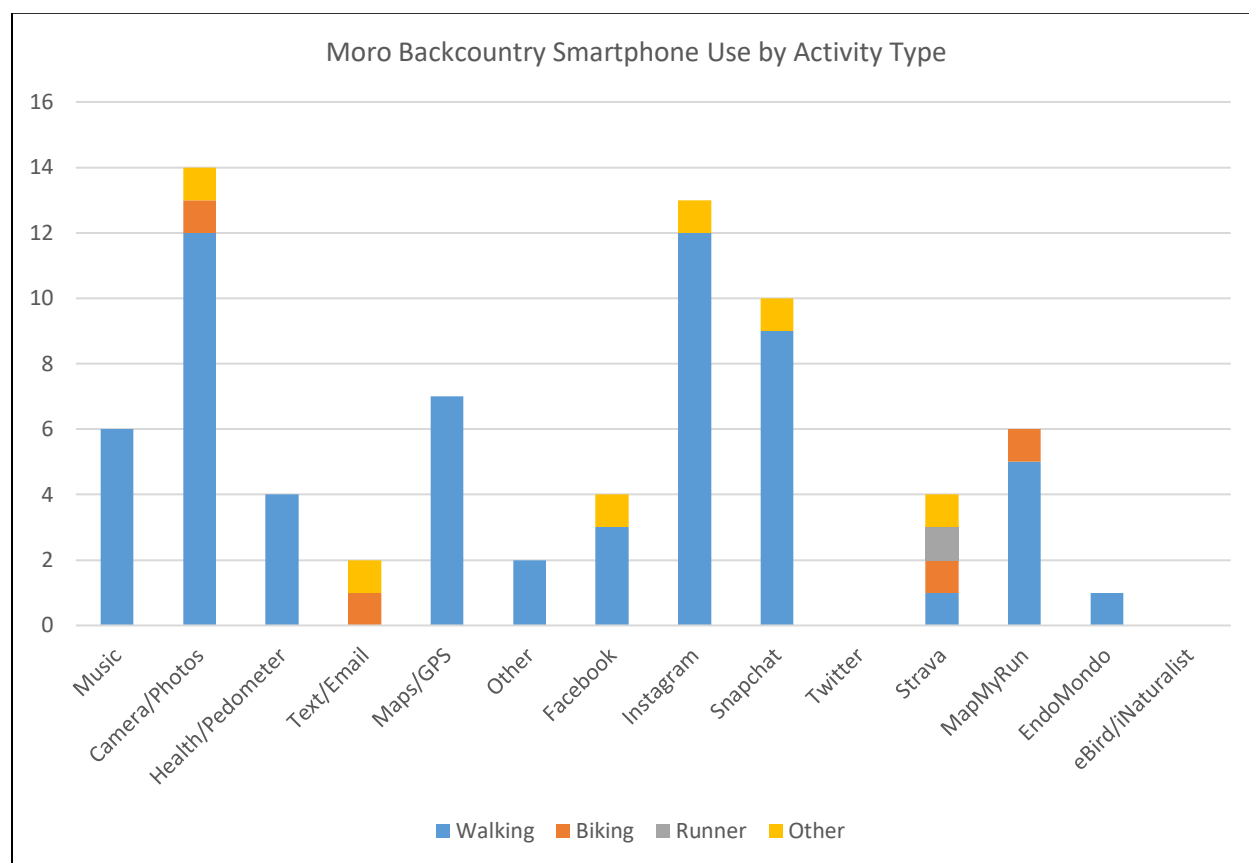
Figure B.42. *Visitor smartphone use for Moro Canyon/Crystal Cove State Park by activity type.*
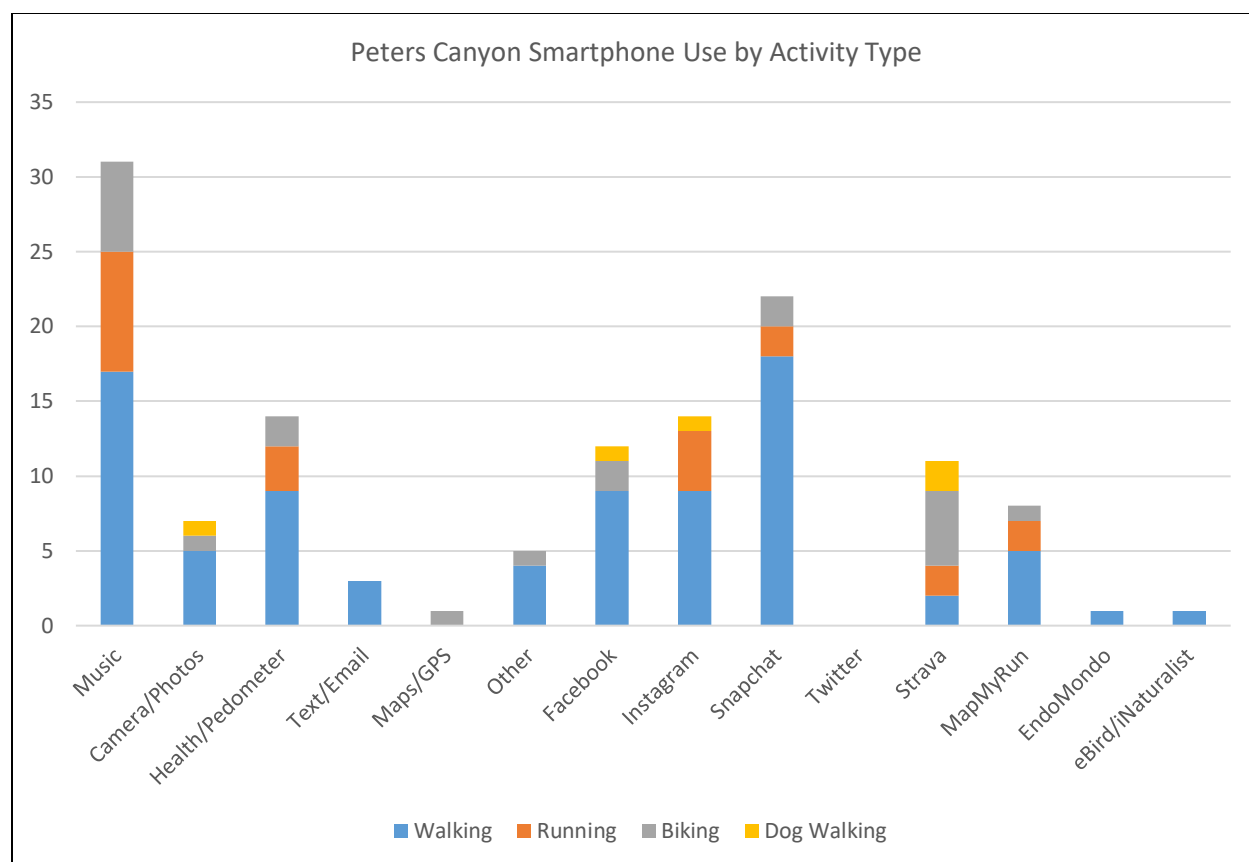
Figure B.43. *Visitor smartphone use for Peters Canyon Regional Park by activity type.*
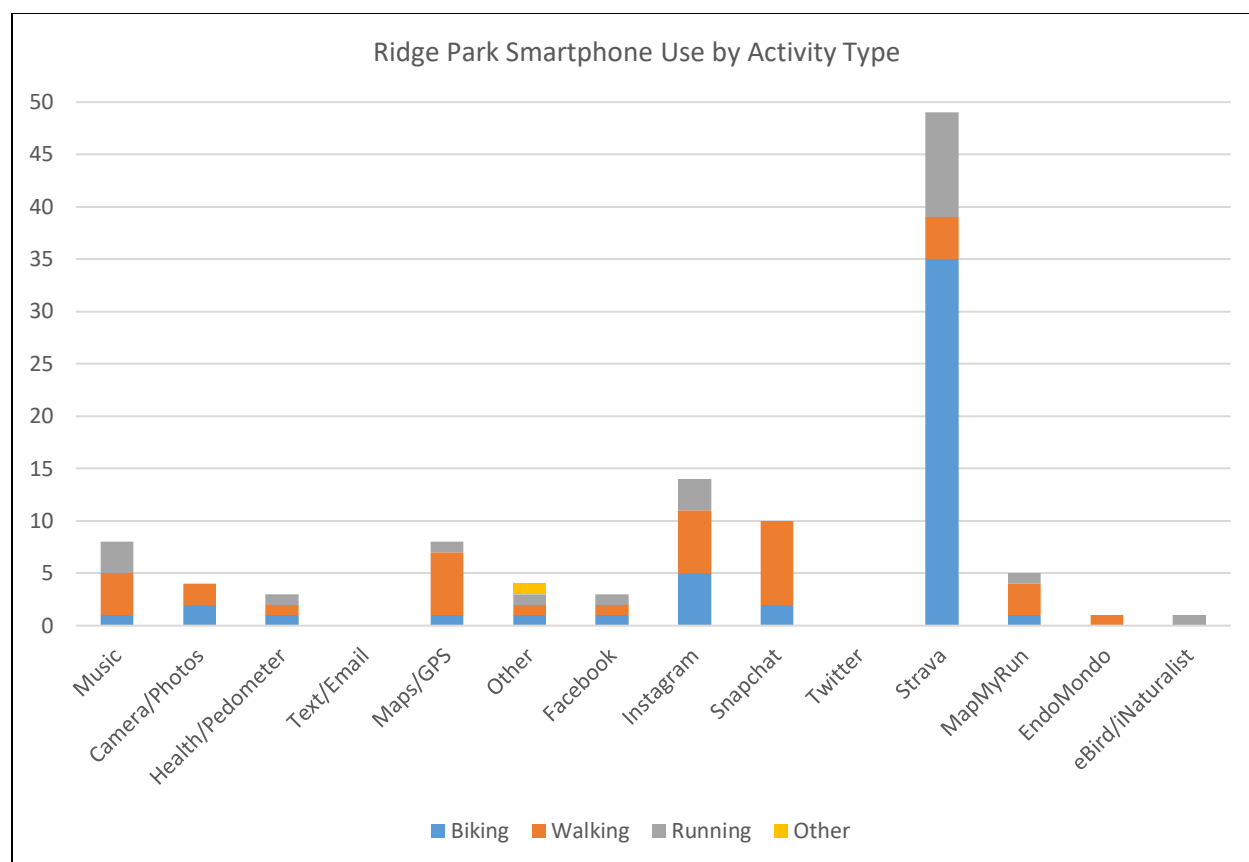
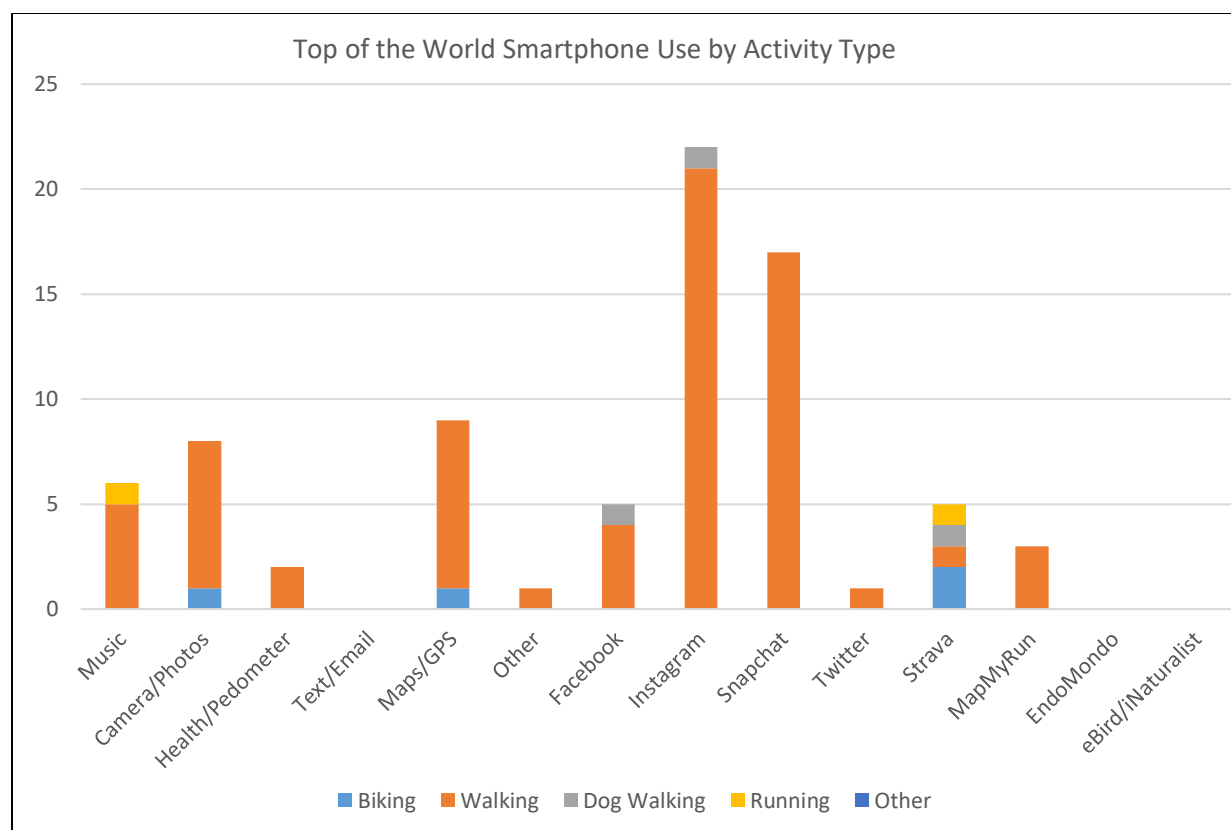**Figure B.44.** *Visitor smartphone use for Ridge Park by activity type.*

Figure B.45. *Visitor smartphone use for Top of the World by activity type.*
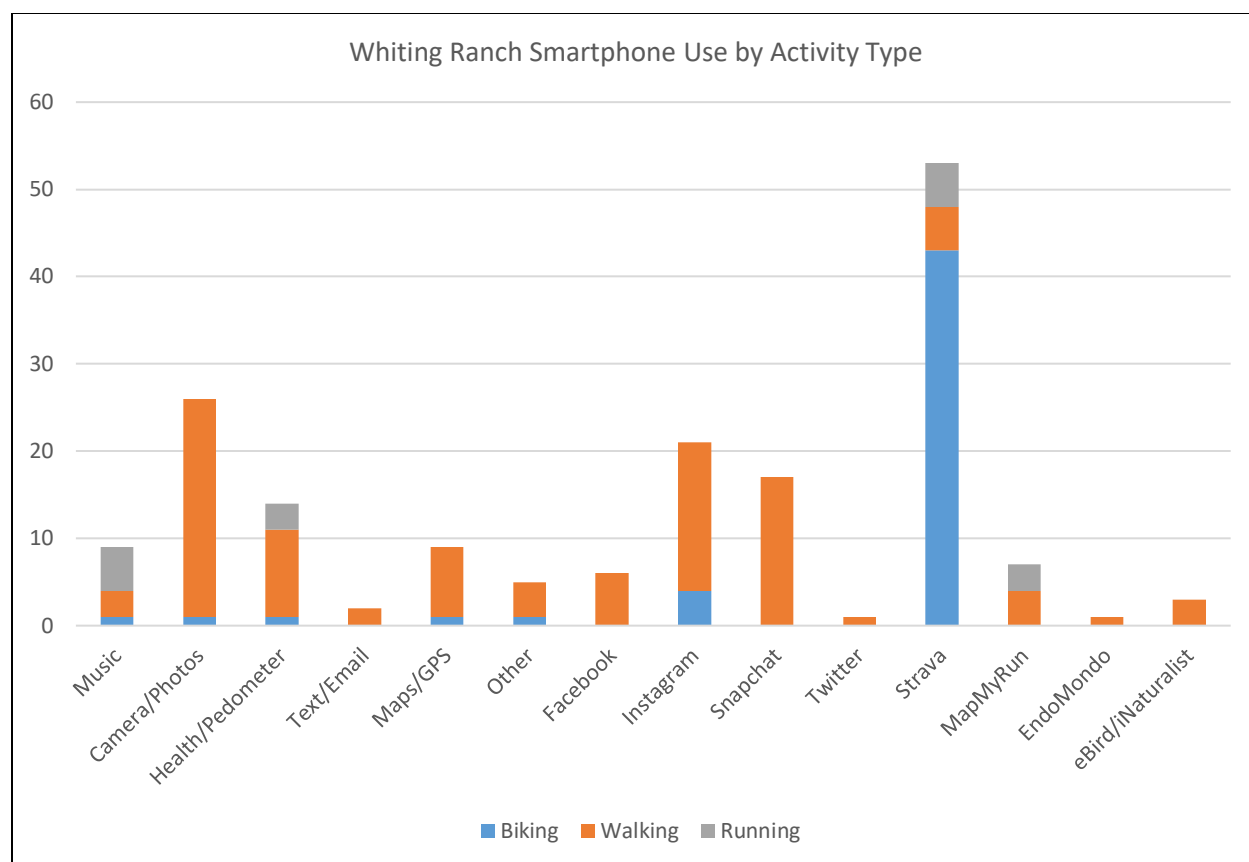
Figure B.46. *Visitor smartphone use for Whiting Ranch Wilderness Park by activity type.*
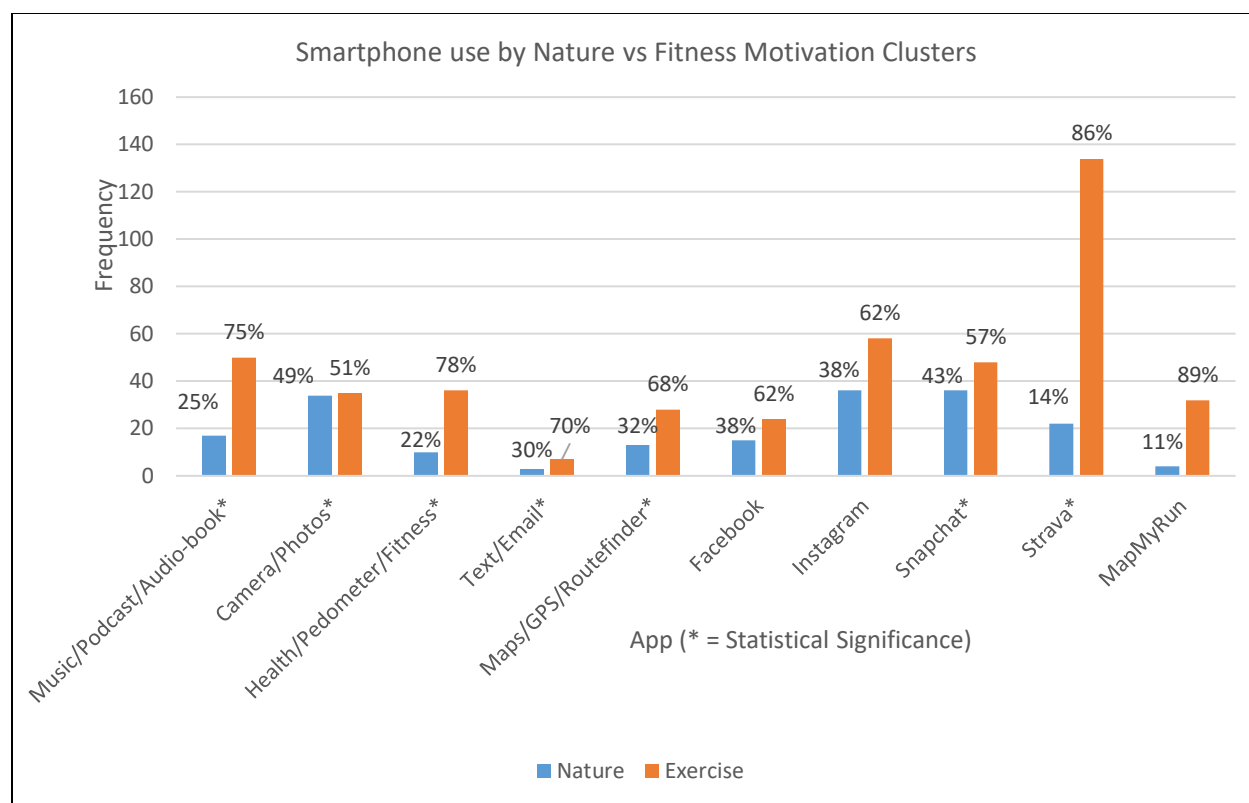
Figure B.47. *Differences in smartphone use by visitor motivation type.*
Smartphone use by visitor motivation type is significantly different at p<.05 using an Analysis of Variance (ANOVA).

All visitors were also asked how frequently they use the Strava app. When analyzed by activity type, bikers and runners tended to use the app more frequently than other user groups (fig. B.48). Several questions were asked specifically for mountain biking visitors who indicated that they used the Strava application, including reasons for and frequency of use of the application. The majority of mountain bike visitors report that they "always" use the Strava application (fig. B.49), and primarily use the app to "track and analyze performance fitness and goals" (fig. B.50). Finally, mountain biking visitors (who were also asked to carry a GPS-based tracking unit with them during their visit) were asked whether the fact that they were carrying a researcher-administered GPS unit caused them to alter their riding behavior. Over 90% of mountain bikers indicated that the presence of the unit did not cause them to alter their riding behavior (fig. B.51).
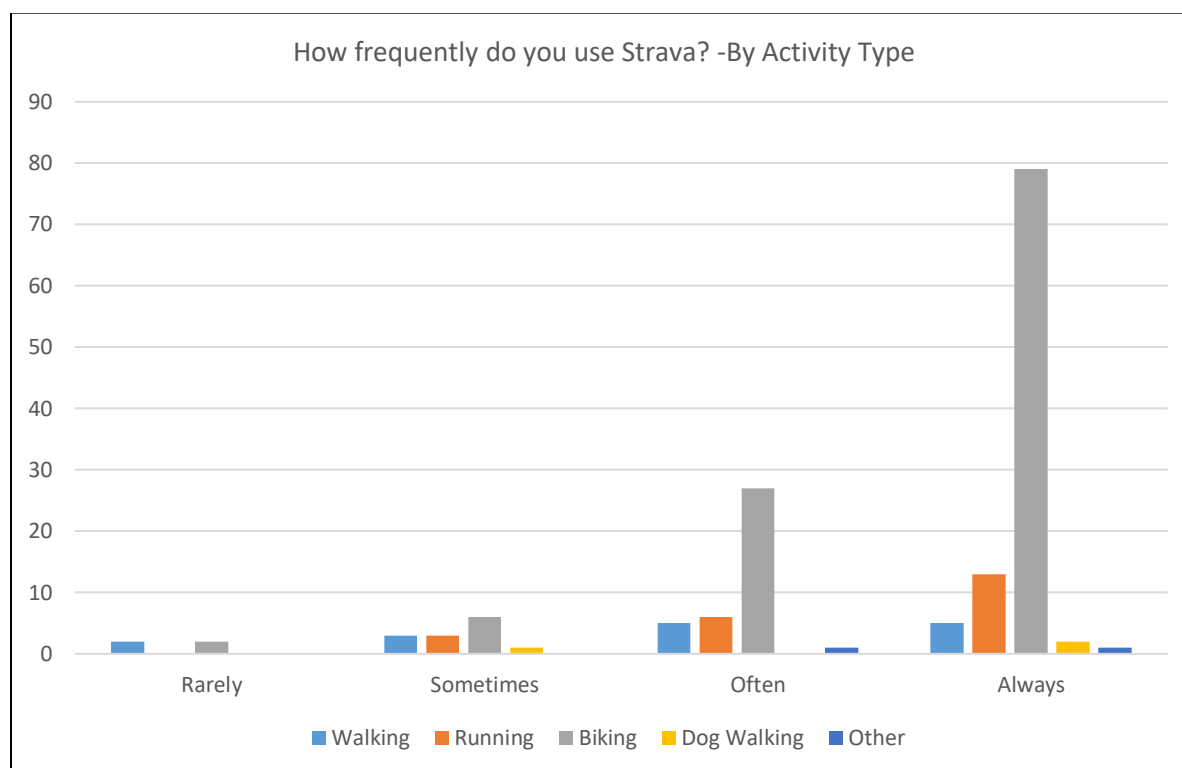
Figure B.48. *Strava application use frequency by activity type.*
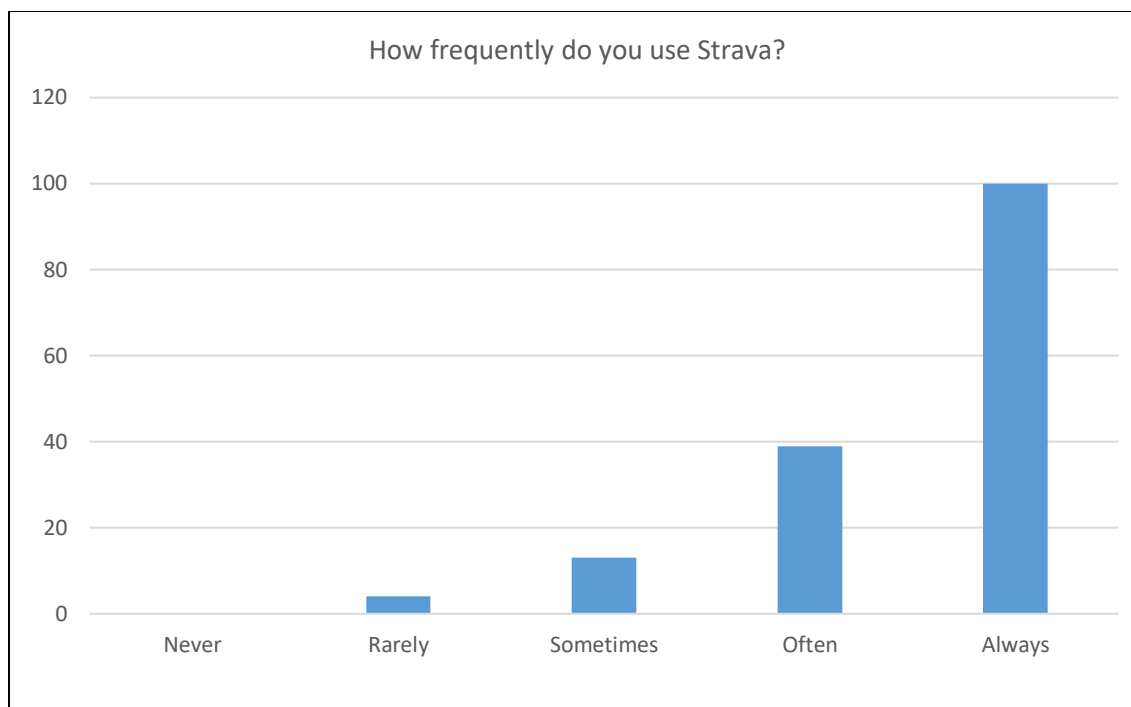
Figure B.49. *Mountain biker frequency of Strava application use.*
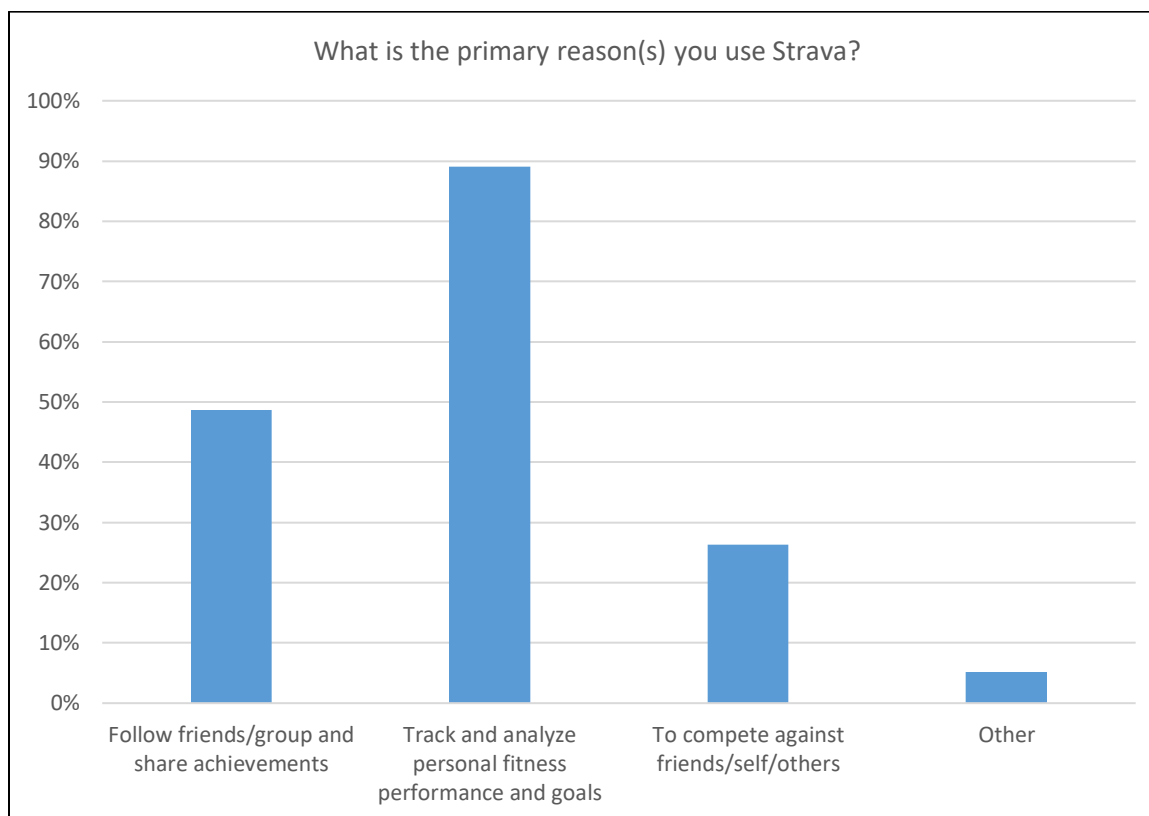
Figure B.50. *Mountain bike visitor primary reasons for use of the Strava app.*
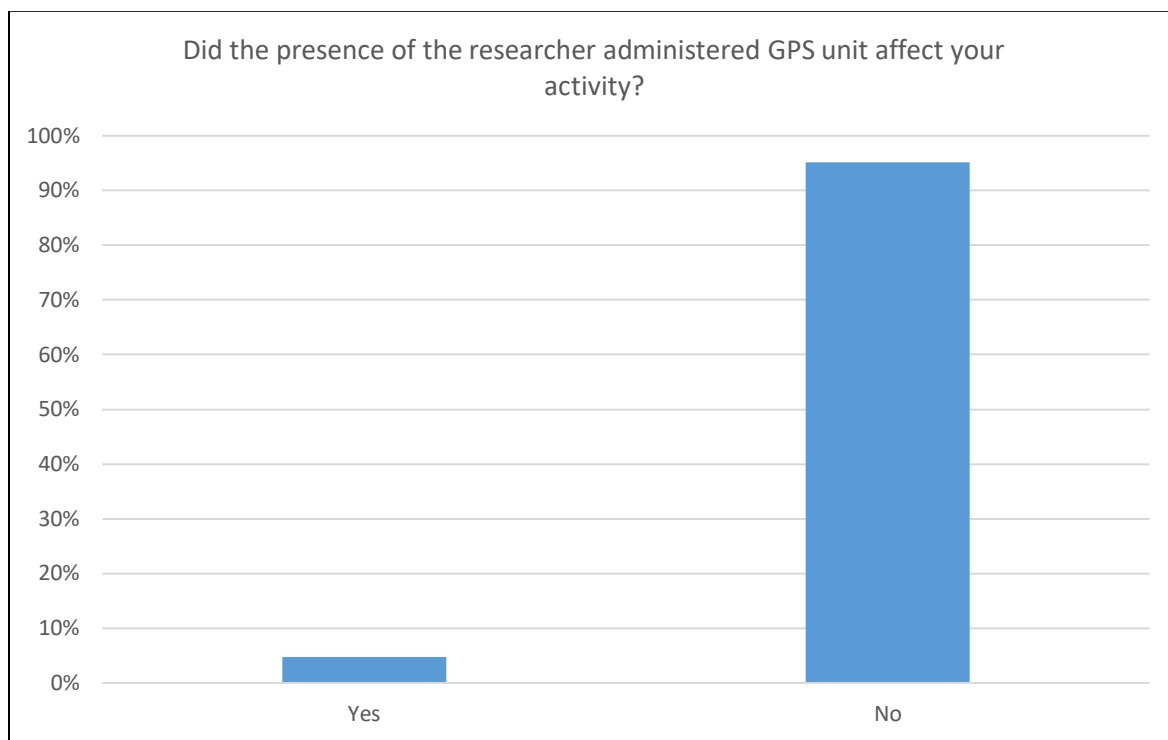
Figure B.51. *Mountain biker responses to whether carrying a researcher-administered GPS unit affected their riding behavior.*

Appendix C – Additional Resource Impact Analyses

Remote Sensing/Soil Exposure Analysis

Trampling studies have been a focus of recreation ecology research because of their direct disturbance to vegetation, displacement and compaction of soil particles, and alteration of plant species composition (Cole, 2004). As a result of high levels of visitation and picturesque Pacific Ocean views, the Top of the World site was selected to understand how these high use levels are changing ecological conditions in Aliso-Wood Canyon Wilderness Park. Satellite imagery was collected from the USDA National Agriculture Imagery Program (NAIP) data portal, which provided a spatial resolution of one meter accuracy and for years 2009, 2012, and 2016. Imagery from 2016 provided four-band imagery (Natural Color and Infrared Color). A supervised object-based image classification was performed to identify only exposed soil within the study area (fig. C.1.; white box) which yielded a polygon shapefile (area in yellow). Using ArcMap the area of exposed soil was calculated in acres. The percentage of increased soil exposure from the 2005 level is indicated in the top right corner for successive years. Between the years 2005-2016, exposed soil was increased 154.9% or 1.06 acres.
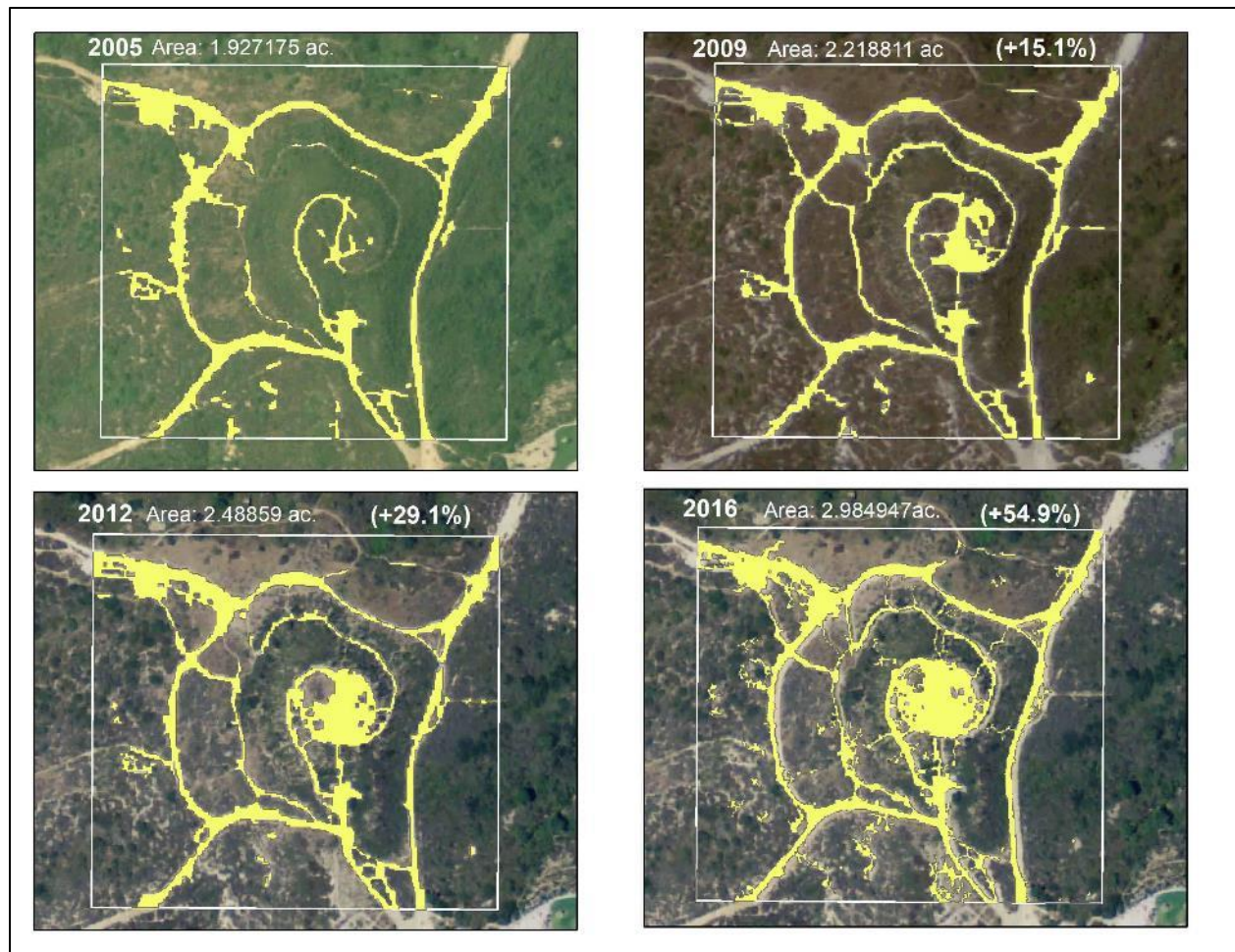
Figure C.1: *(Top of the World) Remote Sensing analysis using a supervised classification technique shows increasing soil exposure from the baseline 2005 to 2016.*

Appendix D – Additional Visitor Use Patterns and Sensitive Resources Methods, Analysis Flowcharts, and Results

Methods

Vegetation Data:

In 2015, Aerial Information Systems (AIS) completed a fine scale vegetation survey in which 86,000 acres of Orange County were mapped. Most of the areas in the Reserve were encompassed in this mapping effort. This mapping effort took several years to complete and consisted of four distinct steps. First, AIS used aerial imagery to identify vegetation types throughout Orange County. Next, these vegetation types were verified in the field. Third, the boundaries of the vegetation types were delineated using California Department of Fish and Game mapping classifications. Finally, the vegetation maps were verified in the field for a second time, and final changes were completed based on the fieldwork. The final vegetation map was estimated to have an overall accuracy of 87% (Aerial Information Systems, 2015).

CACW Data:

In June 2018, CACW occupancy surveys were conducted in the Reserve within suitable habitat areas for the CACW. After the plots were selected, surveys were conducted three times to determine whether the plot was occupied by at least one CACW; if at least one CACW was detected throughout the three surveys, the plot was marked as occupied by CACWs. Both occupied and unoccupied plots were spatially referenced with a GPS-point, resulting in 238 occupied plots and 632 unoccupied plots.

CAGN Data:

In 2016, a CAGN occupancy survey was completed throughout the Reserve A total of 180 plots were randomly selected from a pool of hundreds of plots that were determined to have suitable habitat for the CAGN. Similar to the CACW survey, surveys were conducted three times to determine whether the plot was occupied by at least one CAGN; if at least one was detected during the three surveys, the plot was determined to be occupied by CAGNs. Out of 180 plots surveyed, 53 were found to be occupied by CAGNs. Additionally, researchers made note of 80 'incidental observations of CAGNs, which included birds seen incidentally outside of surveyed plots as researchers were driving through the Reserve, walking from plot to plot, or conducting vegetation surveys. In total, there were 193 documented sightings of CAGNs (113 during survey and 80 incidental) and 428 unoccupied plots that were recorded with a GPS point (Leatherman Bioconsulting, 2016).

Analysis Flowcharts

Various analysis overlays were conducted in ArcGIS, the protocols and procedures used for this analysis are outlined in the flowcharts in figures D.1 – D.5.
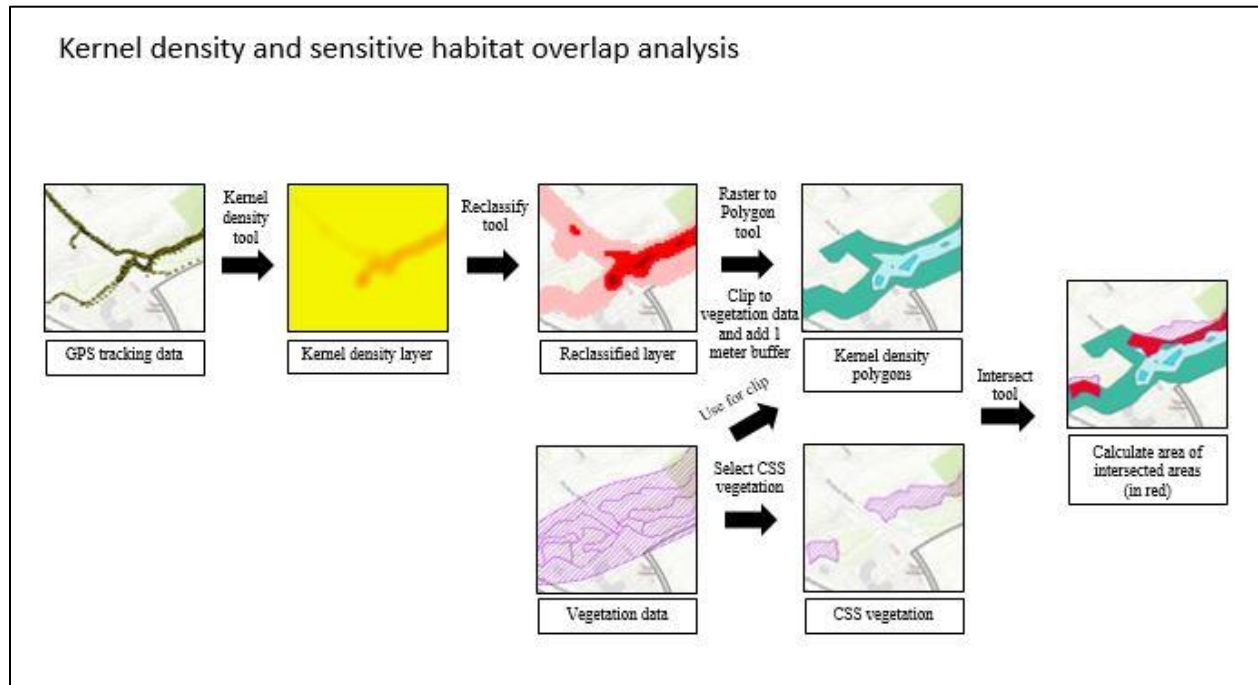

Figure D.1. *Analysis flowchart for kernel density and sensitive habitat overlap analysis.*
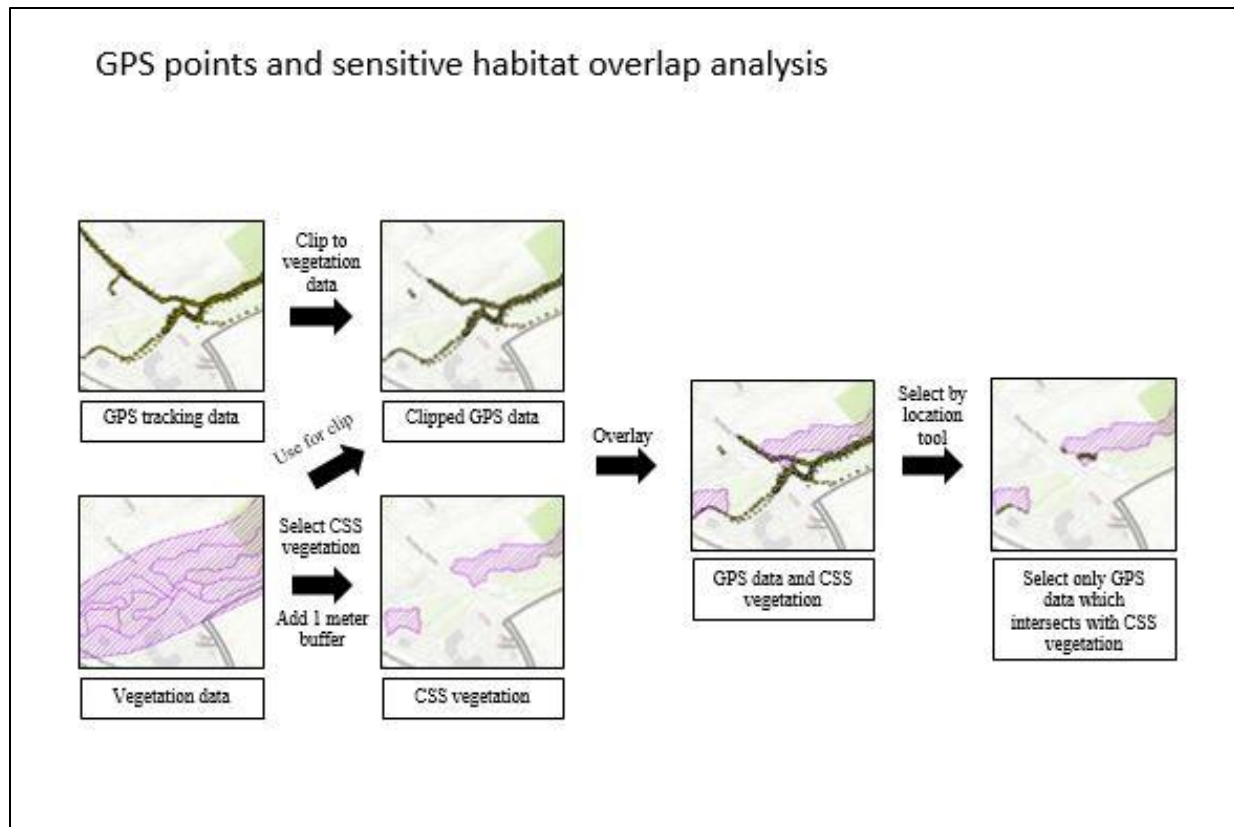
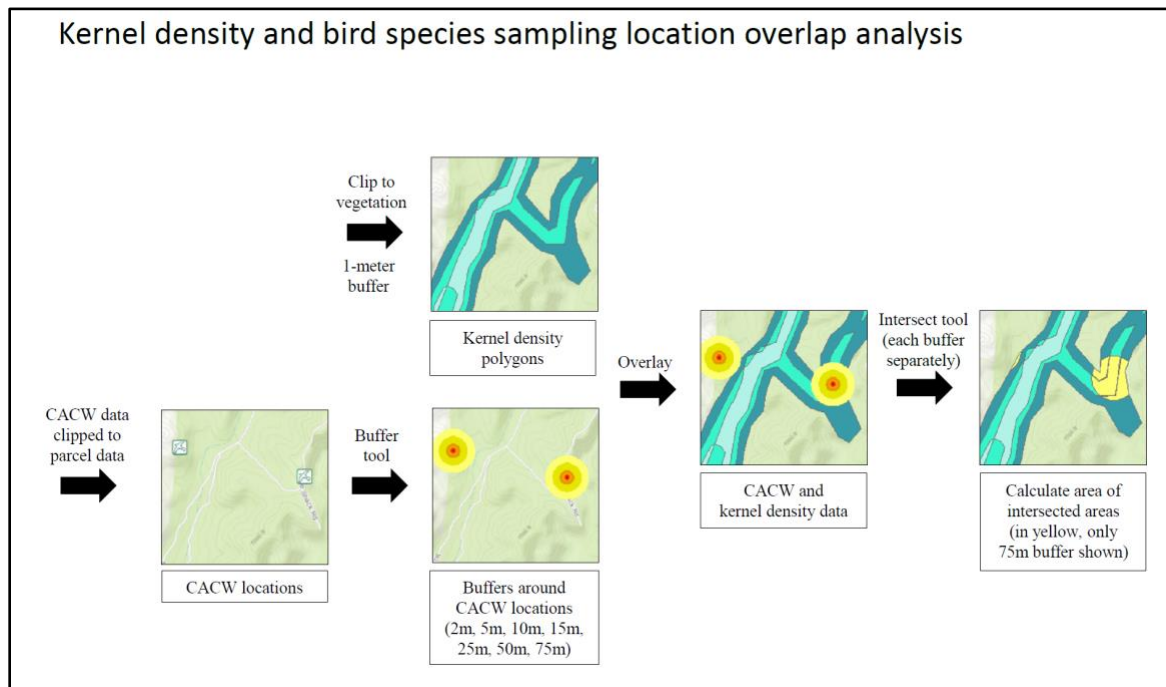**Figure D.2**. *Analysis flowchart for visitor GPS-based tracking point and sensitive habitat overlap analysis*

Figure D.3. *Analysis flowchart for visitor kernel density and bird species sampling overlap analysis.*
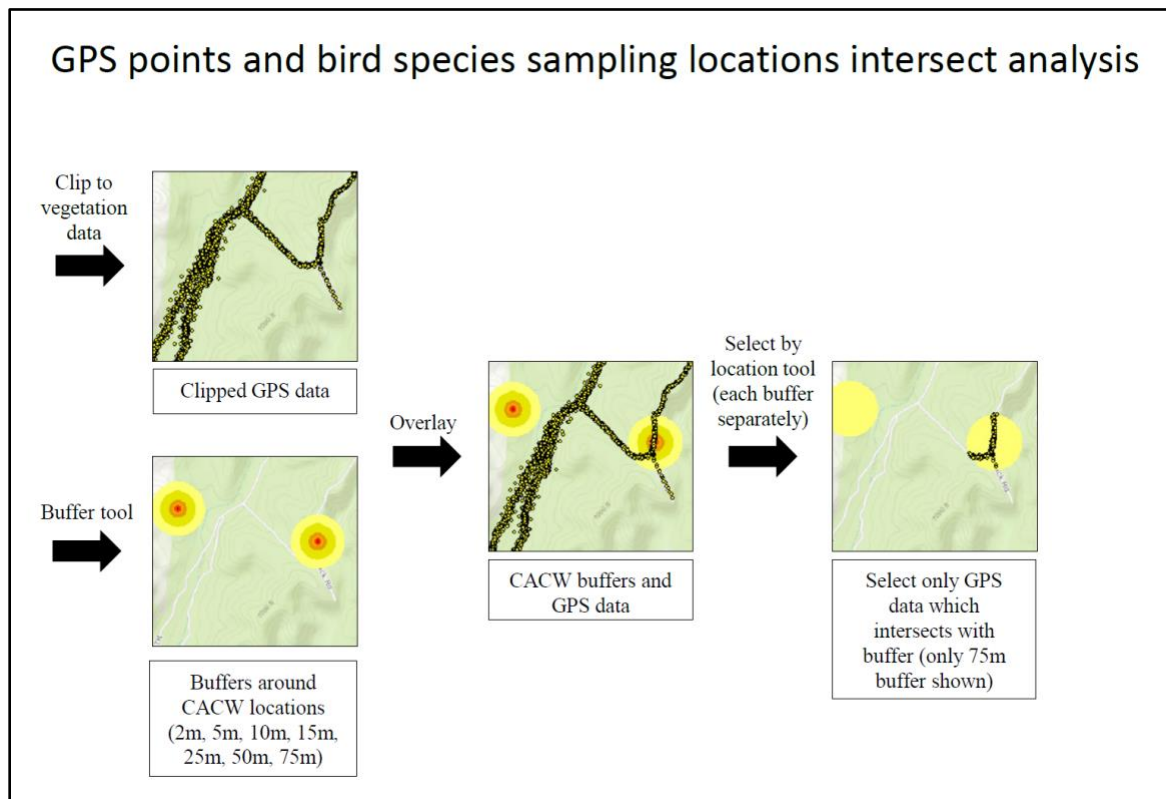
Figure D.4. *Flowchart for intersection of visitor GPS-based tracking point and bird species sampling location analysis.*
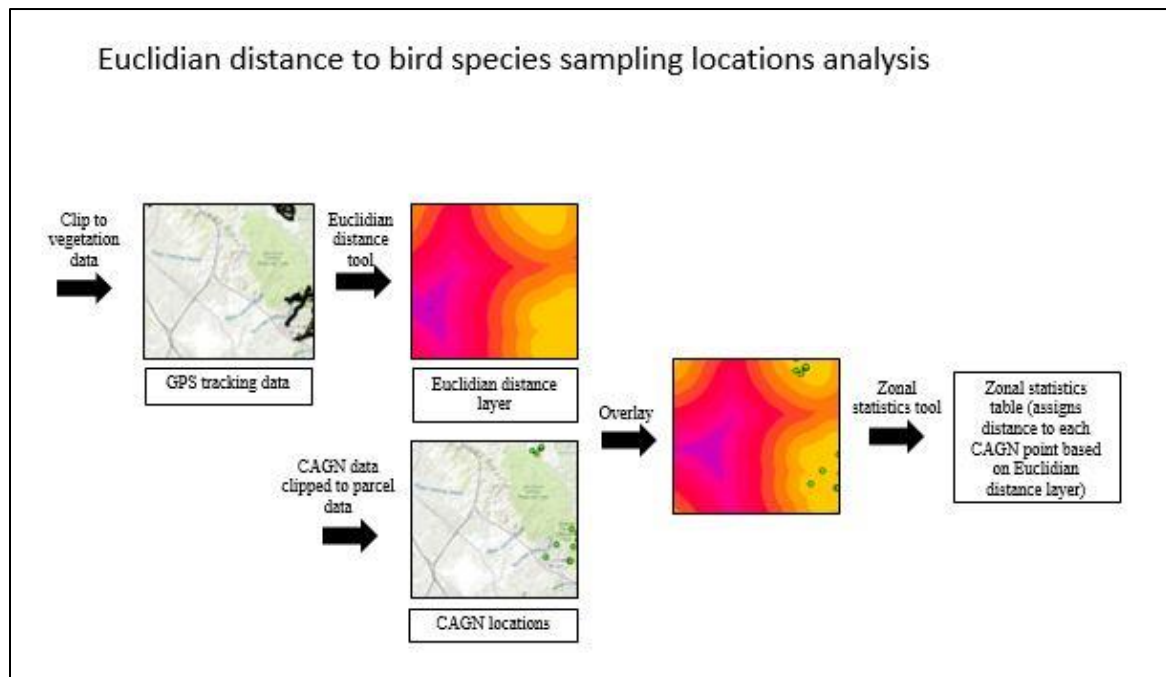
Figure D.5. *Flowchart for Euclidean distance to bird species sampling location analysis.*

Results:

The following tables (D.1 – D.2) and figures (D.6 –D.7) are supplementary summaries to the text and results presented in the "Visitor Use Patterns and Sensitive Resources" section of the report.

Table D.1. *Total number of tracks/individuals, GPS points, and area of kernel density layers representing visitors to the Reserve, reported in square meters.*

	# tracks/ individuals	# of GPS points	Low density (m²)	Medium density (m²)	High density (m²)
All GPS Tracked Visitors	827	337,259	17,723,180	3,708,419	1,614,611
Exercise Group	243	100,052	18,404,731	1,500,049	58,611
Nature Group	417	168,217	15,541,049	2,687,502	425,153

Table D.2. *Intersect between avian sensitive habitat and kernel density layers representing visitors to the Reserve, reported in square meters.*

	Low density (m²)	% of total low density area	Medium density (m²)	% of total medium density area	High density (m²)	% of total high density area
All GPS Tracked Visitors	192,556	1.1	45,295	1.2	22,628	1.4
Exercise Group	206,454	1.1	23,928	1.6	836	1.4
Nature Group	181,122	1.2	33,750	1.3	5,086	1.2
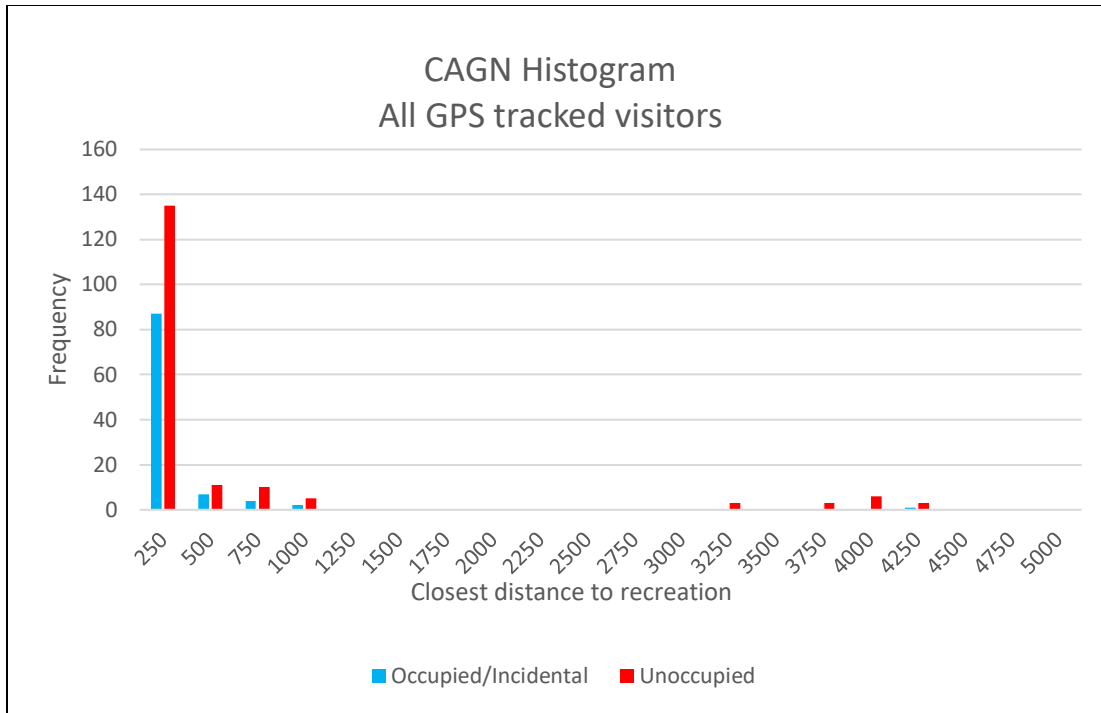
Figure D.6. *Histogram of distances between GPS tracking points and occupied/incidental and unoccupied occupancy locations for CAGN.*
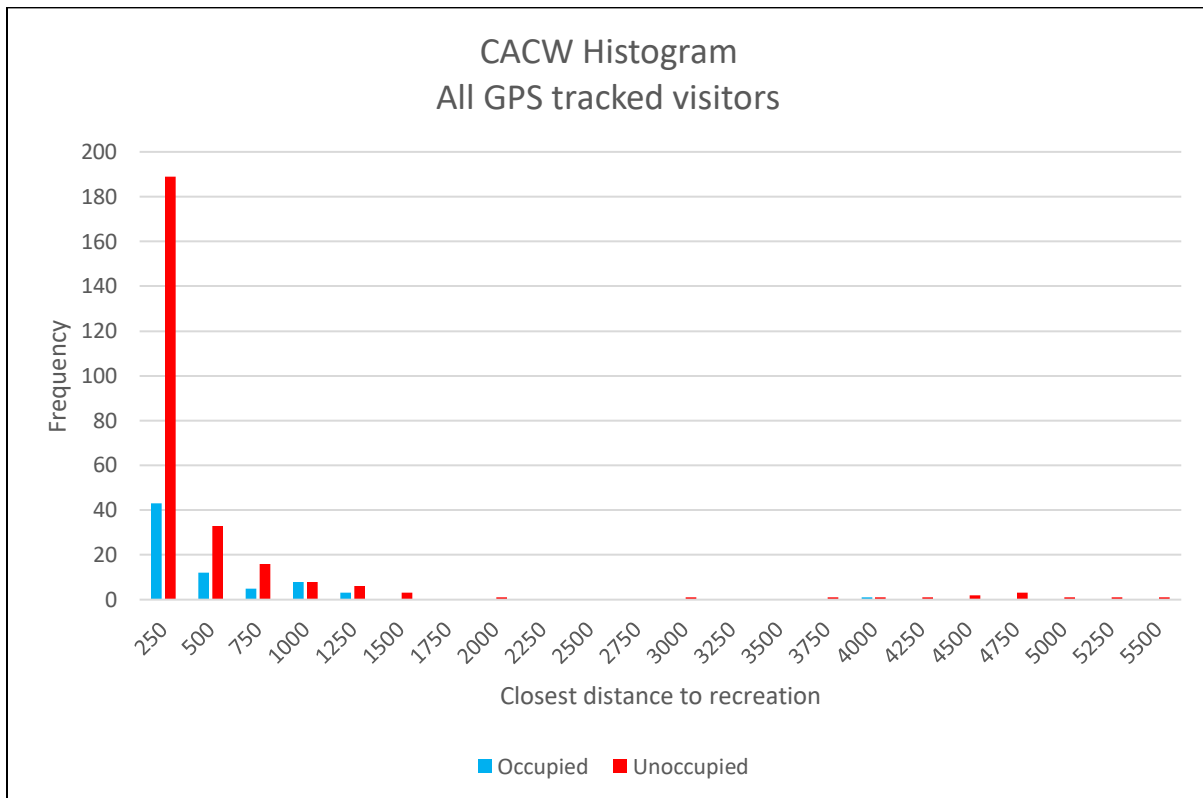
Figure D.7. *Histogram of distances between GPS tracking points and occupied/incidental and unoccupied occupancy locations for CACW.*

Appendix E – Visitor Survey Instruments

2017 Survey

Q1 By continuing on to the survey, you agree to participate in this study. You indicate that you understand the risks and benefits of participation, and that you know what you will be asked to do. You also agree that you have asked any questions you might have, and are clear on how to stop your participation in the study if you choose to do so. Please be sure to retain a copy of this form for your records.

Q2 Would you like to participate in this survey?

○ Yes

○ No

Q3 GPS track label

_____

Q4 Group Size

_____

Q5 What was your intended destination within the park today?

_____

Q6 Where did you depart from your visit to the park today?

    ○ City _____

    ○ Zip Code _____

Q7 What was the primary activity you planned to participate in on your visit today?

_____

_____

_____

_____

_____

Q8 Which one language do you and the members of your personal group primarily use to communicate with each other?

    ○ English

    ○ Other (Please Specify) _____

Q9 What was your intended destination within the park today?

_____

Q10 On this visit, how long did you or you and your personal group stay at this location or on this trail?

◯ Number of **hours**, if less than 24 hours

_____

◯ Number of **days**, if 24 hours or more

_____

Q11 Have you visited this location within the park before today?

☐   Yes

☐   No

☐   If yes, approximately how many trips have you made to this location or along this trail in the last 5 years, including this trip?

_____

☐   How many trips have you made to this park in your lifetime, including this trip?

_____

Q12 What other open space areas in Orange County do you visit regularly? Check all that apply.

- [ ] Crystal Cove State Park

- [ ] Laguna Coast Wilderness Park

- [ ] Aliso and Wood Canyons Wilderness Park

- [ ] Upper Newport Bay Nature Preserve

- [ ] Upper Newport Bay Ecological Reserve

- [ ] Buck Gully Reserve

- [ ] Talbert Regional Park

- [ ] City of Irvine Open Space Preserve

- [ ] Whiting Ranch Wilderness Park

- [ ] Irvine Ranch Open Space

- [ ] Irvine Regional Park

- [ ] Peters Canyon Region Park

- [ ] Santiago Oaks Regional Park

- [ ] Coal Canyon Ecological Reserve

- [ ] Other (Please List) _____

Q13 How would you describe your current knowledge of the Nature Reserve of Orange County in general (locations, purpose, recreation opportunities?)

○ None (This is a Nature Reserve?)

○ Some (I know that this park is part of the Nature Reserve of Orange County, but I'm not sure what that means.)

○ Expert (I have detailed knowledge of different locations within the Nature Reserve, their purpose, and what visitor opportunities are available there.)

Q14 How would you describe your current knowledge of the conservation goals on the Nature Reserve of Orange County? (**Please select only one response**.)

○ None (This is a nature reserve?)

○ Some (I know the Nature Reserve has conservation goals but I don/t know the details.)

○ Expert (I have detailed knowledge of the conservation goals of the reserve.)

Q15 Many popular recreation areas, including the park you are in, are part of the Nature Reserve of Orange County. For each of the following statements, indicate your level of agreement. (Please fill in your response for each statement.)

	Strongly Disagree	Disagree	Agree	Strongly Agree	Don't Know
a. A primary value of the Nature Reserve is to protect wildlife.	☐	☐	☐	☐	☐
b. A primary value of the Nature Reserve is to conserve habitat.	☐	☐	☐	☐	☐
c. A primary value of the Nature Reserve is to provide recreation opportunities to the community.	☐	☐	☐	☐	☐
d. The Nature Reserve is valuable because it protects and enhances biodiversity.	☐	☐	☐	☐	☐
e. The Nature Reserve is valuable whether recreation is allowed or not.	☐	☐	☐	☐	☐
f. Recreation use is compatible with the conservation goals of the Nature Reserve	☐	☐	☐	☐	☐
g. Recreation use should not be allowed on the Nature Reserve if it compromises conservation goals.	☐	☐	☐	☐	☐

Q16 Please describe in a few sentences the experiences you were seeking while visiting the park today.

_____

_____

_____

_____

_____

Q17 Why did you or you and your personal group choose to visit this trail location at the time you did?

_____

_____

_____

_____

_____

Q18 Where did you depart from for your visit to the park today?

☐　　City _____

☐　　Zip Code _____

Q19 About how far from home did you travel for this trip? Did you walk, ride a bike, drive in a personal vehicle, or use public transportation to get this location?

☐　　Miles _____

☐　　Mode of Transport _____

Q20 If you drove or rode in a personal vehicle, where did you park?

○ Designated parking lot

○ Adjacent residential neighborhood

○ Other (please describe): _____

○ N/A- I did not drive or ride in a personal vehicle to get to the park

----

Q21 How did you first learn about the recreation opportunities here?

_____

Q22 How do you obtain updates/ current information about the park? Please select all that apply.

☐   Friends/relatives/word of mouth

☐   Reserve staff/volunteer

☐   Television/radio/newspapers/magazines

☐   Park website

☐   Other Website (Please Specify)

_____

☐   Social Media (Please Specify)

_____

☐   Mobile App (Please Specify)

_____

☐   Other (Please Specify)

_____

Q23 What was the primary activity you planned to participate in on your visit today?

_____

_____

_____

_____

_____

Q24 Please check all of the following things you've done in this location or similar locations within Orange County, and indicate how frequently you participate in these activities.

	I don't do this	10 or fewer days/year	11-25 days/years	26-50 days/year	50 or more days/year
Hiking/Walking on developed trails	☐	☐	☐	☐	☐
Hiking/Walking on beaches or beach bluffs	☐	☐	☐	☐	☐
Biking on paved surfaces	☐	☐	☐	☐	☐
Mountain Biking	☐	☐	☐	☐	☐
Trail Running/Running	☐	☐	☐	☐	☐
Nature/Wildlife Observation	☐	☐	☐	☐	☐
Picnicking	☐	☐	☐	☐	☐
Camping	☐	☐	☐	☐	☐
Ocean swimming	☐	☐	☐	☐	☐
Beachcombing	☐	☐	☐	☐	☐
Tidepooling	☐	☐	☐	☐	☐
Sunbathing	☐	☐	☐	☐	☐
Surfing/Stand up paddleboarding	☐	☐	☐	☐	☐

Other (Please Specify): ☐ ☐ ☐ ☐ ☐

Q25 Below is a list of possible experiences you may want (prefer) to have while visiting lands enrolled within the Natural Reserve of Orange County. For each item, please indicate how important each experience is to you on your visit to the Nature Reserve.

	Not at all	Slightly	Moderately	Very	Extremely
1. To experience solitude	○	○	○	○	○
2. To spend time with family/ friends	○	○	○	○	○
3. To view wildlife	○	○	○	○	○
4. To experience natural quiet	○	○	○	○	○
5. To experience psychological renewal	○	○	○	○	○
6. To grow and develop spiritually	○	○	○	○	○
7. To learn about the history and cultural significance of the reserve	○	○	○	○	○
8. To improve my physical health	○	○	○	○	○
9. To view scenic beauty	○	○	○	○	○
10. To be close to nature	○	○	○	○	○
11. To have an adventure	○	○	○	○	○
12. To be where things are fairly safe	○	○	○	○	○
13. To be alone	○	○	○	○	○
14. To get away from the usual demand of life	○	○	○	○	○
15. To enjoy the sounds of nature	○	○	○	○	○

16. To experience tranquility and contemplativeness in nature   ○   ○   ○   ○   ○

17. To be in touch with my spiritual values   ○   ○   ○   ○   ○

18. To learn about the plants and wildlife in the reserve   ○   ○   ○   ○   ○

19. To share this place with family and friends   ○   ○   ○   ○   ○

20. To get out of the city   ○   ○   ○   ○   ○

21. To experience a sense of connectivity with nature   ○   ○   ○   ○   ○

22. To experience risk   ○   ○   ○   ○   ○

23. To avoid risky situations   ○   ○   ○   ○   ○

24. To be away from crowds of people   ○   ○   ○   ○   ○

25. To photograph wildlife   ○   ○   ○   ○   ○

26. To feel small in a vast landscape   ○   ○   ○   ○   ○

27. To experience a feeling of calmness or peace   ○   ○   ○   ○   ○

28. To experience a spiritual connection with nature   ○   ○   ○   ○   ○

29. To learn about nature conservation and preservation values on the reserve	○	○	○	○	○
30. To get away from the usual demands of life	○	○	○	○	○
31. To get some exercise	○	○	○	○	○
32. To experience the diversity of the natural world	○	○	○	○	○
33. To experience a sense of challenge	○	○	○	○	○
34. To be near others who could help if you needed them	○	○	○	○	○
35. To experience a positive change in mood and emotion	○	○	○	○	○
36. To experience wildlife to have a memorable story to tell other people	○	○	○	○	○
37. To test my abilities	○	○	○	○	○

Q26 Please indicate your level of agreement or disagreement with each of the statements. Please select only one response for each item.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. The site means a lot to me	○	○	○	○	○
2. I enjoy recreating at this park more than in any other park enrolled	○	○	○	○	○
3. I am very attached to this park	○	○	○	○	○
4. I wouldn't substitute any other location for the activity I do here	○	○	○	○	○
5. I strongly identify with this place	○	○	○	○	○
6. I get more satisfaction out of visiting this place than from visiting any other similar place	○	○	○	○	○
7. No other place can compare to this park	○	○	○	○	○
8. I feel that this site is part of me	○	○	○	○	○

| 9. Visiting this location says a lot about who I am | ○ | ○ | ○ | ○ | ○ |

Q27 What about the park added most to your experience today?

_____

_____

_____

_____

_____

Q28 What about the park detracted most from your experience today?

_____

_____

_____

_____

_____

Q29 Did the presence of other people on the trail make you feel rushed or slow you down at any point during your visit today? (Check one box.)

○ Yes

○ No

Q30 During this visit, did other visitors and their activities interfere with your visit to this area?

○ Yes (Please explain how or why)

_____

○ No

Q31 How many people (including you) are in your group?

○ Please enter the number here

_____

Q32 For your personal group today, please provide the following information by marking an X in the provided boxes. (If you don't know the answer, select "Don't Know".)

	Yourself	Member 2	Member 3	Member 4
Current Age				
U.S. City/ Country of Origin				
Male				
Female				
Other/ Prefer not to answer				
Hispanic or Latino				
American Indian or Alaska Native				
Asian				

Black or African				
Native Hawaiian or Pacific Islander				
White				
Other/ Prefer not to respond				
Don't Know				

Q33 What is the highest level of education you have completed? Please select only one response.

○ Less than high school

○ Some high school

○ High school graduate

○ Vocational/ Trade school certificate

○ Some College

○ Two- year college degree

○ Four-year college degree [or bachelor's degree]

○ Master's degree [or other graduate degree]

○ Ph.D, M.D., J.D., or equivalent

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Q34 Which category best represents <u>your</u> annual household income?

○ Less than $25,000

○ $25,000 to $34, 999

○ $35, 000 to $49,999

○ $50,000 to $74,999

○ $75,000 to $99,999

○ $100,000 to $149,999

○ $150,000 to $199,999

○ $200,00 or more

Q35 Which one language do you and the members of your personal group primarily use to communicate with each other?

○ English

○ Other (Please Specify) _____

Q36 Do you have a cell phone at the park with you today?

○ Yes

○ No

Q37 How often do you use the following technology/ apps when recreating in this park? (Please select the appropriate column for each item).

	Never	Rarely	Sometimes	Often	Always
Smartphone	○	○	○	○	○
GPS Device	○	○	○	○	○
Smartphone camera	○	○	○	○	○
DSLR Camera	○	○	○	○	○
Facebook	○	○	○	○	○
Instagram	○	○	○	○	○
Strava	○	○	○	○	○
MapMyHike/Run/Ride	○	○	○	○	○
Other	○	○	○	○	○

2018 Survey

Q1 By continuing on to the survey, you agree to participate in this study. You indicate that you understand the risks and benefits of participation, and that you know what you will be asked to do. You also agree that you have asked any questions you might have, and are clear on how to stop your participation in the study if you choose to do so. Please be sure to retain a copy of this form for your records.

Q2 Would you like to participate in this survey?

○ Yes

○ No

Q3 GPS track label

_____

Q4 What park are you visiting today?

○ Aliso-Wood Canyon

○ Top of the World

○ Ridge Park

○ Whiting Ranch

○ Peter's Canyon

○ Crystal Cove State Park

Q5 What was the primary activity you planned to participate in on your visit today?

◯ Walking/Hiking

◯ Running

◯ Biking

◯ Dog Walking

◯ Horseback Riding

◯ Other (Please Specify) _____

Q6 On average how many days/year do you participate in [activity in Q5] ?

◯ 0-10

◯ 11-25

◯ 26-50

◯ 51+

Q7 Please rate your current experience level in [activity in Q5]. Please mark only one.

◯ Beginner

◯ Novice

◯ Intermediate

◯ Advanced

◯ Expert

Q8 [Non-Response] What was your primary constraint for not participating in this survey?

_____

_____

_____

_____

_____

to open space areas in Orange County are looking for experiences being immersed in nature or exercising outdoors. What was your primary motivation for visiting the park today?

○ Nature immersion

○ Nature immersion and outdoor exercise, but mostly nature immersion

○ Outdoor exercise

○ Outdoor exercise and nature immersion, but mostly outdoor exercise

○ Other (Please specify) _____

Q10 Why did you [and your personal group] decide to get out on the trails you did today?
Select all that apply.

☐   To get away from the demands of life

☐   To be away from crowds

☐   To learn about plants & wildlife

☐   To be in touch with my spiritual values

☐   To test my abilities

☐   To get some exercise

☐   To feel safe while in the outdoors

☐   To spend time with friends

Q11 What did you most enjoy about your recreation experience today? (Please tell us up to
three things you enjoyed most.)

○ 1 _____

○ 2 _____

○ 3 _____

Q12 What did you least enjoy about your recreation experience today? (Please tell us up to three things you enjoyed least.)

○ 1 _____

○ 2 _____

○ 3 _____

Q13 Please indicate your level of satisfaction concerning your ability to achieve the following experiences on trails within [Park selected in Q4] today.

	Extremely dissatisfied	Somewhat dissatisfied	Neither satisfied nor dissatisfied	Somewhat satisfied	Extremely satisfied
To get away from the demands of life	○	○	○	○	○
To be away from crowds	○	○	○	○	○
To learn about plants & wildlife	○	○	○	○	○
To be in touch with my spiritual values	○	○	○	○	○
To test my abilities	○	○	○	○	○
To get some exercise	○	○	○	○	○
To feel safe while in the outdoors	○	○	○	○	○
To spend time with friends	○	○	○	○	○

Q14 To your knowledge, does the park you visited today have any rules about visitors going off the trail? Please select only one response.

○ Yes, visitors are not supposed to go off the trail.

○ No, visitors are allowed to go off the trail.

○ I'm not sure if there is a rule about going off the trail.

Q15 The following statements ask for your evaluation of the management and conditions within [Park selected in Q4]. Please indicate the extent to which you agree or disagree with each of the following statements.

	Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
There is enough parking	○	○	○	○	○
There are enough road signs	○	○	○	○	○
There are enough trail signs	○	○	○	○	○
There are enough rules	○	○	○	○	○
There are enough trails	○	○	○	○	○
There is enough info about plants & animals I might see at the park	○	○	○	○	○
There is enough info about historical and cultural significance of the park	○	○	○	○	○
There is enough info about conservation initiatives at the park	○	○	○	○	○

There is enough info about having a safe experience at the park	○	○	○	○	○

Q16 Thinking about your trip, would you have liked to have seen more of, the same, or less of each of the following facilities? Please select one response for each item.

	Less	Same	More
Trails for hiking	○	○	○
Trails for biking	○	○	○
Trails for horseback riding	○	○	○
Universal Access (e.g., for wheelchairs) sites and facilities	○	○	○
Other (please specify)	○	○	○

Q17 Please indicate how much you agree or disagree with the following statement regarding your concerns while using the trails. Please mark only one response per question.

	Not at all a problem	Slight problem	Moderate problem	Serious problem	Extreme problem
Too many people/large groups on the trails	○	○	○	○	○
Too many mountain bikers on the trails	○	○	○	○	○
Too much noise (traffic/helicopter/music).	○	○	○	○	○
Too much horse/dog manure on the trails	○	○	○	○	○
Trail surface quality (too deeply eroded, muddy, rough, uneven, too wide, too narrow)	○	○	○	○	○
Litter on the trail	○	○	○	○	○
Informal trails (visitor created trails)	○	○	○	○	○
Trails that don't go to the places I want to go	○	○	○	○	○
Trails too difficult (too many hills/too steep)	○	○	○	○	○
Other (Please specify):	○	○	○	○	○

Q18 Were there any places or times you avoided because of conditions you have encountered in the past?

○ No

○ Yes - Please describe the conditions you wanted to avoid.

_____

Q19 On this visit to Aliso & Wood Canyon Wilderness Park, which was the first entrance you used to enter the park?

○ Main entrance (parking lot)

○ Top of the World

○ Hunwut Trail

○ Moulton Meadows

○ Other Neighborhood

Q20 On this visit to Aliso & Wood Canyon Wilderness Park, through which location will you leave on your final exit from the park?

○ Main entrance (parking lot)

○ Top of the World

○ Hunwut Trail

○ Moulton Meadows

○ Other Neighborhood

Q21 On this visit to Whiting Ranch, which was the first entrance you used to enter the park?

○ Market Street (Borrego Trail)

○ Glen Ranch Road

○ Parking near Wahoo's (Serrano Creek Trail)

○ Concourse Park

○ Other Neighborhood

Q22 On this visit to Whiting Ranch, through which location will you leave on your final exit from the park?

○ Market Street (Borrego Trail)

○ Glen Ranch Road

○ Parking near Wahoo's (Serrano Creek Trail)

○ Concourse Park

○ Other Neighborhood

Q23 On this visit to Top of the World, which was the first entrance you used to enter the park?

○ Alta Laguna Boulevard

○ Stairsteps Trail

○ Park Avenue Trail

○ Canyon Acres Drive

Q24 On this visit to Top of the World, through which location will you leave on your final exit from the park?

○ Alta Laguna Boulevard

○ Stairsteps Trail

○ Park Avenue Trail

○ Canyon Acres Drive

Q25 On this visit to Crystal Cove State Park, which was the first entrance you used to enter the park?

○ Lower parking area (Moro Canyon Trail)

○ Upper parking area (No-Dogs Trail near Ranger Station)

○ Pacific Coast Highway to Moro Ridge Trail

○ Muddy Canyon

○ Ridge Park

○ Bommer Canyon

Q26 On this visit to Crystal Cove State Park, through which location will you leave on your final exit from the park?

○ Lower parking area (Moro Canyon Trail)

○ Upper parking area (No-Dogs Trail near Ranger Station)

○ Pacific Coast Highway to Moro Ridge Trail

○ Muddy Canyon

○ Ridge Park

○ Bommer Canyon

Q27 On this visit to Ridge Park, which was the first entrance you used to enter the park?

○ Crystal Cove State Park

○ Bommer Canyon

○ Ridge Park Rd.

○ Laguna Coast Wilderness Park

○ Other Neighborhood

Q28 On this visit to Ridge Park, through which location will you leave on your final exit from the park?

○ Crystal Cove State Park

○ Bommer Canyon

○ Ridge Park Rd.

○ Laguna Coast Wilderness Park

○ Other Neighborhood

Q29 On this visit to Peter's Canyon, which was the first entrance you used to enter the park?

○ Canyon View Parking Lot

○ Peter's Canyon Rd

○ Canyon View & Jamboree Entrance

○ Other Neighborhood

Q30 On this visit to Peter's Canyon, through which location will you leave on your final exit from the park?

○ Canyon View Parking Lot

○ Peter's Canyon Rd

○ Canyon View & Jamboree Entrance

○ Other Neighborhood

Q31 During your visit today, how did you use your Smartphone (cell phone, iPad, tablet)?
(Please select all that apply)

☐ Do not own a smartphone

☐ Did not use my smartphone

☐ Used Facebook

☐ Used Instagram

☐ Used Snapchat

☐ Used Twitter

☐ Used Strava

☐ Used MapMyRun

☐ Used EndoMondo

☐ Used eBird or iNaturalist

☐ Other (Please Specify)

_____

Q32 How frequently do you use Strava?

○ Never

○ Rarely

○ Sometimes

○ Often

○ Always

Q33 What is the primary reason(s) that you use Strava?

☐   Follow friends/group and share achievements

☐   Track and analyze personal fitness performance and goals

☐   Compete against friends/self/others

☐   Other (Please Specify)

_____

Q34 We would like to know how you feel about biking on trails in [Park selected in Q4]. For each item below please rate how much you think it describes the experience of riding on trails [Park selected in Q4] -wide.

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Trails here provide enough challenge for you	○	○	○	○	○
Trails here satisfy your preferred riding style	○	○	○	○	○
The quality/condition of trails is satisfactory	○	○	○	○	○
You experience conflict with < other bikers	○	○	○	○	○
You experience conflict with other non-bike visitors	○	○	○	○	○
Other non-bike users have conflicts with you	○	○	○	○	○

Q35 Did the presence of a researcher administered GPS unit affect your activity?

○ No

○ Yes (Please specify) _____

Q36 Did you go off the designated trail at any point on your visit today? If yes, please describe in several words why you travelled off the designated trail today.

○ No

○ Yes _____

○ Unsure

Q37 Has anything impacted your ability to engage in [Activity selected in Q5] safely?

○ No

○ Yes (Please Specify) _____

Q38 On this visit did you [and your personal group] feel prepared for common safety situations that you may have encountered at [Park selected in Q4]?

	Yes	No
Exposure to sun	○	○
Heat	○	○
Access to drinking water	○	○
Proper equipment (i.e. footwear)	○	○
Encounters with hazardous plants and animals (e.g. Poison Oak, Rattlesnakes)	○	○
Other (Please Specify)	○	○

Q39 How crowded did you feel while [Activity selected in Q5] at [Park selected in Q4] today?

○ Not at all crowded

○ Slightly crowded

○ Moderately crowded

○ Very crowded

○ Extremely crowded

Q40 Do you feel like the number of other people around you has increased your risk or any member of your party's risk of being injured at any point during your visit today?

○ Yes, and it impacted my participation

○ Yes, I felt this way all of the time but it did not impact my participation

○ Yes, I felt this way some of the time but it did not impact my participation

○ No, I did not feel this way

Q41 We would like to know more about your knowledge of some natural history and ecological issues in [Park selected in Q4]. For each item below, please rank your knowledge of this topic as it relates to Orange County Open Spaces by checking the appropriate.

	No Knowledge	Somewhat Familiar	Well Informed
Wildlife	○	○	○
Plants	○	○	○
Insects	○	○	○
Historical and cultural significance of the area	○	○	○
Habitat Conservation	○	○	○
Habitat Restoration	○	○	○
Water Quality	○	○	○
Water Management	○	○	○
Air Quality	○	○	○
Fire Management	○	○	○
Fuel Management	○	○	○
Invasive Species Management	○	○	○

Q42 How would you describe your current knowledge of "Leave No Trace" practices? Please select only one choice.

○ No knowledge

○ Very limited

○ Limited

○ Fair

○ Above average

○ Extensive

Q43 In your opinion, how does each of the following recreational activities impact the natural environment of [Park selected in Q4].

	No impact	Slight impact	Moderate impact	High impact	Extreme impact
Hiking	○	○	○	○	○
Hiking (Off-trail)	○	○	○	○	○
Mountain biking	○	○	○	○	○
Mountain biking (Off-trail)	○	○	○	○	○
Bird watching	○	○	○	○	○
Camping	○	○	○	○	○
Dog walking	○	○	○	○	○
Horseback riding	○	○	○	○	○
Photography	○	○	○	○	○

Q44 What is your age?

_____

Q45 Are you a permanent resident or citizen of the United States?

○ Yes-(What is your Zip Code?) _____

○ No-(What is your Country of Origin?)
_____

Q46 What is the highest level of education you have completed? Please select only one response.

○ Less than high school

○ Some high school

○ High school graduate

○ Vocational/trade school certificate

○ Some College

○ Two-year college degree

○ Four-year college degree [or Bachelor's degree]

○ Master's Degree [or Graduate Degree]

○ Ph.D., M.D., J.D., or equivalent

Q47 What gender do you identify with?

○ Male

○ Female

○ Other

Q48 For you only, are you Hispanic or Latino?

○ No

○ Yes

Q49 When visiting [Park selected in Q4], what languages do you and most members of your personal group prefer to use for the following?

	Other(Specify)	English
Speaking		○
Reading		○