

# Orange County Parks Trail Use Designation Pilot Project



Technical Report



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## Executive Summary

This report provides an analysis and summary of the survey research findings from the Orange County (OC) Parks Trail Use Designation Pilot Project conducted during the summer of 2021. Repeat ecological monitoring flights were completed in May 2022 and the analysis and findings of the ecological effects of the Trail Use Designation Pilot Project will be delivered in a forthcoming addendum to this report.

### Highlights of Survey Research Findings

A research study using a visitor-intercept questionnaire administered with a Before-After-Control-Impact (BACI) design approach was used to examine visitor experience consequences of trail management designations implemented by OC Parks in the Trail Use Designation Pilot Project (TPP). Results suggest that reported conflict among various trail user groups exists at low-moderate levels, but the frequency of occurrence of any one incident of conflict is very low. The TPP may be reducing the perception of conflict and increasing perceptions of safety due to the opinion among visitors that active management of the trails is needed and welcome.

Survey respondents also reported a high degree of agreement and support for the TPP management strategies (i.e., activity-type restrictions, trail direction designation). However, downhill-only trail designations tended to lead to increased velocities among mountain bike visitors. This suggests that downhill-only designations may be most appropriate when combined with activity type restrictions as well, i.e., “downhill and bikes only”. TPP

messaging signs were evaluated to be effective, but the researchers received some comments calling for improved messaging to increase the accessibility and aid in comprehension to diverse populations.

Trail use levels were also monitored prior to and following the implementation of the TPP. Some slight variations in use levels were observed pre-TPP and post-TPP implementation, but these may be due to seasonal variability in use, which the study was not able to control for. Novel trail monitoring methods using Strava Metro data were also used and found to be a reliable tool to understand trail use and behavior that could be used to inform future planning. The very high visitor participation rate (>85%) suggests a high degree of enthusiasm on the part of the visiting public to provide feedback to OC Parks. As such, periodic monitoring of visitor experience conditions as part of an adaptive management process will likely be successful and provide important information to continue to ensure quality recreation experiences and ecological conditions.

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# Contents

<b>Executive Summary</b> .....	1
<b>Nomenclature</b> .....	4
<b>List of Figures</b> .....	4
<b>List of Tables</b> .....	8
<b>Section 1: Introduction</b> .....	9
1.1 Introduction and Scientific Background .....	9
1.2 Trails and Ecological Conditions .....	9
1.3 Visitor Experience Aspects of Trail Systems .....	10
1.4 Visitor Safety on Multiple Use Trails .....	10
1.5 Study Purpose .....	10
<b>Section 2: Approaches and Methods</b> .....	11
2.1 Study Areas .....	11
2.2 Visitor Use Monitoring .....	11
2.3 Visitor Evaluative Survey .....	12
2.3.1 Survey Sampling .....	12
2.4 Data Analysis .....	13
2.4.1 Survey Data .....	13
2.4.2 TRAFx Data .....	13
2.4.3 Strava Metro Data .....	13
<b>Section 3: Findings</b> .....	14
3.1 Results .....	14
3.2 Aliso and Wood Canyons Wilderness Park .....	16
3.2.1 Conflict .....	16
3.2.2 Safety & Effectiveness of Management Actions .....	18
3.2.3 Signage .....	18
3.2.4 TRAFx & Strava Metro Trail Data .....	19
3.3 Laguna Coast Wilderness Park .....	21
3.3.1 Conflict .....	21
3.3.2 Safety & Effectiveness of Management .....	23
3.3.3 Signage .....	23
3.3.4 TRAFx & Strava Metro Trail Data .....	23
3.4 Santiago Oaks Regional Park .....	26
3.4.1 Conflict .....	26
3.4.2 Safety & Effectiveness of Management .....	28
3.4.3 Signage .....	28
3.4.4 TRAFx & Strava Metro Trail Data .....	28
<b>Section 4: Conclusion</b> .....	31
4.1 Discussion .....	31
4.2 Conclusion .....	32



# Contents (Continued)

<b>References</b> .....	33
<b>A Appendix A: Supplementary Figures</b> .....	35
A.1 Aliso and Wood Canyons Wilderness Park .....	35
A.1.1 Visitor Reported Conflict .....	35
A.1.2 Conflict Behaviors .....	37
A.1.3 Conflict Behaviors by Trail by Activity Type .....	40
A.1.4 Signage .....	47
A.2 Laguna Coast Wilderness Park .....	49
A.2.1 Visitor Reported Conflict .....	49
A.2.2 Conflict Behaviors .....	51
A.2.3 Conflict Behaviors by Trail by Activity Type .....	54
A.2.4 Signage .....	60
A.3 Santiago Oaks Regional Park .....	61
A.3.1 Visitor Reported Conflict .....	61
A.3.2 Conflict Behaviors .....	63
A.3.3 Conflict Behaviors by Trail by Activity Type .....	66
A.3.4 Signage .....	80
<b>B Appendix B: TRAFx Datas</b> .....	82
B.1 Aliso and Wood Canyons Wilderness Park .....	82
B.1.1 Cholla .....	82
B.1.2 Lynx .....	83
B.1.3 Rock-it .....	84
B.2 Laguna Coast Wilderness Park .....	85
B.2.1 Laguna Ridge .....	85
B.2.2 Lizard .....	86
B.2.3 Old Emerald .....	87
B.3 Santiago Oaks Regional Park .....	88
B.3.1 Cactus Canyon .....	88
B.3.2 Chutes Ridgeline .....	89
B.3.3 Grasshopper .....	90
B.3.4 Peralta Hills .....	91
B.3.5 Pony .....	92
B.3.6 Sage Ridge .....	93
B.3.7 Yucca Ridge .....	94
<b>C Appendix C: Strava Metro</b> .....	95
C.1 Aliso Wood Canyon Wilderness Park .....	95
C.1.1 Cholla .....	95
C.1.2 Lynx .....	97
C.1.3 Rock It .....	99
C.2 Laguna Coast Wilderness .....	101
C.2.1 Laguna Ridge .....	101
C.2.2 Lizard .....	103

# Contents (Continued)

C.2.3 Old Emerald . . . . .	105
C.3 Santiago Oaks Regional Park . . . . .	107
C.3.1 Cactus Canyon . . . . .	107
C.3.2 Chutes Ridgeline . . . . .	109
C.3.3 Grasshopper . . . . .	111
C.3.4 Peralta Hills . . . . .	113
C.3.5 Pony . . . . .	115
C.3.6 Sage Ridge . . . . .	117
C.3.7 Yucca Ridge . . . . .	119

## D Appendix D: Survey Instrument . . . . . 121

## Nomenclature

### Abbreviations

<b>Abbreviation</b> . . . . .	<b>Definition</b>
ALWO . . . . .	Aliso and Wood Canyons Wilderness Park
LACO . . . . .	Laguna Coast Wilderness Park
PPA . . . . .	Park and Protected Area
SAOA . . . . .	Santiago Oaks Regional Park
TPP . . . . .	Trail Use Designation Pilot Project
USU . . . . .	Utah State University

## List of Figures

2.1 Survey instrument conceptual diagram of variables measured . . . . .	12
3.1 Pre/Post respondent activity type . . . . .	15
3.2 ALWO visitor-reported conflict by trail . . . . .	16
3.3 ALWO visitor-reported conflict by activity type . . . . .	16
3.4 ALWO Conflict Likelihood - Somewhat/Extremely . . . . .	17
3.5 Cholla Pre/Post Hourly Counts . . . . .	19
3.6 ALWO Strava Metro Park Summary . . . . .	20
3.7 LACO visitor-reported conflict by trail . . . . .	21
3.8 LACO visitor-reported conflict by activity type . . . . .	21
3.9 LACO Conflict Likelihood - Somewhat/Extremely . . . . .	22
3.10 Laguna Ridge Pre/Post Hourly Counts . . . . .	24
3.11 LACO Strava Metro Park Summary . . . . .	25
3.12 SAOA visitor-reported conflict by trail . . . . .	26
3.13 SAOA visitor reported conflict by activity type . . . . .	26
3.14 SAOA Conflict Likelihood - Somewhat/Extremely . . . . .	27

## List of Figures (Continued)

3.15 Cactus Canyon Pre/Post Hourly Counts . . . . .	29
3.16 SAOA Strava Metro Park Summary . . . . .	30
A.1 ALWO likelihood of visitor conflict by trail . . . . .	35
A.2 ALWO Conflict by Exp. Use History . . . . .	36
A.3 ALWO Conflict by Gender . . . . .	36
A.4 ALWO Conflict by Specialization . . . . .	37
A.5 ALWO Bike Conflict Behaviors . . . . .	37
A.6 ALWO Dog Walker Conflict Behaviors . . . . .	38
A.7 ALWO Hiker Conflict Behaviors . . . . .	38
A.8 ALWO Equestrian Conflict Behaviors . . . . .	39
A.9 ALWO Runner Conflict Behaviors . . . . .	39
A.10 ALWO Cholla Biker Conflict Behaviors . . . . .	40
A.11 ALWO Cholla Hiker Conflict Behaviors . . . . .	40
A.12 ALWO Cholla Runner Conflict Behaviors . . . . .	41
A.13 ALWO Cholla Dog Walker Conflict Behaviors . . . . .	41
A.14 ALWO Cholla Equestrian Conflict Behaviors . . . . .	42
A.15 ALWO Lynx Biker Conflict Behaviors . . . . .	42
A.16 ALWO Lynx Hiker Conflict Behaviors . . . . .	43
A.17 ALWO Lynx Runner Conflict Behaviors . . . . .	43
A.18 ALWO Lynx Dog Walker Conflict Behaviors . . . . .	44
A.19 ALWO Lynx Equestrian Conflict Behaviors . . . . .	44
A.20 ALWO Rock-It Biker Conflict Behaviors . . . . .	45
A.21 ALWO Rock-It Hiker Conflict Behaviors . . . . .	45
A.22 ALWO Rock-It Runner Conflict Behaviors . . . . .	46
A.23 ALWO Rock-It Dog Walker Conflict Behaviors . . . . .	46
A.24 ALWO Rock-It Equestrian Conflict Behaviors . . . . .	47
A.25 ALWO Pre-TPP General Signage Evaluations . . . . .	47
A.26 ALWO TPP Signage Evaluations . . . . .	48
A.27 LACO likelihood of visitor conflict by trail . . . . .	49
A.28 LACO Conflict by Exp. Use History . . . . .	49
A.29 LACO Conflict by Gender . . . . .	50
A.30 LACO Conflict by Specialization . . . . .	50
A.31 LACO Bike Conflict Behaviors . . . . .	51
A.32 LACO Dog Walker Conflict Behaviors . . . . .	51
A.33 LACO Hiker Conflict Behaviors . . . . .	52
A.34 LACO Equestrian Conflict Behaviors . . . . .	52
A.35 LACO Runner Conflict Behaviors . . . . .	53
A.36 LACO Laguna Ridge Biker Conflict Behaviors . . . . .	54
A.37 LACO Laguna Ridge Hiker Conflict Behaviors . . . . .	54
A.38 LACO Laguna Ridge Runner Conflict Behaviors . . . . .	55
A.39 LACO Laguna Ridge Dog Walker Conflict Behaviors . . . . .	55
A.40 LACO Lizard Biker Conflict Behaviors . . . . .	56
A.41 LACO Lizard Hiker Conflict Behaviors . . . . .	56

## List of Figures (Continued)

A.42	LACO Lizard Runner Conflict Behaviors . . . . .	57
A.43	LACO Lizard Dog Walker Conflict Behaviors . . . . .	57
A.44	LACO Old Emerald Biker Conflict Behaviors . . . . .	58
A.45	LACO Old Emerald Hiker Conflict Behaviors . . . . .	58
A.46	LACO Old Emerald Runner Conflict Behaviors. . . . .	59
A.47	LACO Old Emerald Dog Walker Conflict Behaviors. . . . .	59
A.48	LACO Pre-TPP General Signage Evaluations . . . . .	60
A.49	LACO TPP Signage Evaluations . . . . .	60
A.50	SAOA likelihood of visitor conflict by trail . . . . .	61
A.51	SAOA Conflict by Exp. Use History. . . . .	61
A.52	SAOA Conflict by Gender. . . . .	62
A.53	SAOA Conflict by Specialization. . . . .	62
A.54	SAOA Bike Conflict Behaviors . . . . .	63
A.55	SAOA Dog Walker Conflict Behaviors . . . . .	63
A.56	SAOA Hiker Conflict Behaviors. . . . .	64
A.57	SAOA Equestrian Conflict Behaviors . . . . .	64
A.58	SAOA Runner Conflict Behaviors . . . . .	65
A.59	SAOA Cactus Canyon Biker Conflict Behaviors . . . . .	66
A.60	SAOA Cactus Canyon Hiker Conflict Behaviors . . . . .	66
A.61	SAOA Cactus Canyon Runner Conflict Behaviors. . . . .	67
A.62	SAOA Cactus Canyon Dog Walker Conflict Behaviors. . . . .	67
A.63	SAOA Cactus Canyon Equestrian Conflict Behaviors. . . . .	68
A.64	SAOA Chutes Ridgeline Biker Conflict Behaviors. . . . .	68
A.65	SAOA Chutes Ridgeline Hiker Conflict Behaviors . . . . .	69
A.66	SAOA Chutes Ridgeline Runner Conflict Behaviors . . . . .	69
A.67	SAOA Chutes Ridgeline Equestrian Conflict Behaviors . . . . .	70
A.68	SAOA Grasshopper & Sage Ridge Biker Conflict Behaviors. . . . .	70
A.69	SAOA Grasshopper & Sage Ridge Hiker Conflict Behaviors . . . . .	71
A.70	SAOA Grasshopper & Sage Ridge Runner Conflict Behaviors. . . . .	71
A.71	SAOA Grasshopper & Sage Ridge Dog Walker Conflict Behaviors . . . . .	72
A.72	SAOA Grasshopper & Sage Ridge Equestrian Conflict Behaviors . . . . .	72
A.73	SAOA Peralta Hills Biker Conflict Behaviors . . . . .	73
A.74	SAOA Peralta Hills Hiker Conflict Behaviors. . . . .	73
A.75	SAOA Peralta Hills Runner Conflict Behaviors . . . . .	74
A.76	SAOA Peralta Hills Dog Walker Conflict Behaviors. . . . .	74
A.77	SAOA Peralta Hills Equestrian Conflict Behaviors . . . . .	75
A.78	SAOA Pony Biker Conflict Behaviors . . . . .	75
A.79	SAOA Pony Hiker Conflict Behaviors . . . . .	76
A.80	SAOA Pony Runner Conflict Behaviors. . . . .	76
A.81	SAOA Pony Dog Walker Conflict Behaviors . . . . .	77
A.82	SAOA Pony Equestrian Conflict Behaviors . . . . .	77
A.83	SAOA Yucca Ridge Biker Conflict Behaviors. . . . .	78
A.84	SAOA Yucca Ridge Hiker Conflict Behaviors . . . . .	78
A.85	SAOA Yucca Ridge Runner Conflict Behaviors . . . . .	79

## List of Figures (Continued)

A.86	SAOA Yucca Ridge Dog Walker Conflict Behaviors	79
A.87	SAOA Yucca Ridge Equestrian Conflict Behaviors	80
A.88	SAOA Pre-TPP General Signage Evaluations	80
A.89	SAOA TPP Signage Evaluations	81
B.1	Cholla Daily Counts	82
B.2	Cholla Pre/Post Hourly Counts	82
B.3	Lynx Daily Counts	83
B.4	Lynx Pre/Post Hourly Counts	83
B.5	Rock-it Daily Counts	84
B.6	Rock-it Pre/Post Hourly Counts	84
B.7	Laguna Ridge Daily Counts	85
B.8	Laguna Ridge Pre/Post Hourly Counts	85
B.9	Lizard Daily Counts	86
B.10	Lizard Pre/Post Hourly Counts	86
B.11	Old Emerald Daily Counts	87
B.12	Old Emerald Pre/Post Hourly Counts	87
B.13	Cactus Canyon Daily Counts	88
B.14	Cactus Canyon Pre/Post Hourly Counts	88
B.15	Chutes Ridgeline Daily Counts	89
B.16	Chutes Ridgeline Pre/Post Hourly Counts	89
B.17	Grasshopper Daily Counts	90
B.18	Grasshopper Pre/Post Hourly Counts	90
B.19	Peralta Hills Daily Counts	91
B.20	Peralta Hills Pre/Post Hourly Counts	91
B.21	Pony Daily Counts	92
B.22	Pony Pre/Post Hourly Counts	92
B.23	Sage Ridge Daily Counts	93
B.24	Sage Ridge Pre/Post Hourly Counts	93
B.25	Yucca Ridge Daily Counts	94
B.26	Yucca Ridge Pre/Post Hourly Counts	94
C.1	Results of paired t-test comparing mountain bike uphill and downhill velocities on the Cholla Trail	95
C.2	Cholla Strava Metro/TRAFx Correlation	96
C.3	Results of paired t-test comparing mountain bike uphill and downhill velocities on the Lynx Trail	97
C.4	Lynx Strava Metro/TRAFx Correlation	98
C.5	Results of paired t-test comparing mountain bike uphill and downhill velocities on the Rock-It Trail	99
C.6	Rock It Strava Metro/TRAFx Correlation	100
C.7	Results of paired t-test comparing mountain bike uphill and downhill velocities on the Laguna Ridge Trail	101
C.8	Laguna Ridge Strava Metro/TRAFx Correlation	102
C.9	Results of paired t-test comparing mountain bike uphill and downhill velocities on the Lizard Trail	103
C.10	Lizard Strava Metro/TRAFx Correlation	104
C.11	Results of paired t-test comparing mountain bike uphill and downhill velocities on the Old Emerald Trail	105



## List of Figures (Continued)

C.12 Lizard Strava Metro/TRAFx Correlation. . . . .	106
C.13 Results of paired t-test comparing mountain bike uphill and downhill velocities on the Cactus Canyon Trail. . . . .	107
C.14 Cactus Canyon Strava Metro/TRAFx Correlation . . . . .	108
C.15 Results of paired t-test comparing mountain bike uphill and downhill velocities on the Chutes Ridgeline Trail. . . . .	109
C.16 Chutes Ridgeline Strava Metro/TRAFx Correlation. . . . .	110
C.17 Results of paired t-test comparing mountain bike uphill and downhill velocities on the Grasshopper Trail. . . . .	111
C.18 Grasshopper Strava Metro/TRAFx Correlation . . . . .	112
C.19 . Results of paired t-test comparing mountain bike uphill and downhill velocities on the Peralta Hills Trail. . . . .	113
C.20 Peralta Hills Strava Metro/TRAFx Correlation . . . . .	114
C.21 Results of paired t-test comparing mountain bike uphill and downhill velocities on the Pony Trail. . . . .	115
C.22 Pony Strava Metro/TRAFx Correlation . . . . .	116
C.23 . . Results of paired t-test comparing mountain bike uphill and downhill velocities on the Sage Ridge Trail. . . . .	117
C.24 Sage Ridge Strava Metro/TRAFx Correlation . . . . .	118
C.25 . . . . .Results of paired t-test comparing mountain bike uphill and downhill velocities on the Yucca Ridge Trail. . . . .	119
C.26 Yucca Ridge Strava Metro/TRAFx Correlation . . . . .	120

## List of Tables

2.1 Aliso and Wood Canyons Wilderness Park TPP changes. . . . .	11
2.2 Laguna Coast Wilderness Park TPP changes. . . . .	11
2.3 Santiago Oaks Regional Park TPP changes. . . . .	11
3.1 Pre/Post completed surveys by park. . . . .	14
3.2 Pre/Post respondent activity type frequencies . . . . .	15
3.3 ALWO Pre/Post mean conflict likelihood by trail. . . . .	17
3.4 Visitor Evaluations of TPP management strategy effectiveness . . . . .	18
3.5 ALWO Strava Metro/TRAFx Correlations . . . . .	20
3.6 LACO Pre/Post mean conflict likelihood by trail . . . . .	22
3.7 Visitor Evaluations of TPP management strategy effectiveness . . . . .	23
3.8 LACO Strava Metro/TRAFx Correlations . . . . .	24
3.9 SAOA Pre/Post mean conflict likelihood by trail . . . . .	27
3.10 Visitor Evaluations of TPP management strategy effectiveness . . . . .	28
3.11 SAOA Strava Metro/TRAFx Correlations . . . . .	29

# Section 1:

## Introduction

### Summary:

This section provides a brief synopsis of scientific literature on visitor use monitoring, conflict, and ecological disturbance. It then outlines the research directions for the project.

### 1.1. Introduction and Scientific Background

The management of nature-based recreation activities is an ongoing challenge. Recent reports suggest outdoor recreation continues to be of growing popularity, with over 150 million people in the US participating annually, resulting in over 10.2 billion recreational outings (Cordell, 2012; Outdoor Foundation, 2019). Participation rates in all forms of outdoor recreation have grown by an average of 1.4% annually since 2016. Much of this activity occurs in urban-proximate wildland settings (D'Antonio & Monz, 2016; Kyle & Graefe, 2007) with recent data suggesting that 63% of participants primarily recreate within 10 miles of their homes (Outdoor Foundation, 2019). Parks and open-space in close proximity to population centers are often highly desirable as people in our increasingly urban society seek opportunities to experience nature for exercise and renewal on a regular basis. Consequently, the demand for access to and participation in a range of recreation activities is often extremely high in urban-proximate locations. For example, a recent study of visitor use trends at 11 park locations in Orange County found an overall 64% increase in recreation visits from 2014 to 2018, with total visitation increasing from 3.4M to 5.5M during this period (Monz et al., 2019).

This demand has further increased, in some cases dramatically, as a result of the COVID-19 pandemic since outdoor recreation is viewed as relatively safe from infection risk. These trends raise concerns whether other protected area goals are being compromised, such as the conservation of habitat for plant and wildlife species. Broadly, there is increasing recognition of trade-offs between the range of ecosystem services provided by parks and protected areas (Maes et al., 2012). An example of this trade-off is the cultural ecosystem services provided by the supply of recreation opportunities and ecosystem services impacted by recreation use, including regulating services such as erosion control and provisioning services such as biodiversity. Managers of urban-proximate lands must strike a careful balance between providing nature-based recreation experiences and maintenance of other ecosystem services through conservation goals.

### 1.2. Trails and Ecological Conditions

A fundamental recreational component of any Park and Protected Area (PPA) is the system of trails. Trails provide access opportunities for a wide range of outdoor recreation activities and can allow visitors to experience nature in a more unconfined and unstructured manner. The proper design, maintenance and management of trails is a primary factor in the overall sustainability of a trail system, in that most environmental problems that occur on trails (e.g., erosion, muddy sections, excessive slope) can be mitigated through proper location and construction (Hammit et al., 2015; Olive & Marion, 2009; Tomczyk & Ewertowski, 2011).

Accordingly, the mode of travel and participant behavior can play a substantial role in affecting resource conditions on trails. For example, while complex and situational, numerous studies have generally found that horse use results in much more erosion on trails than foot travel. In terms of mountain bikes, initial research suggests that trails frequently used by mountain bikers experience erosion similar to hiking, except in situations where bike travel results in skids and trail-widening behaviors (Hammit et al., 2015; Newsome & Davies, 2009; Pickering et al., 2010). More recent work, using UAV aerial image analysis and an experimental design, suggests that bicycle impacts proceed more rapidly than those from hiking (Martin et al., 2018). Motorized use of all types have a high potential to result in resource impacts for various reasons, such as the ability to travel further and faster than non-motorized activities. The increased mechanical forces of spinning tires can also dislodge soil and damage vegetation, easily increasing the potential for soil erosion. Behavioral aspects play a substantial role as well as motorized users often seek out new terrain and steep, unstable slopes resulting in rapid erosion (Hammit et al., 2015).

Overall, from an environmental impact perspective, a primary conclusion is that a wide variety of recreation use types can be accommodated on trail systems, but not all environment types, trail designs, and management capabilities are compatible with all modes of travel. Consequently, managers concerned with sustainable use of trail systems direct use to certain trail segments where specific modes of travel can be best accommodated safely and sustainably and in a manner that limits potential conflict among visitors. Limiting off trail use, for all modes

of travel, especially motorized and mechanized travel, can have a significant effect on limiting overall impacts (Hammit et al., 2015).

### 1.3. Visitor Experience Aspects of Trail Systems

Trails are focal aspects of the visitor experience in parks and natural areas and thus trail use and trail condition quality can have a significant effect on visitors' overall experience. Crowding, for example, has been extensively examined for trail-based activities. Although relationships between crowding and experience satisfaction are complex, visitors certainly desire conditions that allow them to realize their activity goals and experience preferences (Manning, 2011). Therefore, understanding the thresholds of acceptability of crowding is often a component of successful trail management.

Conflict among different activity types on a trail system has also been the topic of extensive re- search (e.g. Jacob & Schreyer, 1980; Manning, 2011) and minimizing conflict is a common and important trail management goal. Conflict is also a complex construct, with factors such as activity style, resource specificity (the significance attributed to using a resource for a specific activity), mode of experiencing nature, and lifestyle preference all potentially important constructs in understanding conflict. Common examples of conflict are motorized verses non-motorized recreation, and when one group of visitors are perceived as disrupting traditional uses and behavioral norms (Manning, 2011). Conflict often arises in situations where new activity types or technologies are introduced in recreation venues where there are previously established uses, and are thus perceived as a disruption to more traditional activities.

### 1.4. Visitor Safety on Multiple Use Trails

Both perceived and actual safety concerns from an interaction of visitors with contrasting behaviors have been identified on multiple-use trail systems. For example, mountain bikers travel at far greater speeds than pedestrians and can surprise hikers on blind corners. Studies suggest that pedestrians often highlight this as a safety issue, however there is some indication that the perception of safety hazards potentially exceeds the actuality (e.g. Cessford, 2003). Regardless, managers are often concerned with this safety issue, and can employ direct management strategies such as developing separate or directional trails to accommodate various activity types. Indirect strategies usually employ educational approaches (i.e., "yield triangle" signs) to educate visitors about appropriate trail etiquette and about experiential similarities between the various groups.

### 1.5. Study Purpose

Orange County Parks (OC Parks) employed direct management strategies on select trail segments in order to evaluate the effectiveness of trail management, reduce conflict and enhance safety. Researchers from Utah State University worked closely with OC Parks to study the short term (6-month to 1-year) ecological and social consequences of various trail management strategies under consideration. Based on these findings, researchers then developed longer-term monitoring approaches and recommendations.





## Section 2: Approach & Methods

### Summary:

This section outlines the research approaches and methods for the design of the study, survey instrument, and visitor-use monitoring.

### 2.1. Study Areas

A total of 22 park units in Orange County, California, USA under various management jurisdictions are part of the Nature Reserve of Orange County. Collectively known as the Nature Reserve of Orange County, the habitat and species conservation of these areas is coordinated by the Natural Communities Coalition (NCC, 2022), a nonprofit organization that oversees implementation of the Natural Community Conservation Plan/Habitat Conservation Plan (NCCP/HCP) (CDFW, 2022). The overall goal of the Reserve is to conserve natural, functioning ecosystems at a landscape level in the region. The Reserve is part of the California chaparral and woodlands ecoregion and harbors thirty-nine plant and animal species protected under federal and state endangered species acts. The primary vegetation type in the Reserve is coastal sage scrub, along with oak woodland (*Quercus* spp.), native grassland, chaparral, Tecate cypress (*Cupressus forbesii*) and riparian communities.

The Reserve system parks offer a variety of outdoor recreation opportunities, such as hiking, running, mountain biking, beach recreation and nature appreciation in an urban-proximate setting to the over 3.2 million residents of Orange County (Center for Demographic Research, 2019). Two seasons of visitor survey research across the Reserve parks, conducted by The Recreation Ecology Lab (e.g. Sisneros-Kidd et al., 2019), revealed that nature immersion/appreciation and exercise were primary reasons for visiting the Reserve. Typically, visitors were highly place-attached, with slightly stronger emotional and symbolic meanings and connections (place identity) compared to a functional attachment (place dependence). Across all activity types (i.e., hiking, running, mountain biking), visitors reported a high degree of satisfaction in their ability to realize the primary motives for their visit. The spatial extent of visitor use varied significantly by location, but most visitors engaged in use behaviors that were focused on particular locations while some visitors traveled across several Reserve units in a single visit. In particular, mountain bike visitors exhibited the largest spatial extent of use across user groups.

In this project we focused on areas managed by OC Parks. Specifically, the project collected data in Aliso and Wood Canyons Wilderness, Laguna Coast Wilderness Park, and Santiago Oaks Regional Park on select trail segments, as specified by the OC Parks Trail Pilot Project (TPP) (Tables: 2.1-2.3).

**Table 2.1:** Aliso and Wood Canyons TPP trail segments and proposed changes.  
**Note:**The "Rock-it" Trail served as the control trail segment for this park.

Trail Name	Current Use	Proposed Change
Cholla	Hiking, biking, equestrian; Bidirectional	Bikes: uphill only; Other users remain bidirectional
Lynx	Hiking, biking, equestrian; Bidirectional	Bikes only; Downhill only

**Table 2.2:** Laguna Coast Wilderness TPP trail segments and proposed changes.  
**Note:**The "Lizard" Trail served as the control trail segment for this park.

Trail Name	Current Use	Proposed Change
Laguna Ridge	Hiking, biking; Bidirectional	Bikes only; Downhill only
Old Emerald	Hiking, biking; Bidirectional	Bikes: downhill only. Hikers remain bidirectional

**Table 2.3:** Santiago Oaks Regional Park TPP trail segments and proposed changes.  
**Note:**The "Sage Ridge" & "Grasshopper" Trails served as the control trail segments for this park.

Trail Name	Current Use	Proposed Change
Chutes Ridgeline	Hiking, biking, equestrian; Bidirectional	Bikes only; Downhill only
Cactus Canyon	Hiking, biking, equestrian; Bidirectional	Multiuse; Downhill only
Pony Trail	Hiking, biking, equestrian; Bidirectional	Hiking and equestrian use only; Bidirectional
Peralta Hills	Hiking, biking, equestrian; Bidirectional	Hiking and equestrian use only; Bidirectional
Yucca Ridge	Hiking, biking, equestrian; Bidirectional	Multiuse; Downhill only.

### 2.2. Visitor Use Monitoring

Visitor use levels on treatment and control trail segments were determined using automated trail counting techniques to document temporal patterns of visitor use on a continuous basis for the study period. TRAFx® automated trail counters were installed at the trailhead and junctions along the route to count visitor use at key

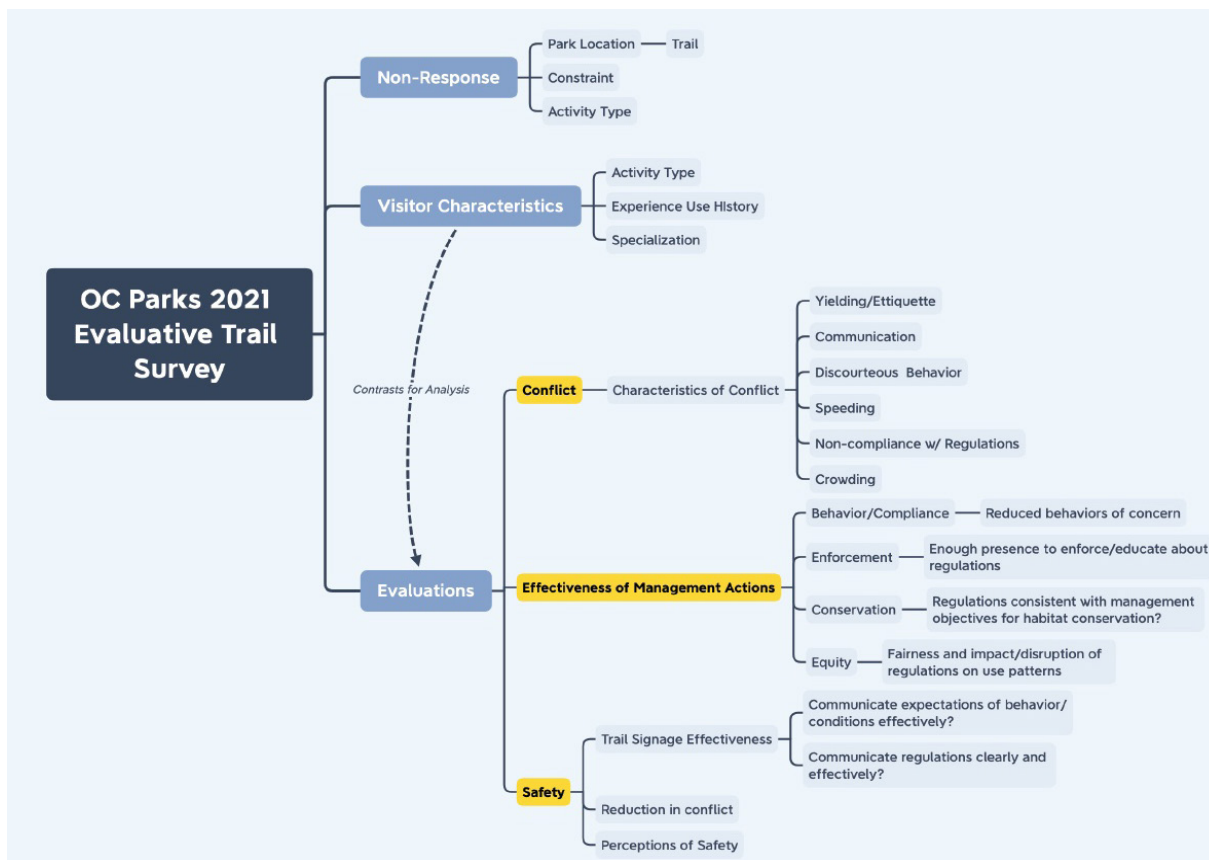
locations. Counters were calibrated using a comparison with direct observations (i.e. counts of trail users) conducted by researchers and OC Parks volunteers in the field (Pettebone et al., 2010). This calibration technique provided a classification of trail users and relative proportions of use types (hikers, runners, mountain bikers, eBikers). Strava Metro was also assessed as a tool to understand the direction of trail use as well as to measure trail users' velocities. These data were examined for sample bias through comparisons with trail counter calibrations in terms of the proportions of pedestrians and cyclists.

### 2.3. Visitor Evaluative Survey

A survey instrument was developed in collaboration with OC Parks to administer to OC Parks visitors in the three study areas prior to and following the implementation of the TPP. The survey was designed to elicit visitors' evaluations of the acceptability and effectiveness of TPP trail management strategies as well as perceptions of conflict and safety. The conceptual diagram in figure 2.1 below illustrates the components measured in the survey instrument. The full survey instrument is included in this report in Appendix D (page 122).

#### 2.3.1 Survey Sampling

The survey was administered by Utah State University (USU) researchers during the month of May 2021, prior to the implementation of the TPP, and following its implementation in late July through early August 2021. Researchers intercepted visitors at all TPP and control trails in the three parks. Sampling days were balanced to include both weekdays and weekends. A systematic, stratified random intercept protocol was employed to recruit participants in the survey. Researchers selected six random digits between zero and sixty, and invited the next visitor to pass by a TPP or control trail to participate in the survey at those randomly selected minutes-on-the-hour throughout the day from approximately park open until close. This sampling technique reduces the introduction of systematic bias in the survey sample by capturing a random cross-section of the visitors to the trails where visitors throughout the day have an equal probability of participation in the survey and can be generalized to the population of visitors who use the park. Visitors who agreed to participate in the survey were provided an iPad to self-administer the survey that was designed on Qualtrics ("Qualtrics," 2022) software.



**Figure 2.1:** Survey instrument conceptual diagram of variables measured





## 2.4. Data Analysis

### 2.4.1 Survey Data

After completion of the study, survey responses were downloaded from Qualtrics’ servers and prepared for analysis. Data analysis was conducted using statistical packages in Python, including SciPy (Virtanen et al., 2020) and Pingouin (Vallat, 2018).

### 2.4.2 TRAFx Data

TRAFx infra-red trail counters were installed on all TPP and control trails in late April 2021 to collect trail use data prior to and following the implementation of the TPP trail management and regulations. The TRAFx units collected hourly counts of trail users which were uploaded to TRAFx DataNet, a web- platform to for the storage of counter records. Each counter was calibrated by OC Parks volunteers and Utah State University research technicians by counting visitors passing by the counter and com- paring those counts to the TRAFx counter reading. Additionally, these counts provided estimates of the proportion of pedestrian and cyclists as well as the direction of trail use. Calibration records were then used to apply a correction factor using equation 2.1 to each counter’s data. Further, the data were smoothed by the removal of potentially erroneous readings and outliers using SciPy’s (Virtanen et al., 2020) univariate derivative

interpolation on hourly counts with z-scores beyond an absolute value of 3.

$$\delta = \frac{\textit{counter count}}{\textit{observed count}}$$

Equation 2.1

### 2.4.3 Strava Metro Data

To evaluate the effect of the TPP management on trail behavior, researchers obtained Strava Metro data for TPP and control trails between May and September 2021. This dataset provides de-identified and aggregated daily summaries of Strava app users’ bicycle and pedestrian use of trails as well as trail use behavior, including directionality of trail use and speed. These data were evaluated against the TRAFx data to determine their representativeness of the population of visitors using these trails. Next, mountain bike velocities prior to and following the implementation of the TPP were com- pared using a t-test to determine if the changes in the directionality or activity type regulations part of the TPP had a significant effect on mountain bike velocity.

## Section 3: Findings

### Summary:

This section provides highlights of the results survey research. The findings are organized according to the surveys that occurred prior to (Pre) and following (Post) the implementation of the TPP. Further, results are presented for each park in the study.

### 3.1. Results

Similar to our previous survey-based studies in Park and Protected Areas (PPAs) in Orange County (Sisneros-Kidd et al., 2019), the combined response rate for the Pre and Post TPP surveys was high at 86.3% (Pre 87.4%, Post 85.1%), which suggests that the survey sample is representative of the vast majority of visitors. In total, 1,140 survey responses from the Pre-TPP and Post-TPP sampling intervals across trails at the three parks, which after data cleaning and processing resulted in a total of 975 complete surveys and 162 non-response surveys. Table 3.1 below shows the breakdown of surveys collected at each park during the pre and post sampling intervals.

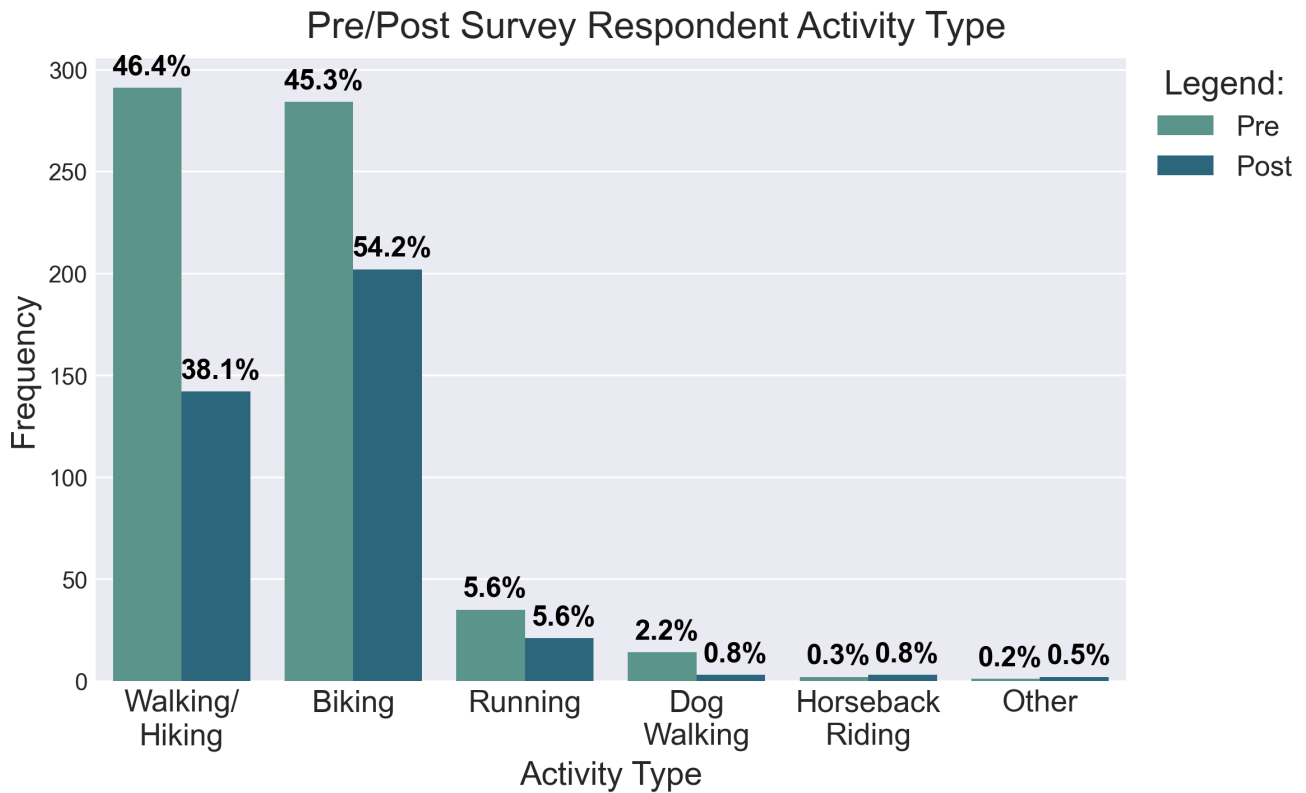
**Table 3.1:** Completed surveys in Pre and Post sampling periods for each park in TPP.

Sample	Park	Count
Pre	ALWO	221
	LACO	205
	SAOA	290
Post	ALWO	129
	LACO	112
	SAOA	183

The composition of activity types between the Pre and Post samples are presented in Figure 3.1 and Table 3.2 below. The proportions of activity types for each sample were evaluated with the Chi-square test of homogeneity of variance,  $\chi^2(5,1139)=14.969$ ,  $p<.05$ , which indicates that the proportions of activity types between the two samples were unequal. Nevertheless, the proportions of the most common activity types were roughly similar, but the time of season between the two samples (i.e. early vs late summer) may have had an effect on visitors' choice in activity type.

**In the following sections, the analysis will highlight the primary goals of the TPP: reduction in conflict, increase in perceptions of safety, and effectiveness of management actions for each park in the study.**





**Figure 3.1:** Activity type of survey respondents in Pre and Post surveys.

**Table 3.2:** Activity Type frequency and percent of survey respondents in Pre and Post Surveys

Pre/Post	ActivityType	Count	Percent
Pre	Biking	284	45.3%
	Walking/ Hiking	291	46.4%
	Running	35	5.6%
	Dog Walking	14	2.2%
	Horseback Riding	2	0.3%
	Other	1	0.2%
Post	Biking	202	54.2%
	Walking/ Hiking	142	38.1%
	Running	21	5.6%
	Horseback Riding	3	0.8%
	Dog Walking	3	0.8%
	Other	2	0.5%



## 3.2. Aliso Wood Canyons Wilderness Park (ALWO)

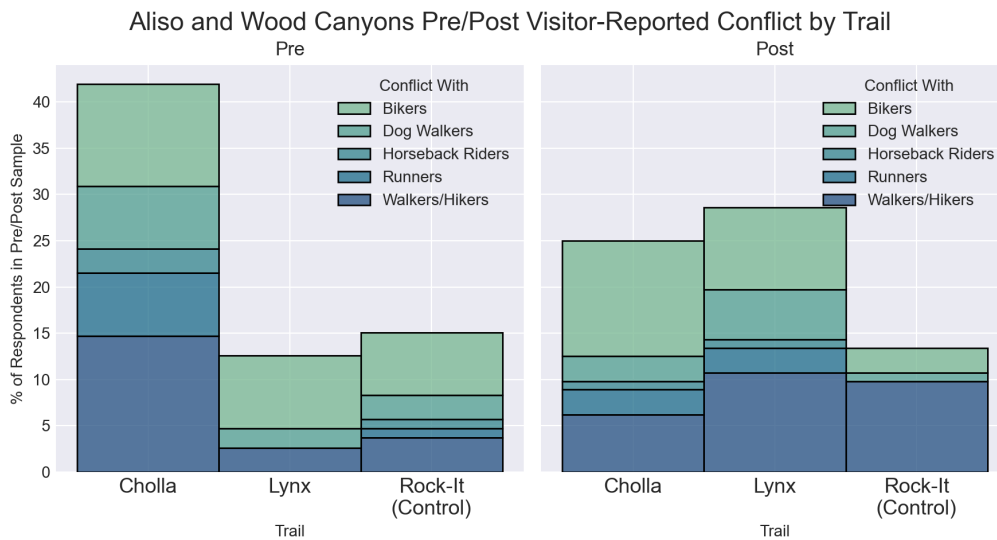
### 3.2.1 Conflict

ALWO visitors reported low to moderate levels of conflict with other activity types (Figure 3.2) in the Pre-TPP survey and generally lower levels in the Post-TPP survey with the exception of the Lynx Trail. In Figure 3.2, the stacked bar chart represents the cumulative reported conflict with specific activity types. It should be noted that any one respondent could report conflict with any or all of the activity types. Nevertheless, it is important to understand the nature of these conflicts, in particular the dynamics of the conflict as well as the likelihood or frequency.

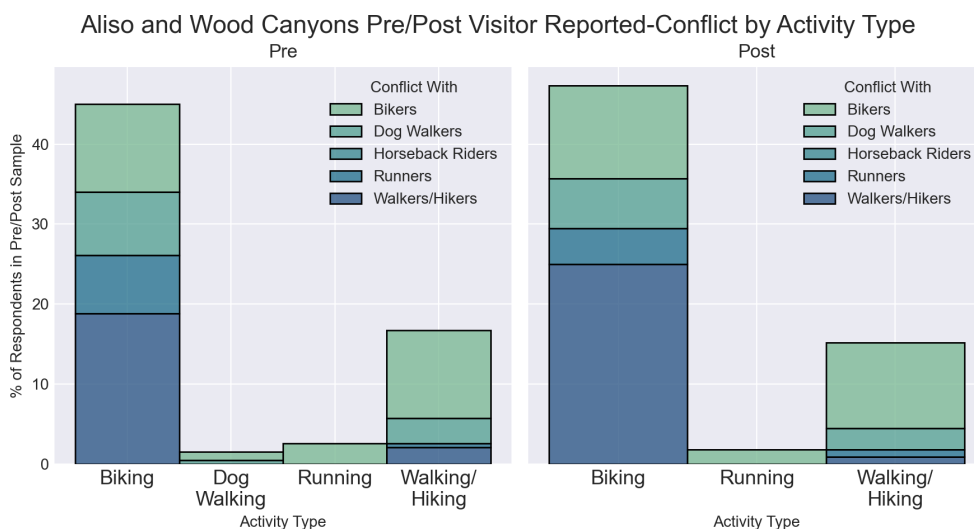
The direction of conflicts in ALWO appear to be asymmetrical (i.e. biking and hiking), where one trail user perceives conflict with an "other" activity type while

the "other" does not (Figure 3.3). This illustrates the complexity of measuring and managing visitor conflict in recreation settings where conflict is shaped by visitors' perceptions, expectations, and attitudes.

It can be useful for managers to characterize visitors who are most likely to report conflict during their recreation experience. Visitors who were most likely to report conflict during their experience in both the Pre-TPP and Post-TPP surveys are males who recreate frequently with intermediate to expert levels of specialization (Appendix A: Figures A.2-A.4). This finding is supported by the literature, which suggests that visitors with high levels of specialization have more developed and specific preferences for the social, ecological, and managerial characteristics of the setting (Manning, 2011).



**Figure 3.2:** ALWO visitor-reported conflict by Park trail. The hue of the bar represents the group with which visitors reported experiencing conflict. This stacked bar chart represents the cumulative reported conflict with specific activity types, and that any one respondent could report conflict with any or all of the activity types



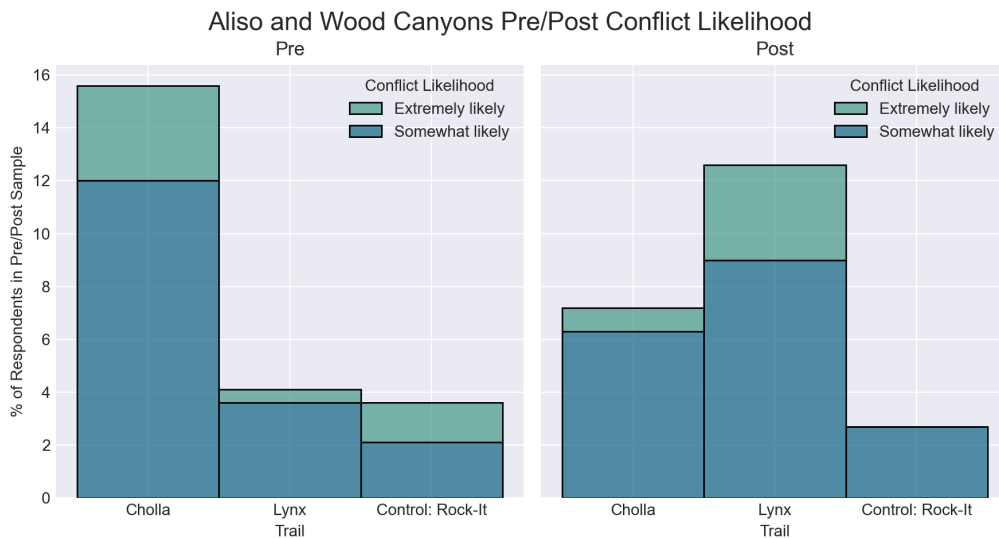
**Figure 3.3:** ALWO visitor reported conflict by activity type. The hue of the bar represents the group visitors reported conflict with.

The survey instrument first asked visitors whether they experienced conflict with another activity type, and then asked them to qualify the frequency or likelihood of conflict with an activity type on a five-point Likert scale (1=Extremely unlikely, 3 = Neither likely or unlikely, 5=Extremely likely). For example, while nearly 40% of visitors reported experiencing conflicts on the Cholla trail, only approximately 16% of those conflicts were somewhat or extremely likely in the Pre-TPP survey and 12% in the Post-TPP Survey (see Figure 3.4 & Appendix A: A.1).

The average likelihood of conflict by activity types across the three trails in the Pre-TPP and Post-TPP surveys are presented in Table 3.3. There were no statistically significant increases or decreases in the likelihood of conflict between activity types across the three trails. However, the frequencies of reported conflicts as a result of specific behaviors from other activity types were reduced in the Post-TPP sample compared to the Pre-

TPP sample (Appendix A: Figures A.5- A.9). Further, the frequencies of reported behaviors at the source of the conflict for all activities and all trails were reduced in the Post-TPP sample (Appendix A: Figures A.10-A.24).

While the statistical analysis does not provide sufficient support to establish causation between the TPP and a reduction in conflict on trails, the data suggest a trend towards reduction in conflict between activity types. Nevertheless, these data are based upon a small minority of trail users who report conflict with other activity types, while the majority of trail users do not experience or perceive conflict with other trail users. When the broader sample is engaged, there is a statistically significant increase in agreement from the Pre-TPP to Post-TPP to statements evaluating the effectiveness of TPP management strategies like restrictions on activity type and trail direction designations reducing conflict (Table 3.4).



**Figure 3.4:** ALWO visitor reported likelihood of conflict with other activity types, showing only responses that were somewhat or extremely likely.

Trail	Pre/Post	Mean Conflict Likelihood
Cholla	Pre	2.78
	Post	2.58
Lynx	Pre	2.42
	Post	2.58
Rock-It (Control)	Pre	2.48
	Post	2.53

**Table 3.3:** Mean likelihood of visitor reported conflict likelihood on 5-point Likert scale (1=Extremely Unlikely, 3=Neither Likely nor Unlikely, 5=Extremely Likely)



### 3.2.2 Safety & Effectiveness of Management Actions

Safety, like conflict, is a complex construct shaped by visitor perceptions and experience and is difficult to measure in recreation contexts. To elicit responses from visitors regarding perceptions of safety in relation to TPP trail management strategies (i.e., activity type restrictions and direction of trail use), we designed statements to evaluate each strategy and its effect on increasing visitor safety (Table 3.4). Visitors reported moderate levels of agreement in the Pre-TPP survey there was a statistically significant increase in agreement to all statements in the Post-TPP survey. This suggests that after experiencing the trails under the TPP, visitors believed the changes were effective at increasing safety.

Visitors in the Post-TPP survey reported a statistically significant increase in agreement that changes to activity restrictions and direction designations increased safety, reduced conflict, and increased the quality of the visitor’s experience. Finally, visitors were asked to evaluate the TPP subjectively and objectively, whether the TPP “increased

the quality of (their) experience” and “create(s) a better experience for all visitors”. The level of agreement on the effect of the TPP on all visitors’ experience was higher than the effect on the individual’s experience of the TPP in both the Pre-TPP and Post-TPP surveys.

### 3.2.3 Signage

Visitor evaluations of existing signage prior to the TPP were somewhat mixed, finding the effectiveness of the communication of park habitat and conservation goals, trail closures, and trail etiquette moderately to very effective (see Appendix A: A.25). When visitors were asked to evaluate the signage communicating the new TPP trails regulations there were high levels of agreement that the signage communicated expected behaviors, effectively communicated the new regulations, and that there was enough signage posted in the right locations (see Appendix A: A.26).

**Table 3.4:** Visitor evaluations of TPP management strategies effects on safety, reduction in conflict, and visitor experience. Responses are on 5-point Likert scale measuring agreement (1=Strongly Disagree, 3=Indifferent/Neutral, 5=Strongly Agree).

Management Statement	Pre/Post	
	Pre	Post
Restricting activity types on some trails creates safer conditions for everyone.	3.75	4.19**
Restricting activity types on some trails reduces conflict.	3.67	4.20***
Designating the direction of trail use creates safer conditions for everyone.	3.92	4.44***
Designating the direction of trail use reduces conflict.	3.74	4.28***
Overall, the new trail regulations (i.e. activity type/direction of use) have increased the quality of my experience.	3.65	4.00*
Overall, the new trail regulations (i.e. activity type/direction of use) create a better experience for all visitors.	3.77	4.14**

\*p<.05, \*\*p<.01, \*\*\*p<.001

### 3.2.4 TRAFx & Strava Metro Trail Data

#### TRAFx Data

Trail use was monitored prior to and following the implementation of the TPP to understand the effect of the TPP on the magnitude of trail use, compliance with TPP management (i.e., direction of use and activity restrictions), as well as behavioral changes in trail use.

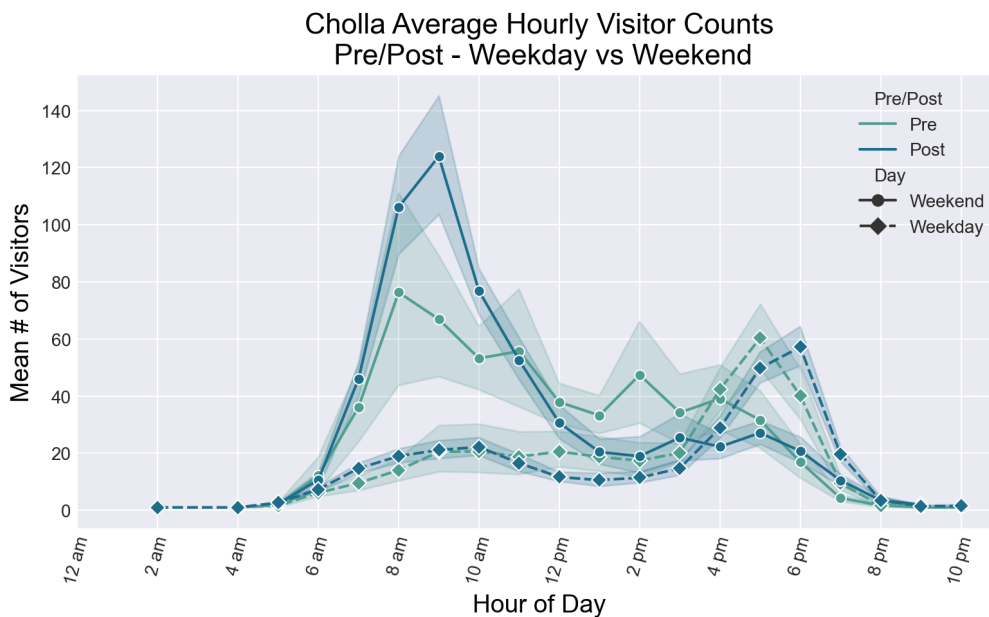
TRAFx infrared trail counters were deployed on the TPP and control trails to measure trail use throughout the summer of 2021. Figure 3.5 below illustrates patterns of daily trail use prior to and following the implementation of the TPP, as well as weekday vs weekend use. The weekday use appears to be generally similar throughout the day, while the weekend use is more pronounced in the Post-TPP period than in the Pre-TPP. However, the Pre-TPP and Post-TPP data represent different times of the summer season where weather patterns may have affected the amount and time of use. Figures for each trail in ALWO summarizing use by hour of day and day of week can be found in Appendix B: Figures B.1 - B.6.

#### Strava Metro

We obtained data from Strava Metro which summarizes aggregated data from Strava, a fitness tracking app. While Strava Metro is typically used for urban/active transportation planning, it can also be used to summarize trail use and understand some of the trail behaviors. Previous survey research in OC Parks indicates that Strava is a commonly used app among visitors, so researchers conducted an analysis to determine how representative or generalizable these data were to total trail use.

Researchers used data from the TRAFx calibrations to estimate the proportion of pedestrians or bicyclists and the direction of trail use. These estimates were then compared to the Strava Metro data to understand the correlation, or the relationship of these data (see Table 3.5). Generally, because the app is used most frequently by mountain bikers, the estimates of bike use and use on trails popular among mountain bike users had the highest and most statistically significant correlations. Further, the prevailing direction of trail use on Strava Metro closely matched the patterns observed in calibrations. This data is also useful to monitor compliance with the TPP trail regulations and understand patterns of trail use among mountain bikers.

Finally, Strava Metro data also provided aggregated daily summaries of the velocity, or speeds of mountain bike users on trails. Figure 3.6 below visualizes the uphill and downhill distributions of mountain bike trail velocities for the three trails in ALWO. This figure helps visualize the spread of the data with the median as a black bar and boxes as the interquartile range of the data (Hofmann et al., 2017). Researchers compared the Strava Metro mountain bike uphill and downhill trail velocities and found a statistically significant Post-TPP increase in the downhill velocities on the Cholla Trail, despite the uphill only mountain bike direction designation of TPP trail management. There were no significant changes in trail velocities on the Rock-it and Lynx trails, however the data suggest the downhill velocities on the Rock-it and Lynx trails at times exceeded the 10 mph posted speed limit. Figures summarizing the correlation between the Strava Metro and TRAFx data as well as t-tests of velocities for each trail can be found in Appendix C: Figures C.1 - C.6.



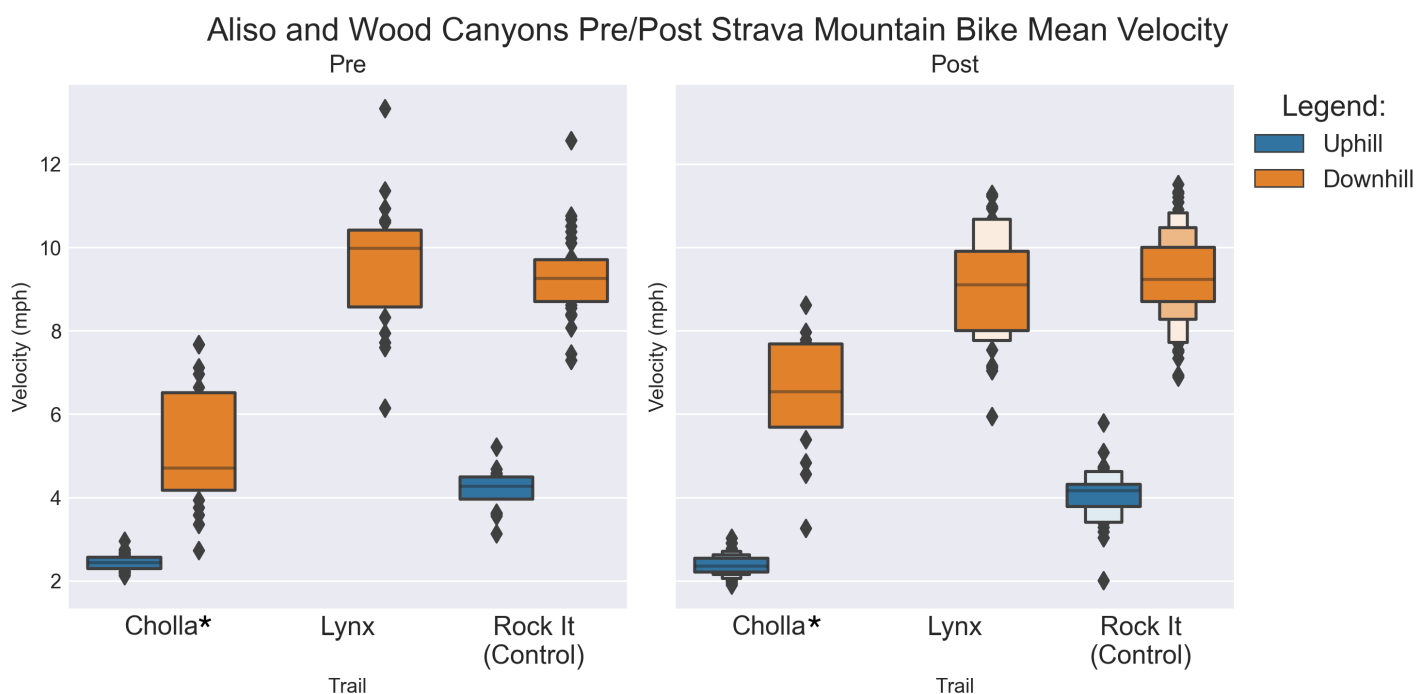
**Figure 3.5:** Cholla visitor counts by Pre/Post pilot program hour of the day, weekday vs weekend.

Note : Cholla corrected data from 05/01/21 to 08/31/21(123 days) omitting zero count hours.

**Table 3.5:** Pearson’s r correlation values comparing TRAFx counts and Strava Metro Counts. Each trail was analyzed by comparing total counts, pedestrian and bicycle counts, and up and down directionality.

Trail	Variable	r	p-value	Deg. Freedom
Lynx	Bike Counts	.902	<.001	63
Lynx	Down Counts	.887	<.001	13
Cholla	Up Counts	.837	<.001	134
Cholla	Total Counts	.823	<.001	151
Cholla	Bike Counts	.822	<.001	147
Rock It	Total Counts	.804	<.001	149
Rock It	Down Counts	.800	<.001	105
Rock It	Bike Counts	.798	<.001	146
Lynx	Total Counts	.564	<.001	71
Cholla	Pedestrian Counts	.357	<.001	138
Lynx	Up Counts	.248	.372	13
Rock It	Pedestrian Counts	.246	<.01	108
Cholla	Down Counts	.233	<.01	134
Rock It	Up Counts	.100	.307	105
Lynx	Pedestrian Counts	.036	.870	21

**Figure 3.6:** Summary of Pre-TPP and Post-TPP mountain bike velocities on trails in ALWO. Median velocities are represented as black bar in box, while the boxes represent the 25th to 75th percentile of the data distributions. Trail names with an asterisk (\*) indicate a statistically significant difference between the Pre-TPP and Post-TPP velocities.



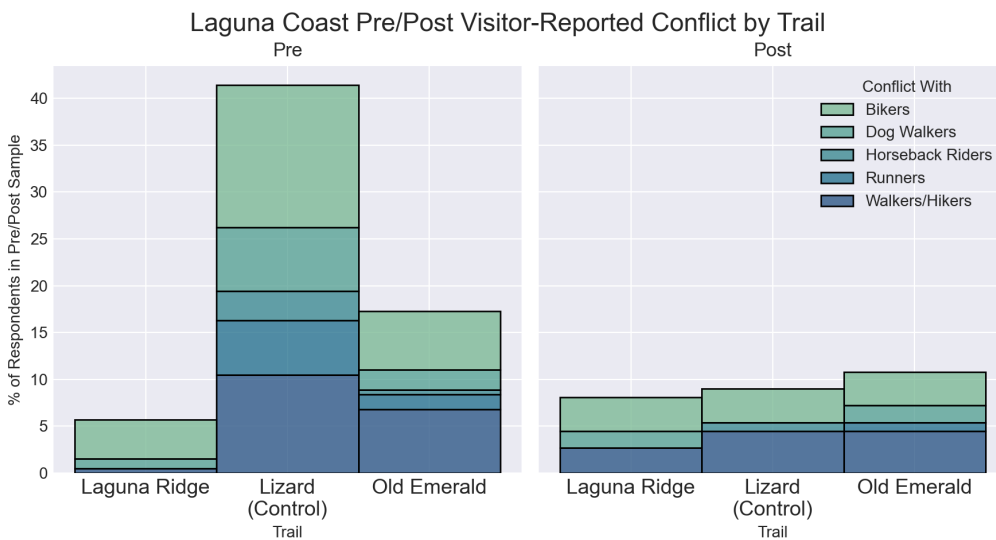
### 3.3. Laguna Coast Wilderness Park (LACO)

#### 3.3.1 Conflict

LACO visitors reported low to moderate levels of conflict with other activity types (Figure 3.7) in the Pre-TPP survey and generally lower levels in the Post-TPP survey on TPP trails with the exception of Laguna Ridge which saw a slight increase in reported conflict with hikers in the Post-TPP survey. Approximately 40% of visitors reported conflicts with other trail users in the Pre-TPP survey while only 10% reported conflict in the Post-TPP survey. However, the Lizard trail was closed for trail maintenance for a short period prior to the Post-TPP survey, which may have had an effect on reported conflict. Nevertheless, it is important to understand the nature of these conflicts, in particular the dynamics of the conflict as well as the likelihood or frequency.

The direction of conflicts in LACO appear to be symmetrical in the Pre-TPP survey (i.e. biking and hiking), and somewhat asymmetrical in the Post-TPP survey (see Figure 3.8). The nature of conflict can shift over time, and potentially as a result of trail management decisions designed to address the conflict. Similar to ALWO, this illustrates the complexity of measuring and managing visitor conflict in recreation settings where conflict is shaped by visitors' perceptions, expectations, and attitudes.

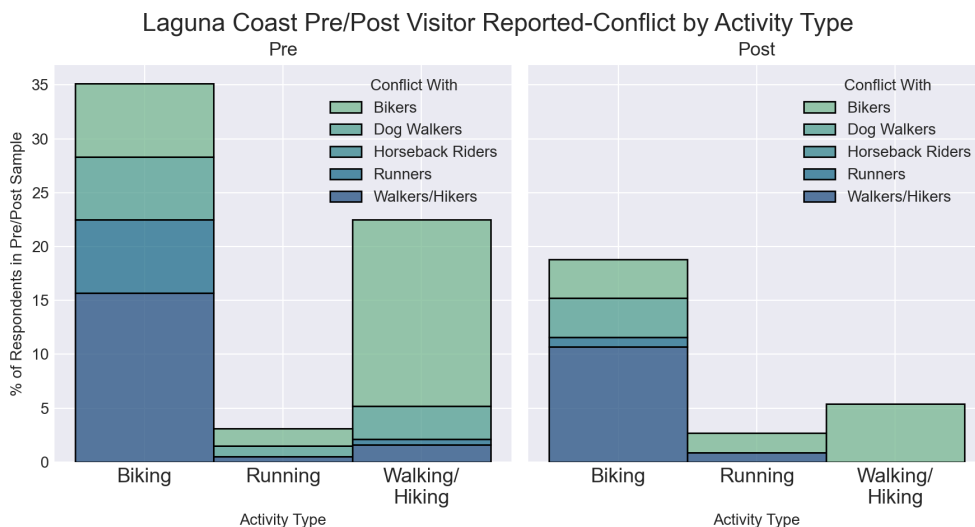
The profile of visitors who are most likely to report conflict during their recreation experience was similar to visitors in ALWO. Visitors most likely to report conflict during their experience in both the Pre-TPP and Post-TPP surveys are males who recreate frequently with intermediate to expert levels of specialization (Appendix A: Figures A.28-A.30).



**Figure 3.7:** Visitor-reported conflict by Park trail. The hue of the bar represents the group with which visitors reported

experiencing conflict. This stacked bar chart represents the cumulative reported conflict with specific activity types, and that

any one respondent could report conflict with any or all of the activity types.



**Figure 3.8:** LACO visitor reported conflict by activity type. The hue of the bar represents the group visitors reported conflict with.

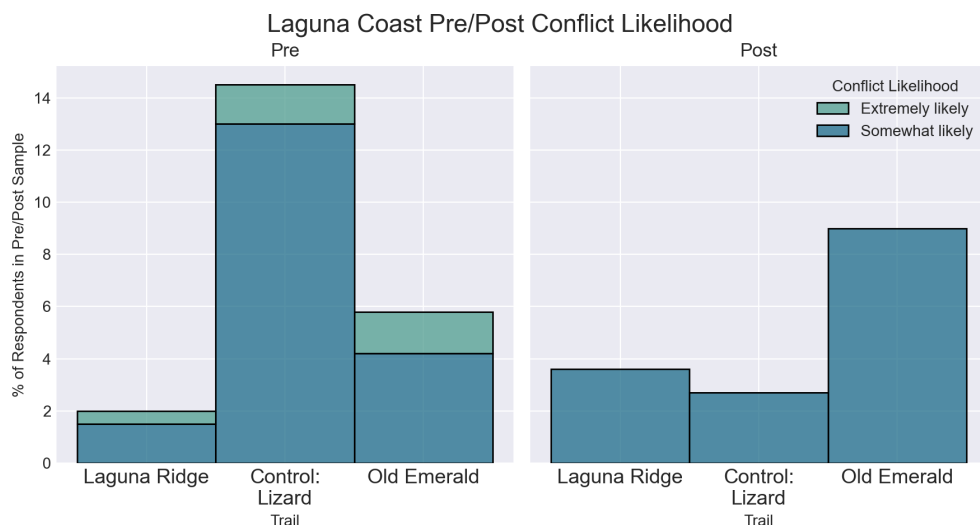
This finding is supported by the literature, which suggests that visitors with high levels of specialization have more developed and specific preferences for the social, ecological, and managerial characteristics of the setting (Manning, 2011).

The survey instrument first asked visitors whether they experienced conflict with another activity type, and then asked them to qualify the frequency or likelihood of conflict with an activity type on a five-point Likert scale (1=Extremely unlikely, 3 = Neither likely or unlikely, 5=Extremely likely). While nearly 40% of visitors reported conflicts on the Lizard trail, only approximately 14% of those conflicts were somewhat or extremely likely in the Pre-TPP survey and approximately 2% in the Post-TPP survey (see Figures 3.9 & Appendix A: A.27).

The mean, or average, likelihood of conflict with other activity types across the three trails in the Pre-TPP and Post-TPP surveys are presented in Table 3.6. There were no statistically significant increases or decreases in the

likelihood of conflict between activity types across the three trails, however the frequencies of reported conflicts as a result of specific behaviors from other activity types were reduced in the Post-TPP sample (Appendix A: Figures A.31- A.35). Furthermore, frequencies of behavior reported to be at the source of conflict for all activities and all trails were reduced in the Post-TPP sample

While the statistical analysis does not provide sufficient support to establish causation between the TPP and a reduction in conflict on trails, the data suggest a trend towards reduction in conflict between activity types. Nevertheless, these data are based upon a small minority of trail users who report conflict with other activity types, while the majority of trail users do not experience or perceive conflict with other trail users. When the broader sample is engaged, there is a statistically significant increase in agreement between Pre-TPP and Post-TPP surveys on statements evaluating the effectiveness of TPP management strategies like restrictions on activity type reducing conflict (Table 3.7).



**Figure 3.9:** LACO visitor reported likelihood of conflicts by activity types, showing only somewhat or extremely likely.

Trail	Pre/Post	Mean Conflict Likelihood
Laguna Ridge	Pre	2.36
	Post	3.12
Old Emerald	Pre	2.91
	Post	3.58
Lizard (Control)	Pre	2.77
	Post	2.40

**Table 3.6:** Mean likelihood of visitor reported conflict likelihood on 5-point Likert scale (1=Extremely Unlikely, 3=Neither Likely nor Unlikely, 5=Extremely Likely)



### 3.3.2 Safety & Effectiveness of Management

Safety, like conflict, is a complex construct shaped by visitor perceptions and experience and is difficult to measure in recreation contexts. To elicit responses from visitors regarding perceptions of safety in relation to TPP trail management strategies (i.e., activity type restrictions and direction of trail use), we designed statements to evaluate each strategy and its effect on increasing visitor safety (Table 3.7). Visitors reported moderate levels of agreement in the Pre-TPP survey, and there was a statistically significant increase in agreement in the Post-TPP survey for statements related to restricting activity types. Although the statements related to designating the direction of trail use and its effect on safety and reduction in conflict were not statistically significantly higher in the Post-TPP survey, their means are higher in the Post-TPP survey.

Finally, visitors were asked to evaluate the TPP subjectively and objectively, whether the TPP “increased the quality of (their) experience” and “create(s) a better experience for all visitors”. Similar to ALWO, the level of agreement on the effect of the TPP on all visitors’ experience was higher than the effect on the individual’s experience of the TPP in both the Pre-TPP and Post-TPP surveys.

### 3.3.3 Signage

Visitor evaluations of existing signage prior to the TPP were somewhat mixed, finding the effectiveness of communication about the park habitat and conservation goals, trail closures, and trail etiquette moderately to very effective (see Appendix A: A.48). When visitors were asked to evaluate signage communicating the new TPP trail regulations, there was high levels of agreement that the signage communicated expected behaviors, was effective at communicating the new regulations, and that there was enough signage posted in the right locations(see Appendix A: A.49).

### 3.3.4 TRAFx & Strava Metro Trail Data

#### TRAFx Data

Trail use was monitored prior to and following the implementation of the TPP to understand the effect of the TPP on the magnitude of trail use, compliance with TPP management (i.e., direction of use and activity restrictions), as well as behavioral changes in trail use.

TRAFx infrared trail counters were deployed on TPP and control trails to measure trail use throughout the summer

**Table 3.7:** Visitor evaluations of TPP management strategies effects on safety, reduction in conflict, and visitor experience. Responses are on 5-point Likert scale measuring agreement (1=Strongly Disagree, 3=Indifferent/Neutral, 5= Strongly Agree).

Management Statement	Pre/Post	
	Pre	Post
Restricting activity types on some trails creates safer conditions for everyone.	3.58	3.97*
Restricting activity types on some trails reduces conflict.	3.55	3.87*
Designating the direction of trail use creates safer conditions for everyone.	3.80	4.04
Designating the direction of trail use reduces conflict.	3.61	3.84
Overall, the new trail regulations (i.e. activity type/direction of use) have increased the quality of my experience.	3.60	3.81
Overall, the new trail regulations (i.e. activity type/direction of use) create a better experience for all visitors.	3.71	4.00

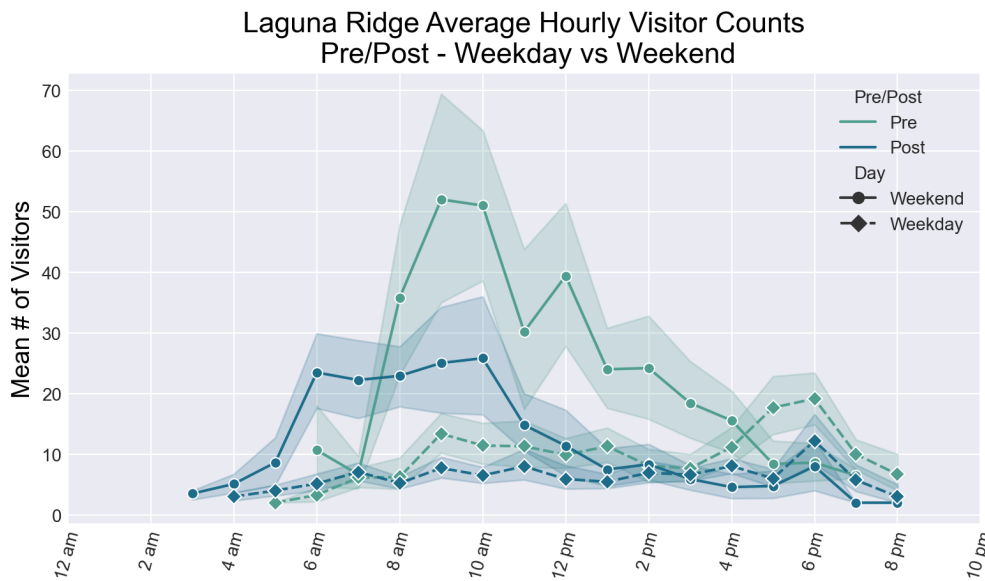
\*p<.05, \*\*p<.01, \*\*\*p<.001

of 2021. Figure 3.10 below illustrates patterns of daily trail use prior to and following the implementation of the TPP, as well as weekday vs weekend use. Weekday use appears to be generally similar throughout the day, while weekend use is more pronounced in the Post-TPP period than in the Pre-TPP. However, the Pre-TPP and Post-TPP data represent different times of the summer season where weather patterns may have affected the amount and time of use. Figures for each trail in LACO summarizing use by hour of day and day of week can be found in Appendix B: Figures B.7 - B.12.

### Strava Metro

We obtained data from Strava Metro which summarizes aggregated data from Strava, a fitness tracking app. While Strava Metro is typically used for urban/active transportation planning, it can also be used to summarize trail use and understand some of the trail behaviors. Previous survey research in OC Parks indicates that Strava is a commonly used app among visitors, so researchers conducted an analysis to determine how representative or generalizable these data were to total trail use.

Researchers used data from the TRAFx calibrations to



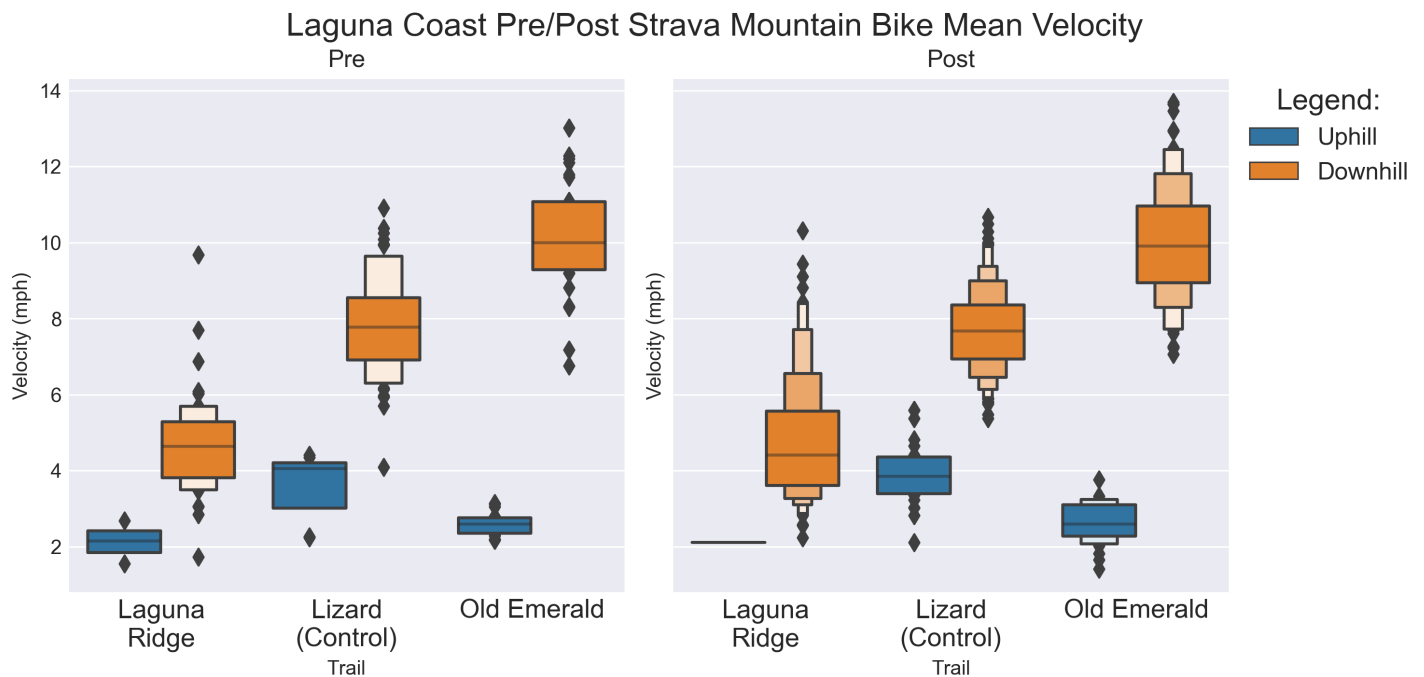
**Figure 3.10:** Laguna Ridge visitor counts by Pre/Post pilot program hour of the day, weekday vs weekend.

Trail	Variable	Pearson r	p-value	Deg. Freedom
Lizard	Total Counts	.917	<.001	130
Lizard	Bike Counts	.900	<.001	128
Lizard	Down Counts	.879	<.001	76
Old Emerald	Total Counts	.799	<.001	135
Old Emerald	Bike Counts	.794	<.001	134
Old Emerald	Down Counts	.723	<.001	39
Laguna Ridge	Total Counts	.696	<.001	110
Laguna Ridge	Bike Counts	.693	<.001	100
Laguna Ridge	Down Counts	.591	<.001	52
Lizard	Pedestrian Counts	.523	<.001	78
Old Emerald	Up Counts	.466	<.01	39
Old Emerald	Pedestrian Counts	.420	<.01	40
Lizard	Up Counts	.290	<.01	76
Laguna Ridge	Pedestrian Counts	.197	.119	62
Laguna Ridge	Up Counts	.071	.609	52

**Table 3.8:** Pearson's r correlation values comparing TRAFx counts and Strava Metro Counts. Each trail was analyzed by comparing total counts, pedestrian and bicycle counts, as well as up and down directionality.

estimate the proportion of pedestrians or bicyclists and the direction of trail use. These estimates were then compared to the Strava Metro data to understand the correlation, or the relationship of these data (see Table 3.8). Generally, because the app is used most frequently by mountain bikers, the estimates of bike use and use on trails popular among mountain bike users had the highest and most statistically significant correlations. Furthermore, the prevailing direction of trail use on Strava Metro closely matched the patterns observed in calibrations. However, while the correlations for pedestrian counts were statistically significant on the Lizard and Old Emerald trails, the correlations of 0.4 to 0.5 represent only a moderate relationship between the Strava and TRAFx estimates.

Finally, Strava Metro data also provided aggregated daily summaries of the velocity, or speeds of mountain bike users on trails. Figure 3.11 below visualizes the uphill and downhill distributions of mountain bike trail velocities for the three trails in LACO. This figure helps visualize the spread of the data with the median as a black bar and boxes as the interquartile range of the data (Hofmann et al., 2017). Researchers compared these Strava Metro mountain bike uphill and downhill trail velocities and found no statistically significant changes in trail velocities (Figure 3.11). However, the data suggest the downhill velocities on the Old Emerald trails at times exceeded the 10 mph posted speed limit. Figures summarizing the correlation between the Strava Metro and TRAFx data as well as t-tests of velocities for each trail can be found in Appendix C: Figures C.7 - C.12.



**Figure 3.11:** Summary of Pre and Post TPP mountain bike velocities on trails in LACO. Median velocities are represented as black bar in box, while the boxes represent the 25th to 75th percentile of the data distributions. Trail names with an asterisk(\*) indicate a statistically significant difference between the Pre and Post velocities.

### 3.4. Santiago Oaks Regional Park (SAOA)

#### 3.4.1 Conflict

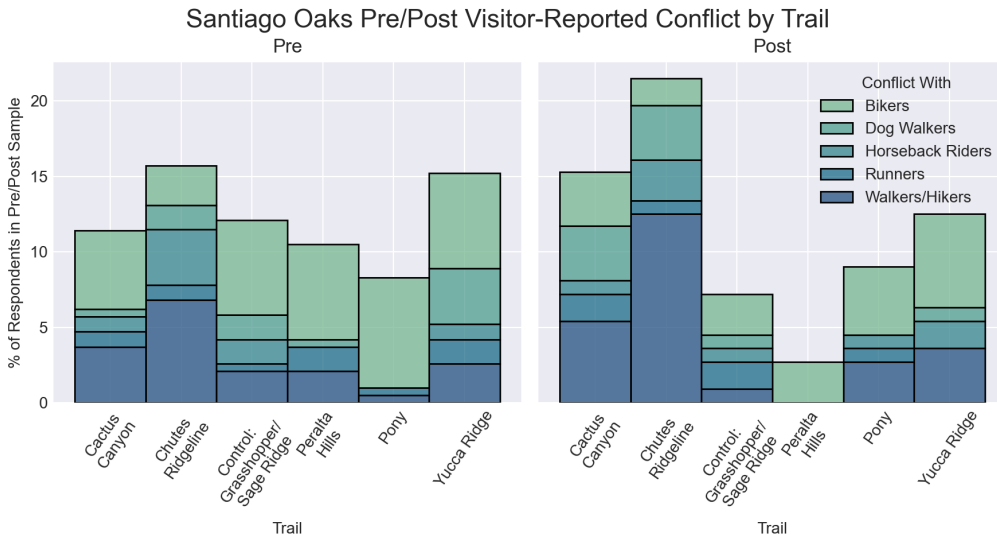
SAOA visitors reported generally low levels of conflict with other activity types (Figure 3.12) in the Pre-TPP survey and lower levels in the Post-TPP survey on TPP trails, with the exception of the Chutes Ridgeline and Cactus Canyon trails. Nevertheless, it is important to understand the nature of these conflicts, in particular the dynamics of the conflict as well as the likelihood or frequency.

The direction of conflicts in SAOA appear to be asymmetrical (i.e. biking and hiking), where one trail user perceives conflict with an "other" activity type while the "other" does not, in both the Pre-TPP and Post-TPP surveys (see Figure 3.13). Here we see hikers attributing more conflict to mountain bikers than mountain bikers attribute to hiking in the Pre-TPP survey, and vice versa in the Post-TPP survey. Similar to the dynamics in LACO,

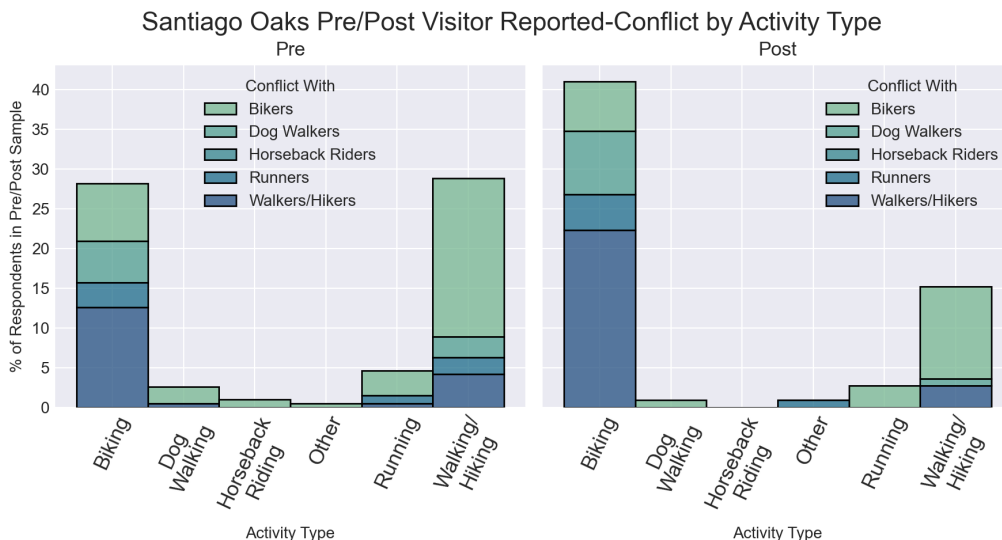
the nature of conflict can shift over time and even as a result of trail management decisions designed to address the conflict. This illustrates the complexity of measuring and managing visitor conflict in recreation settings, where conflict is shaped by visitors' perceptions, expectations, and attitudes.

The visitors who were most likely to report conflict during their recreation experience was similar to visitors in ALWO & LACO. Visitors most likely to report conflict in both the Pre-TPP & Post-TPP surveys were males who recreate frequently with intermediate to expert levels of specialization (Appendix A: Figures A.51-A.53). This finding is supported by the literature, which suggests that visitors with high levels of specialization have more developed and specific preferences for the social, ecological, and managerial characteristics of the setting (Manning, 2011).

The survey instrument first asked visitors whether they



**Figure 3.12:** Visitor reported conflict by Park trail. The hue of the bar represents the group with which visitors reported experiencing conflict. This stacked bar chart represents the cumulative reported conflict with specific activity types, and that any one respondent could report conflict with any or all of the activity types



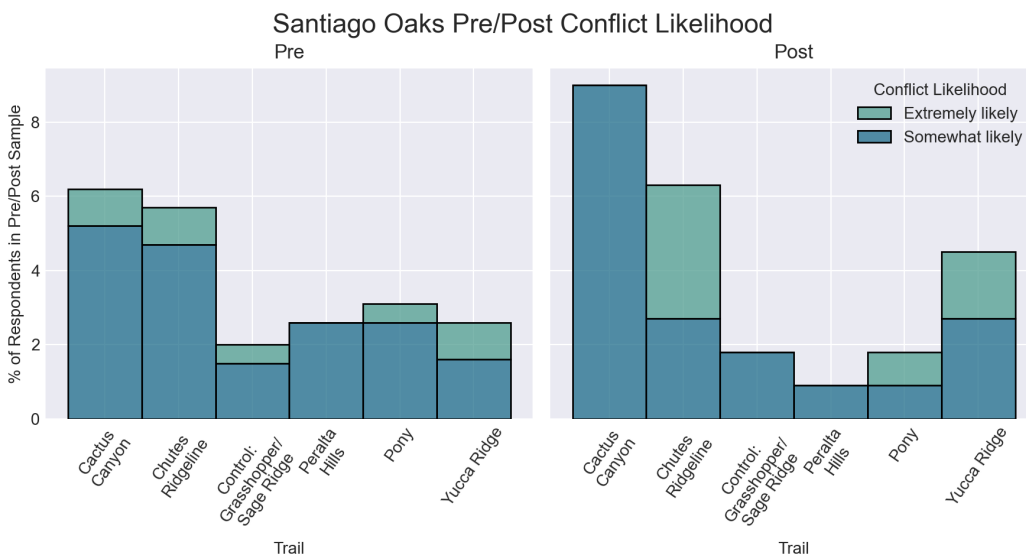
**Figure 3.13:** SAOA visitor reported conflict by activity type. The hue of the bar represents the group visitors reported conflict with.

experienced conflict with another activity type, and then asked them to qualify the frequency or likelihood of conflict with an activity type on a five-point Likert scale (1=Extremely unlikely, 3 = Neither likely or unlikely, 5= Extremely likely). While nearly 15% of visitors reported conflicts on the Cactus Canyon trail in the Post-TPP survey, only approximately 8.5% of those conflicts were, at most, somewhat likely (see Figures 3.14 & Appendix A: A.50). Furthermore, on the Chutes Ridgeline trail only 6% of respondents indicated that conflict was somewhat or extremely likely and only approximately 4% of respondents reported that conflict on the Yucca Ridge trail was somewhat or extremely likely.

The mean, or average, likelihood of conflict by activity types across the three trails in the Pre-TPP and Post-TPP surveys are presented in Table 3.9. There were no statistically significant increases or decreases in the likelihood of conflict between activity types aside from Yucca Ridge. The Yucca Ridge trail was closed for trail maintenance for during the month of May when the Pre-TPP survey was being administered, which may have

influenced the survey responses. The frequencies of reported conflicts as a result of specific behaviors from other activity types were reduced in the Post- TPP sample (Appendix A: Figures A.54- A.58). Furthermore, the frequencies of behaviors reported to be at the source of the conflict for all activities on all trails were reduced in the Post-TPP sample (Appendix A: Figures A.36 - A.47).

While the statistical analysis does not provide sufficient support to establish causation between the TPP and a reduction in conflict on trails, the data suggests a trend towards reduction in conflict between activity types. Nevertheless, these data are based upon a small minority of trail users who report conflict with other activity types, while most trail users do not experience or perceive conflict with other trail users. When the broader sample is engaged, there is a statistically significant increase in agreement from the Pre-TPP to Post-TPP to statements evaluating the effectiveness of TPP management strategies like restrictions on activity type and trail direction designations reducing conflict (Table 3.10).



**Figure 3.14:** SAOA visitor reported likelihood of conflicts with other activity types, showing only somewhat or extremely likely.

**Table 3.9:** Weighted average of visitor reported conflict likelihood on 5-point Likert scale (1=Extremely Unlikely, 3=Neither Likely nor Unlikely, 5= Extremely Likely)

Trail	Pre/Post	Mean Conflict Likelihood
Cactus Canyon	Pre	3.32
	Post	3.47
Chutes Ridgeline	Pre	2.48
	Post	2.74
Grasshopper/Sage Ridge ( <b>Control</b> )	Pre	2.39
	Post	2.50
Peralta Hills	Pre	2.28
	Post	2.67
Pony	Pre	2.87
	Post	2.83
Yucca Ridge*	Pre	1.97
	Post	2.79



### 3.4.2 Safety & Effectiveness of Management

Safety, like conflict, is a complex construct shaped by visitor perceptions and experience and is difficult to measure in recreation contexts. To elicit responses from visitors regarding perceptions of safety in relation to TPP trail management strategies (i.e., activity type restrictions and direction of trail use), we designed statements to evaluate each strategy and its effect on increasing visitor safety (Table 3.10). Visitors reported moderate levels of agreement in the Pre-TPP survey there was a statistically significant increase in agreement to five out of the six statements in the Post-TPP survey. This suggests that after experiencing the trails under the TPP, visitors believed they were effective at increasing safety on trails.

Visitors in the Post-TPP survey reported a statistically significant increase in agreement that the trail management changes to activity restrictions and direction designations increased safety, reduced conflict, and increased the quality of the visitor experience. Finally, visitors were asked to evaluate the TPP subjectively and objectively, whether the TPP “increased the quality of (their) experience” and “create(s) a better experience for all visitors”. Similar to ALWO and LACO, the level of agreement on the effect of the TPP on all visitors’ experience was higher than the effect on the individual’s experience of the TPP in both the Pre-TPP and Post-TPP surveys. Taken together, visitors indicated strong support for the TPP in Santiago Oaks Regional Park and viewed the trail management as effective and equitable.

### 3.4.3 Signage

Visitor evaluations of existing signage prior to the TPP were somewhat mixed, finding the effectiveness of

communication about park habitat and conservation goals, trail closures, and trail etiquette moderately to very effective (see Appendix A: A.88). When visitors were asked to evaluate the signage fore the new TPP trail regulations, there were high levels of agreement that the signage communicated expected behaviors, was effective at communicating the new regulations, and that there was enough signage posted in the right locations (see Appendix A: A.89).

### 3.4.4 TRAFx & Strava Metro Trail Data

#### TRAFx Data

Trail use was monitored prior to and following the implementation of the TPP to understand the effect of the TPP on the magnitude of trail use, compliance with TPP management (i.e., direction of use and activity restrictions), as well as behavioral changes in trail use.

TRAFx infrared trail counters were deployed on TPP and control trails to measure trail use throughout the summer of 2021. Figure 3.15 below illustrates patterns of daily trail use prior to and following the implementation of the TPP, as well as weekday vs weekend use. Weekday use appears to be generally similar throughout the day, while weekend use is more pronounced in the Post-TPP period than in the Pre-TPP. However, the Pre-TPP and Post-TPP data represent different times of the summer season where weather patterns may have affected the amount and time of use. Figures for each trail in SAOA summarizing use by hour of day and day of week can be found in Appendix B: Figures B.13 - B.26.

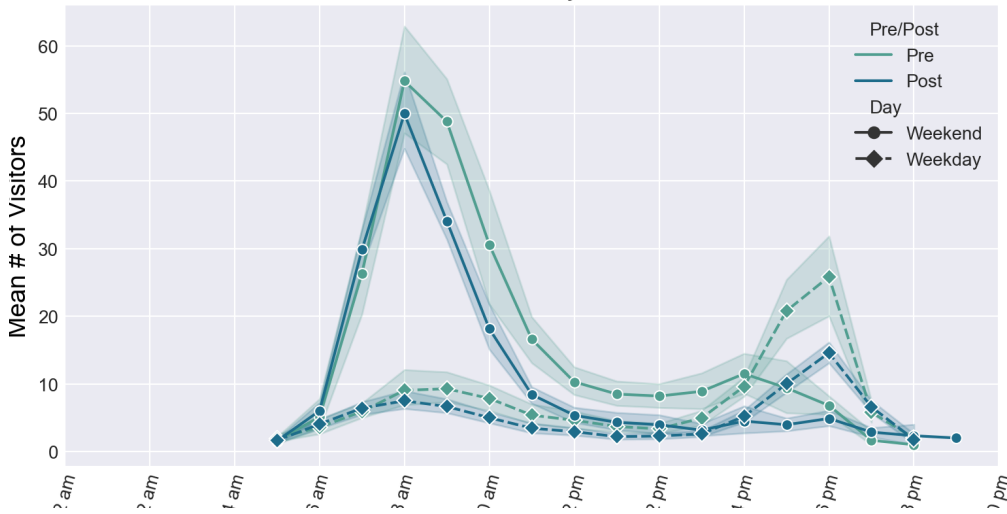
Management Statement	Pre/Post	
	Pre	Post
Restricting activity types on some trails creates safer conditions for everyone.	3.60	3.97**
Restricting activity types on some trails reduces conflict.	3.40	3.84***
Designating the direction of trail use creates safer conditions for everyone.	3.73	4.09**
Designating the direction of trail use reduces conflict.	3.59	3.97**
Overall, the new trail regulations (i.e. activity type/direction of use) have increased the quality of my experience.	3.51	3.68
Overall, the new trail regulations (i.e. activity type/direction of use) create a better experience for all visitors.	3.68	3.97**

\*p<.05, \*\*p<.01, \*\*\*p<.001

**Table 3.10:** Visitor evaluations of TPP management strategies effects on safety, reduction in conflict, and visitor experience.

Responses are on 5-point Likert scale measuring agreement (1=Strongly Disagree, 3=Indifferent/Neutral, 5= Strongly Agree).

Cactus Canyon Average Hourly Visitor Counts  
Pre/Post - Weekday vs Weekend



**Figure 3.15:** Cactus Canyon visitor counts by Pre/Post pilot program hour of the day, weekday vs weekend..

**Strava Metro**

We obtained data from Strava Metro which summarizes aggregated data from Strava, a fitness tracking app. While Strava Metro is typically used for urban/active transportation planning, it can also be used to summarize trail use and understand some of their trail behaviors. Previous survey research in OC Parks indicates that Strava is a commonly used app among visitors, so researchers conducted an analysis to determine how representative or generalizable these data were to total trail use.

Researchers used data from the TRAFx calibrations to estimate the proportion of pedestrians or bicyclists and the direction of trail use. These estimates were then compared to the Strava Metro data to understand the correlation, or the relationship of these data (see Table 3.11). Generally, because the app is used most frequently by mountain bikers, the estimates of bike use and use on trails popular among mountain bike users had the highest and most statistically significant correlations. Further, the prevailing direction of trail use on Strava Metro closely matched the patterns observed in calibrations. However, while the correlations for pedestrian counts were statistically significant on the Chutes Ridge- line and Cactus Canyon trails, the correlations of 0.3 to 0.4 represent a low to moderate relationship.

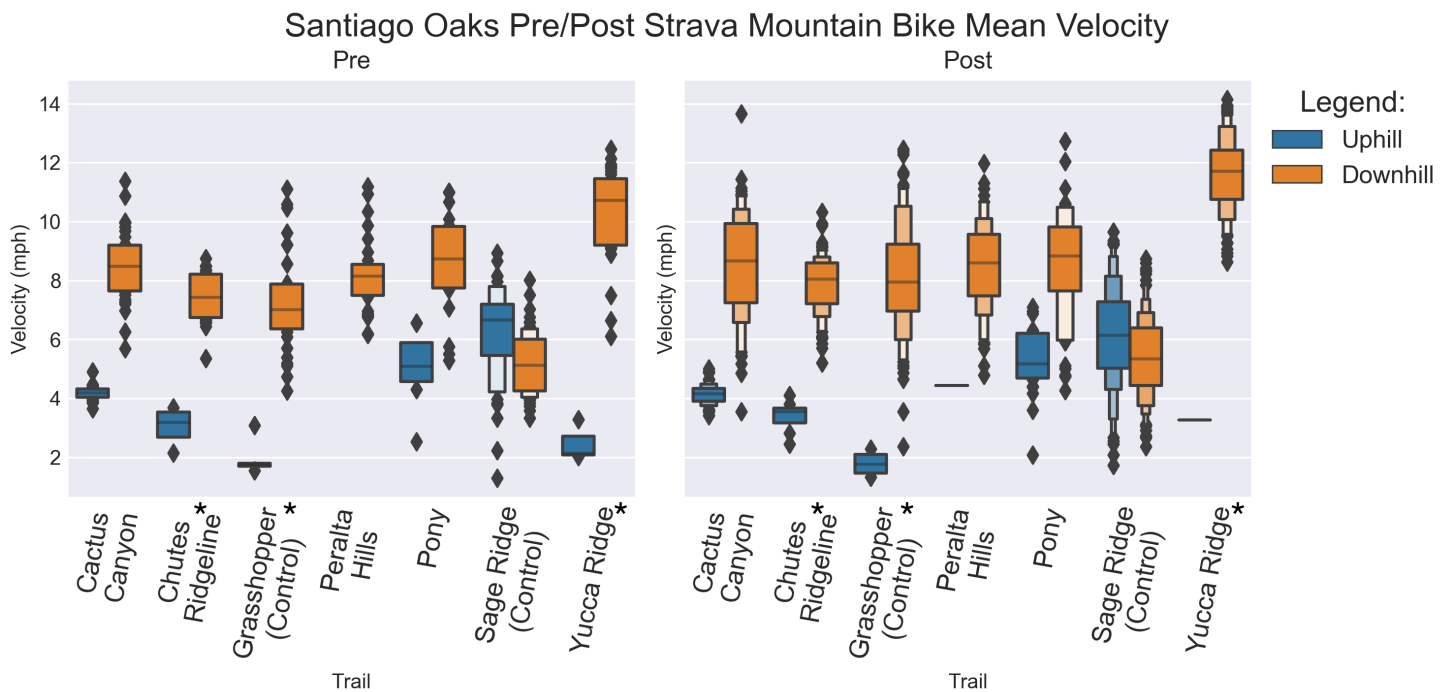
**Table 3.11:** Pearson’s r correlation values comparing TRAFx counts and Strava Metro Counts. Each trail was analyzed by comparing total counts, pedestrian and bicycle counts, as well as up and down directionality.

Trail	Variable	r	p-value	Deg. Freedom
Chutes Ridgeline	Bike Counts	.872	<.001	125
Chutes Ridgeline	Total Counts	.863	<.001	126
Yucca Ridge	Bike Counts	.856	<.001	132
Yucca Ridge	Total Counts	.853	<.001	132
Yucca Ridge	Down Counts	.844	<.001	17
Chutes Ridgeline	Down Counts	.843	<.001	26
Cactus Canyon	Total Counts	.813	<.001	151
Sage Ridge	Total Counts	.806	<.001	136
Sage Ridge	Bike Counts	.783	<.001	135
Cactus Canyon	Bike Counts	.736	<.001	151
Sage Ridge	Down Counts	.728	<.001	46
Grasshopper	Total Counts	.672	<.001	140
Peralta Hills	Down Counts	.670	<.001	57
Cactus Canyon	Up Counts	.661	<.001	78
Peralta Hills	Total Counts	.660	<.001	111
Grasshopper	Bike Counts	.643	<.001	140
Peralta Hills	Bike Counts	.636	<.001	92
Pony	Down Counts	.545	<.001	60
Grasshopper	Down Counts	.528	<.01	28
Chutes Ridgeline	Pedestrian Counts	.446	<.05	27
Chutes Ridgeline	Up Counts	.388	<.05	26
Pony	Total Counts	.384	<.001	131
Cactus Canyon	Pedestrian Counts	.374	<.001	78
Sage Ridge	Up Counts	.365	<.05	46
Cactus Canyon	Down Counts	.355	<.001	78
Sage Ridge	Pedestrian Counts	.334	<.05	47
Pony	Pedestrian Counts	.273	<.01	119
Peralta Hills	Pedestrian Counts	.270	<.05	76
Pony	Up Counts	.229	.073	60
Yucca Ridge	Up Counts	.197	.420	17
Peralta Hills	Up Counts	.178	.177	57
Yucca Ridge	Pedestrian Counts	.075	.760	17
Grasshopper	Up Counts	.045	.812	28
Pony	Bike Counts	.031	.793	72
Grasshopper	Pedestrian Counts	-.024	.899	28

Finally, Strava Metro data also provided aggregated daily summaries of the velocity, or speeds of mountain bike users on trails. Figure 3.16 below visualizes the uphill and downhill distributions of mountain bike trail velocities for the seven trails in SAOA. This figure helps visualize the spread of the data with the median as a black bar and boxes as the interquartile range of the data (Hofmann et al., 2017). Researchers compared the Strava Metro mountain bike uphill and downhill trail velocities and found statistically significant increases in the downhill velocities on the Chutes Ridgeline, Grasshopper, and Yucca Ridge

trails (Figure 3.16). There were no significant changes in trail velocities on the remaining trails, however the data indicate continued usage of the Peralta Hills trail and an increase in the downhill velocities despite the activity type restriction part of the TPP. Figures summarizing the correlation between the Strava Metro and TRAFx data as well as t-tests of velocities for each trail can be found in Appendix C: Figures C.13 - C.26.

**Figure 3.16:** Summary of Pre and Post TPP mountain bike velocities on trails in SAOA. Median velocities are represented as black bar in box, while the boxes represent the 25th to 75th percentile of the data distributions. Trail names with an asterisk(\*) indicate a statistically significant difference between the Pre and Post velocities.



## Section 4:

### Summary

#### Summary:

This section provides context and commentary for the findings of this study as well as conclusions and considerations for future management.

#### 4.1. Discussion

Urban-proximate Park and Protected Areas (PPAs) face unique recreation management challenges to provide opportunities for diverse visitors in systems with high levels of recreation use on multiple-use trails. A commonly held assumption among many public land recreation managers is that, “varied patterns and activities can co-occur under a multiple-use model,” but, “if conflict occurs or is perceived, then land managers have a responsibility to minimize it through system management” (Shilling et al., 2012, p. 393). The factors that contribute to conflict between recreation visitors have been well researched (Jacob & Schreyer, 1980; Vaske et al., 1995) in recreation literature and are believed to be exacerbated in systems with high encounter rates with diverse and varied users (Chavez, 2001).

In these contexts, managers often engage with competing management goals of access and visitor freedom and providing high-quality, safe, and ecologically-sustainable recreation opportunities. The Trail Use Designation Pilot Program (TPP), designed by OC Parks, is an example of an adaptive management strategy to address conflict between visitors and increase perceptions of safety for trail users. Adaptive management strategies are intended to be iterative and dynamic in order to develop in response to new information, and incorporate feedback into future planning (IVUMC, 2019). OC Park’s TPP provided an opportunity for researchers at Utah State University to study the effects of an adaptive management program and develop a better understanding of the complex dynamics between visitor behavior and the environment.

To study the effects of the TPP, researchers developed a Before-After-Control-Impact (BACI) study design to attempt to isolate and understand the impact on the visitor experience and the ecological resource conditions. Several unexpected findings in this research contribute to an appreciation of the complexity of recreation management in this setting.

First, we observed changes in visitor survey responses and behavior on certain control trails (e.g. Grasshopper in

Santiago Oaks Regional Park) that might suggest that there are “spillover” effects from the TPP on the surrounding trails within a park system. Because trails collectively form a network, manipulation of activity-types and trail directions may introduce new, emergent dynamics on other trails within the system.

The BACI design also provided an opportunity to elicit visitor perceptions of safety and conflict at two points in time, in order to understand the effectiveness of the TPP management strategies. Broadly across the three study areas, we observed low to moderate levels of visitor-reported conflict between users, but the likelihood of those conflicts was generally infrequent. Furthermore, among visitors who reported conflict, researchers did not observe statistically significant differences in the likelihood of conflict following the implementation of the TPP, but a trend towards reduced visitor conflicts with the exception of the Yucca Ridge Trail. In many cases, the reported conflicts were generally low or infrequent which made the changes observed quite subtle. On one hand, this provides managers an objective assessment that the majority of visitors do not perceive or experience conflict with other activity types. On the other hand, visitors were able to identify specific behaviors of concern that they believe impacted their recreation experience.

Survey respondents across the parks consistently indicated high levels of agreement and support for the strategies TPP used to address its goals. Respondents’ evaluations showed the trail management strategies of activity-type restrictions and trail direction designation changes were largely regarded as effective, particularly after having experienced the trails after the TPP was implemented. Activity-type restrictions, also referred to as spatial zoning or separation techniques, have a long tradition as a management tool in multi-use recreation settings like the United States Forest Service (USFS) (Clark & Stankey, 1979) where managers plan landscapes to spatially separate incompatible uses. These strategies can be very effective at reducing encounter rates between different uses and mitigate conflicts, as OC Parks visitors indicated in this survey. However, the survey instrument was designed to measure the effectiveness of these strategies, and was not designed to measure visitors’ evaluation of the acceptability of these strategies. The favorability among visitors of these zoning strategies, which limit visitor freedom, is useful for managers to consider. Nonetheless, in the limited application of these techniques in the TPP,



visitors' evaluations of the effectiveness of these strategies at reducing conflict and increasing perceptions of safety were high.

The second management strategy of re-designating the direction of trail use was seen as more effective at increasing safety and reducing conflict than activity type restrictions in all OC Park study areas. These trail behavior type management strategies are widely employed in urban and high-visitation multi-use recreation areas, however very limited research exists evaluating these strategies. Understanding visitors' patterns of trail behaviors on an aggregate level is very complex in response to the features, terrain, and attributes of the setting as well as to exogenous factors in OC Parks facilities which often have multiple entrances in the surrounding neighborhoods. These patterns of trail use behavior (like direction of trail use and its impact on trail speeds) on trails where different activity-types interact can have impacts on the visitor experience in dimensions like conflict and perceptions of safety. When carefully designed, these strategies can have limited impact on the existing patterns of use while harmonizing interactions between users by reducing the speed differential between users (e.g., a trail where hikers share the trail with uphill-bound mountain bikers). Alternatively, these strategies might be viewed as disruptive and intrusive where they are discordant with the existing patterns of use among various activity types and limit freedom. While there is insufficient data to determine the circumstances of the increase in conflict likelihood on the Yucca Ridge trail, it stands out as it had the same multi-use downhill-only designation as Cactus Canyon where no increase in conflict likelihood was observed. The analysis of the Strava Metro data indicates that in many cases downhill designations lead to increased mountain bike velocities. Special consideration should be applied when creating downhill designations for mountain bike users and determining if activity type restrictions should accompany a direction designation for trail safety and to mitigate conflicts between activity types.

Communication of new trail management and regulations to the general public is challenging, particularly in urban-proximate PPAs like OC Parks which have a diverse, multi-lingual surrounding populations. Visitors across the three parks indicated that existing signage concerning aspects of trail safety and conflict, like etiquette and speed limits, were only moderately or slightly effective. However, visitors generally evaluated the effectiveness and adequacy of TPP signage favorably. Recreation research focused on effective signage in recreation settings can offer best practices for the use of normative, proscriptive-injunctive (Cialdini, 1996) messaging and the combined use of symbols, icons, and text on signage to surpass language

barriers and aid in comprehension (Winter, 2007).

## 4.2. Conclusion

Adaptive management implies land managers will develop, implement, and evaluate the effectiveness of management actions in achieving goals by monitoring key indicators of performance. While the TPP was designed as a Pilot Project, many OC Parks visitors responded favorably to the program and its effort to address key dimensions of their recreation experience. This research demonstrated novel techniques to monitor visitor use patterns and behavior and can help illustrate the complexity of visitor perceptions of conflict and safety during their trail experience in OC Parks. The findings highlight the importance of understanding existing patterns of recreation use in order to align and harmonize with these visitors' self-organized patterns of use and behaviors. Additionally, managers might carefully consider the potential effects any new trail management strategy might have on other trails within the system. A dimension of this study which is still ongoing is an assessment of the effect on biophysical resources on trails. This will be delivered in a future addendum to this report.





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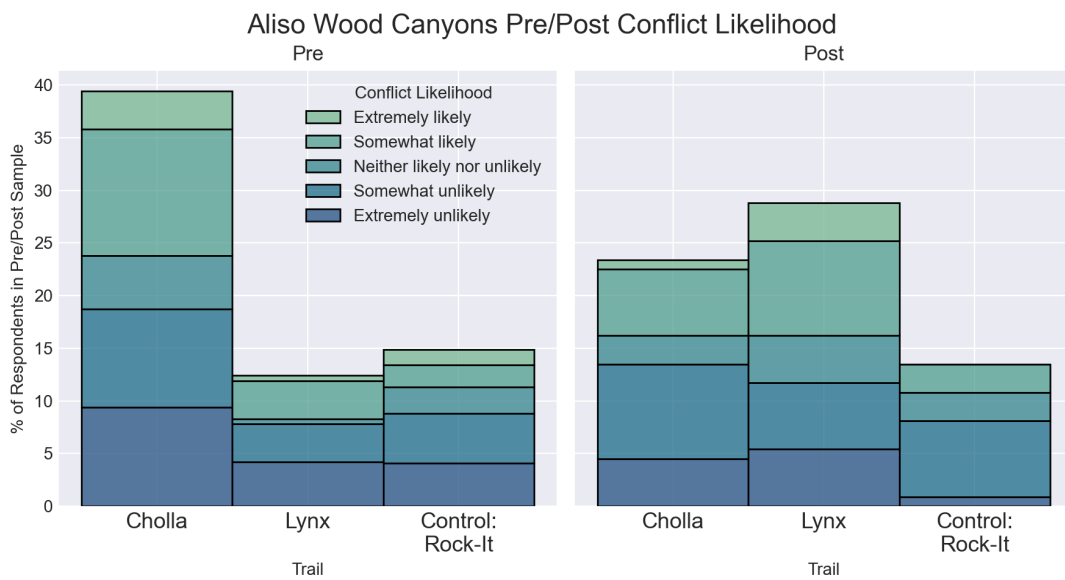
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# Appendix A: Supplementary Figures

## A.1. Aliso and Wood Canyons Wilderness Park

### A.1.1 Visitor Reported Conflict

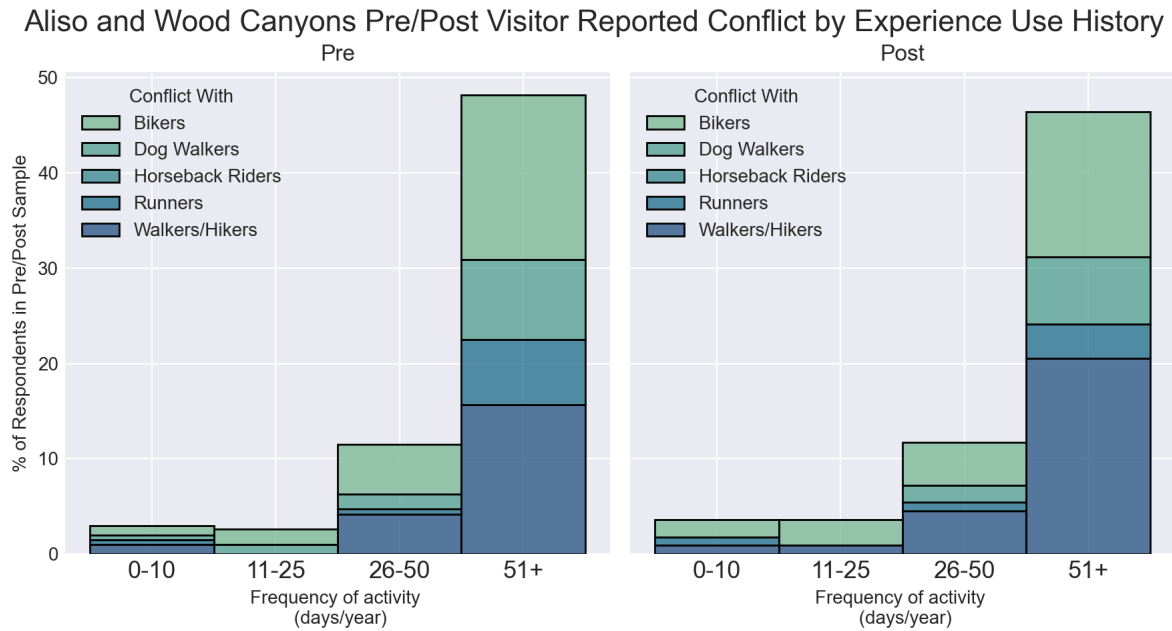


**Figure A.1:** Visitor reported likelihood of conflict. The hue of the bar represents the likelihood of conflict.

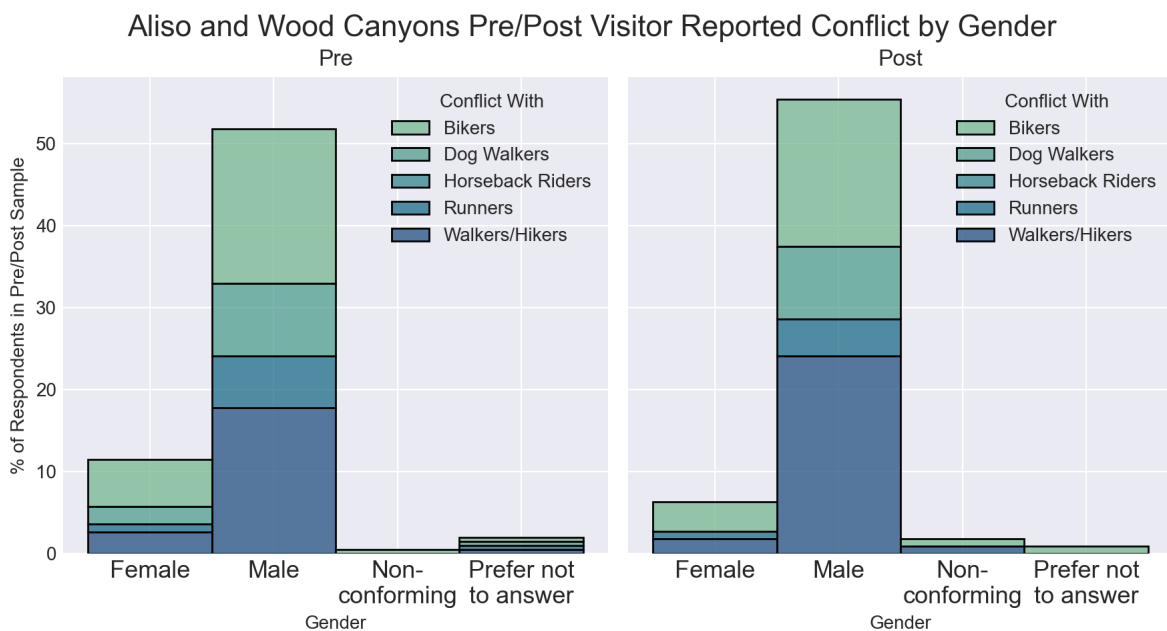


# A.1. Aliso and Wood Canyons Wilderness Park

## Supplementary Figures



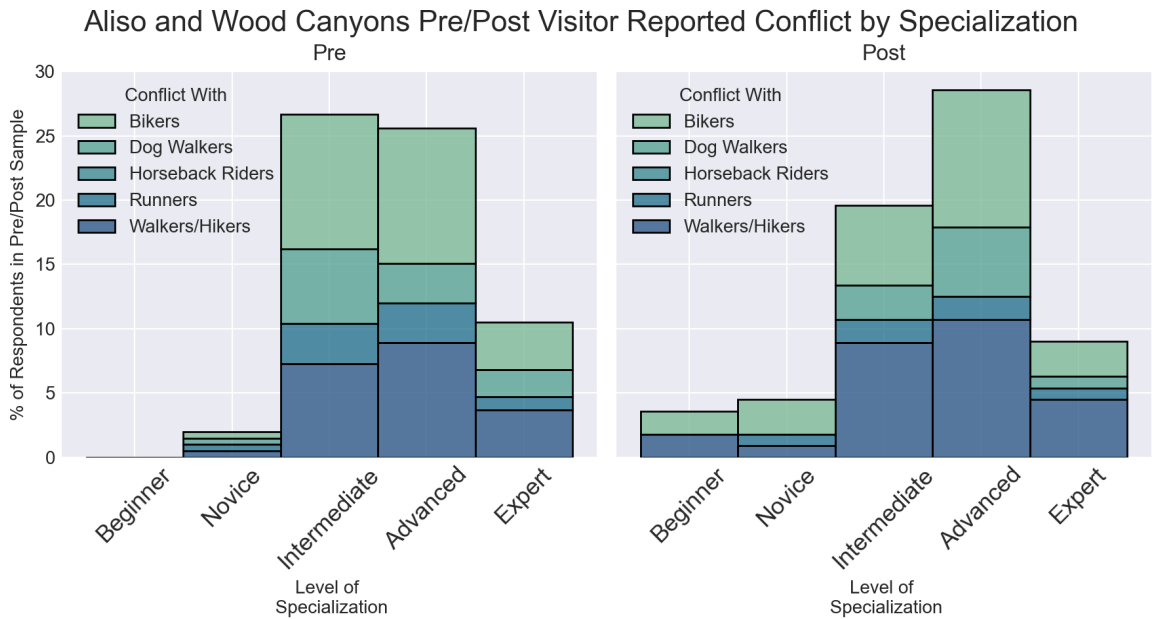
**Figure A.2:** ALWO visitor reported conflict by Experience Use History, or the frequency (in days/year) a visitor participates in their preferred activity type.



**Figure A.3:** ALWO visitor reported conflict by a visitors' self-identified gender.

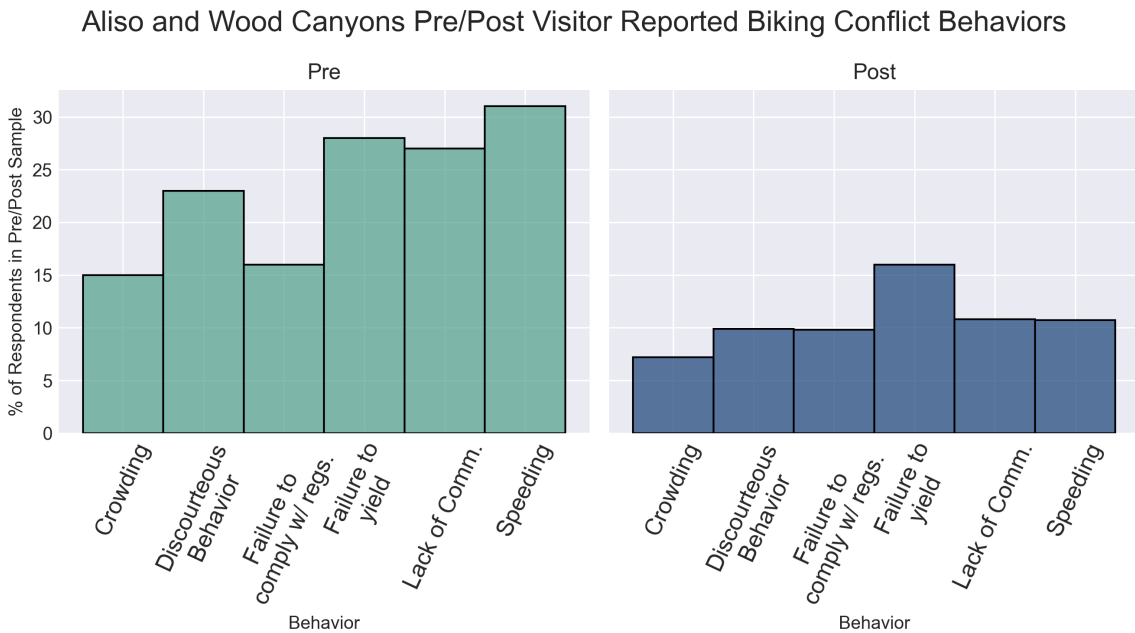
# A.1. Aliso and Wood Canyons Wilderness Park

## Supplementary Figures



**Figure A.4:** ALWO visitor reported conflict by a visitors' self-reported Specialization, or skill/ability level in their activity-type.

### A.1.2 Conflict Behaviors

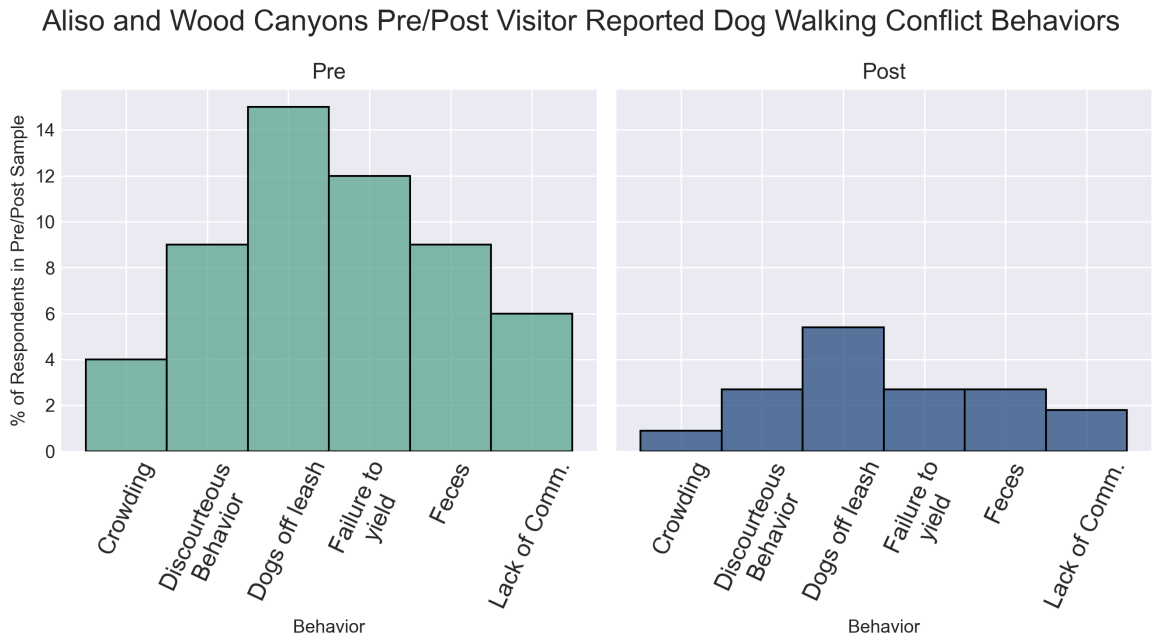


**Figure A.5:** Specific behaviors visitors report are the source of conflict with bikers.

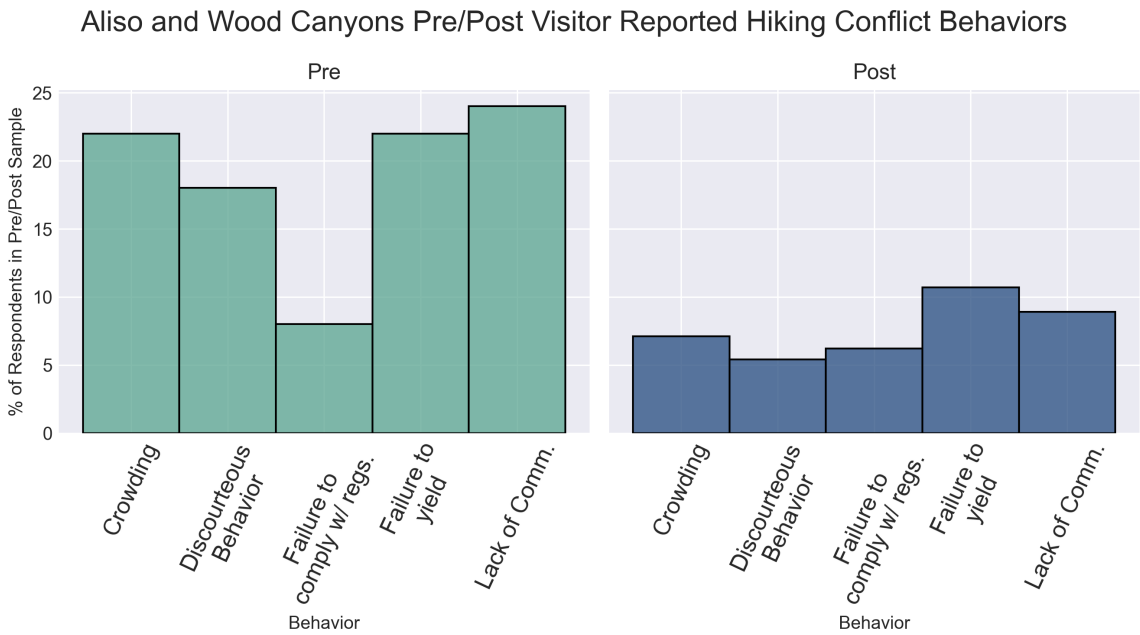


# A.1. Aliso and Wood Canyons Wilderness Park

## Supplementary Figures



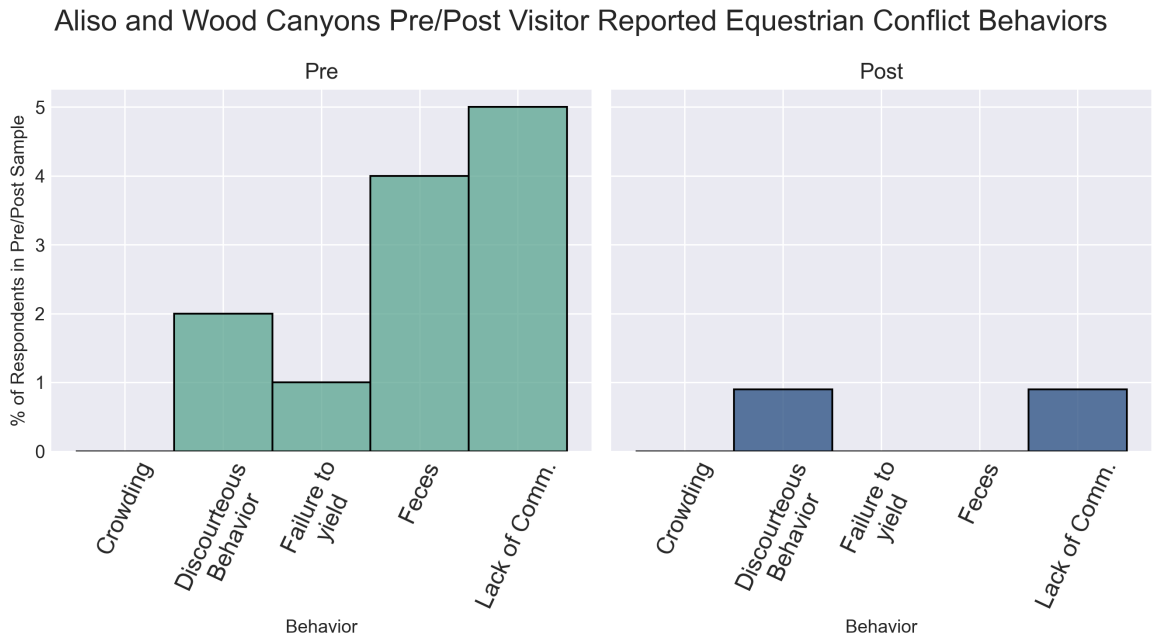
**Figure A.6:** Specific behaviors visitors report are the source of conflict with dog walkers.



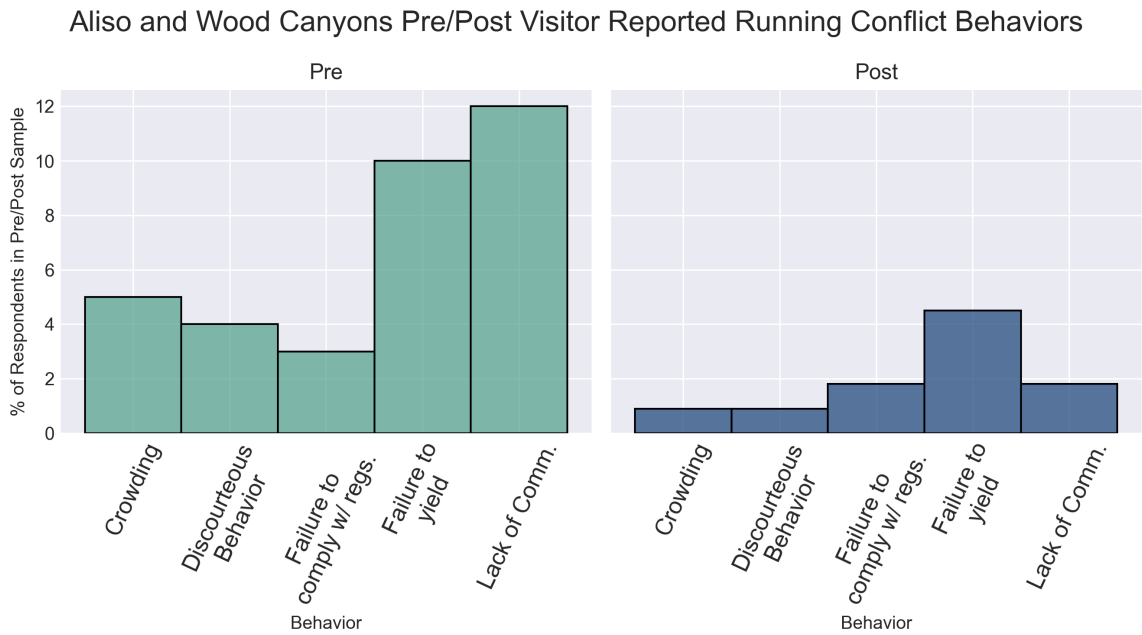
**Figure A.7:** Specific behaviors visitors report are the source of conflict with hikers

# A.1. Aliso and Wood Canyons Wilderness Park

## Supplementary Figures



**Figure A.8:** Specific behaviors visitors report are the source of conflict with equestrians

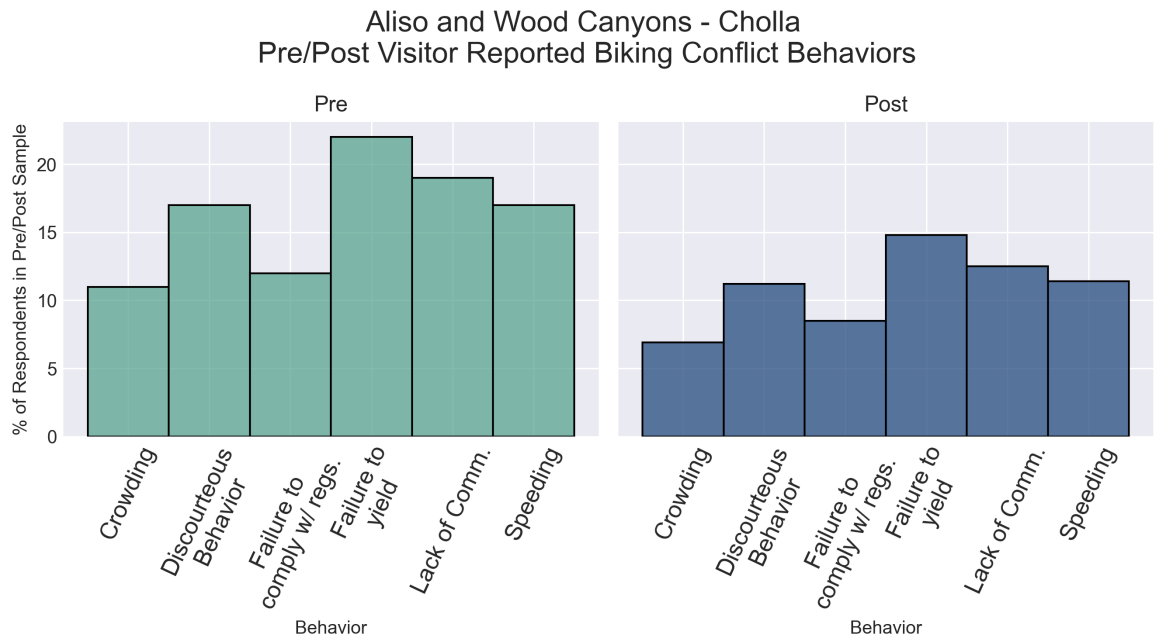


**Figure A.9:** Specific behaviors visitors report are the source of conflict with runners.

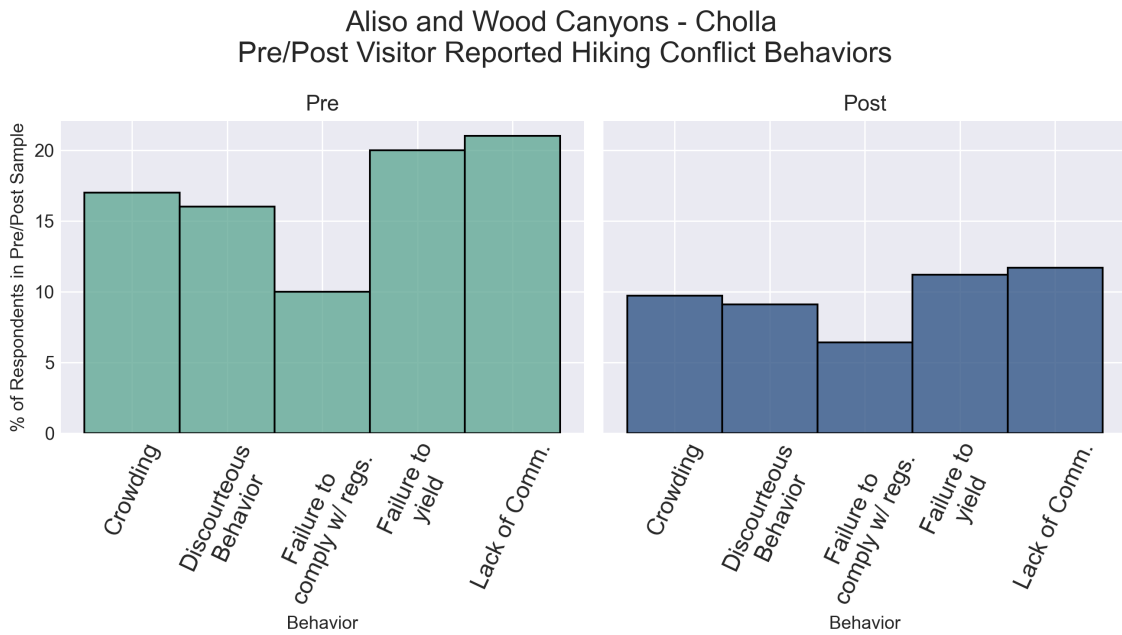
# A.1. Aliso and Wood Canyons Wilderness Park

## Supplementary Figures

### A.1.3 Conflict Behaviors - Cholla



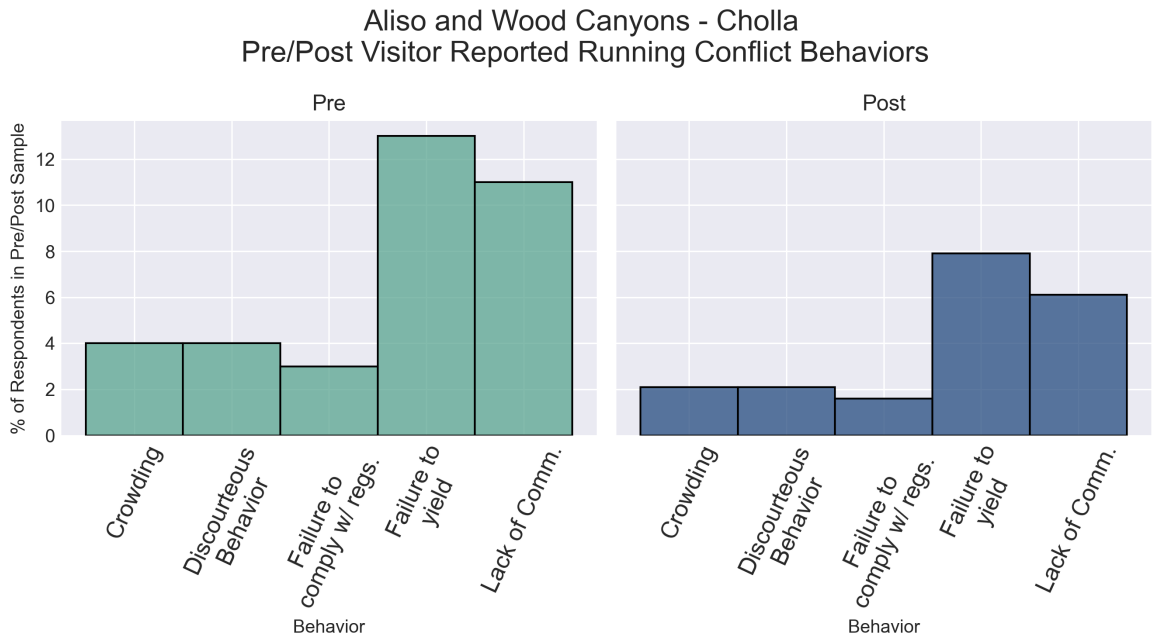
**Figure A.10:** Specific behaviors visitors report are the source of conflict with bikers on the Cholla trail.



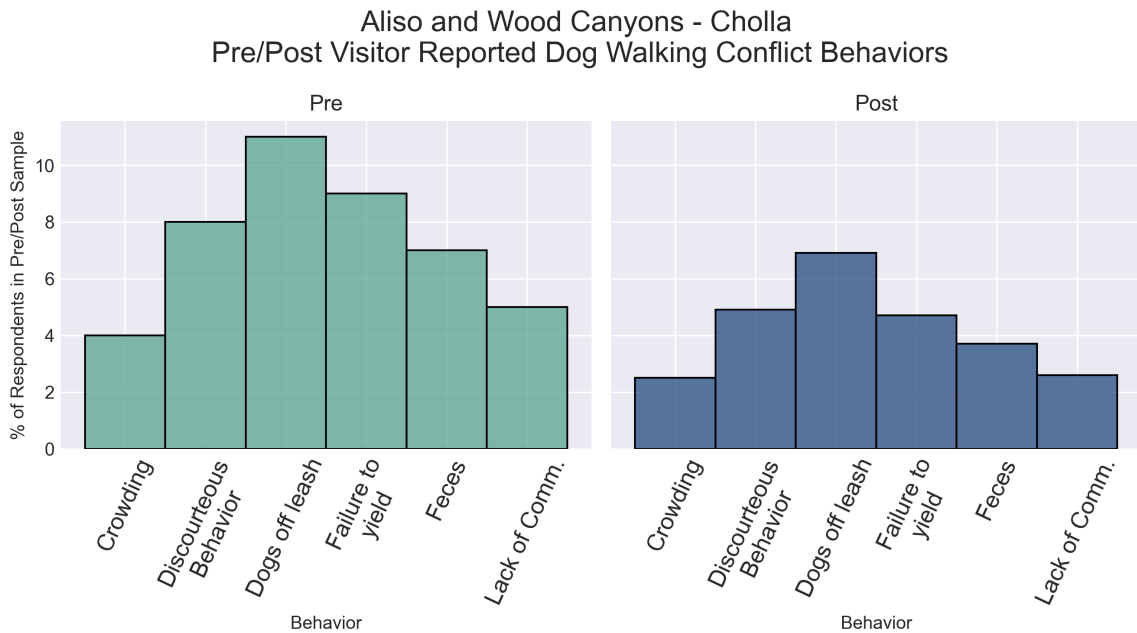
**Figure A.11:** Specific behaviors visitors report are the source of conflict with hikers on the Cholla trail.

# A.1. Aliso and Wood Canyons Wilderness Park

## Supplementary Figures



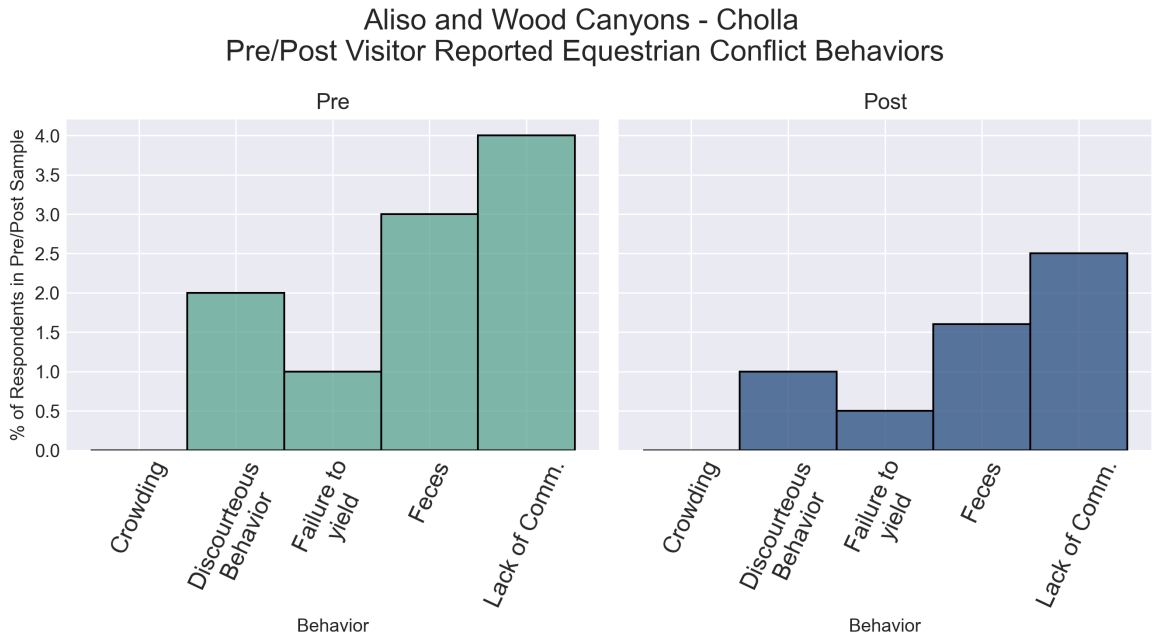
**Figure A.12:** Specific behaviors visitors report are the source of conflict with runners on the Cholla Trail.



**Figure A.13:** Specific behaviors visitors report are the source of conflict with dog walkers on the Cholla Trail.

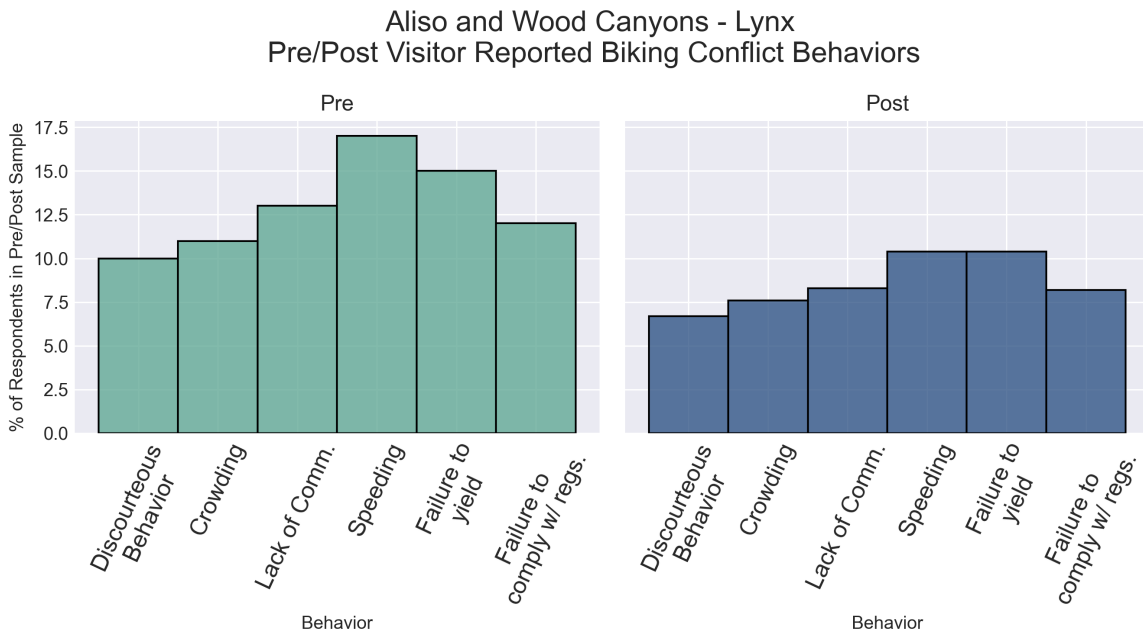
# A.1. Aliso and Wood Canyons Wilderness Park

## Supplementary Figures



**Figure A.14:** Specific behaviors visitors report are the source of conflict with Equestrians on the Cholla Trail.

### Lynx

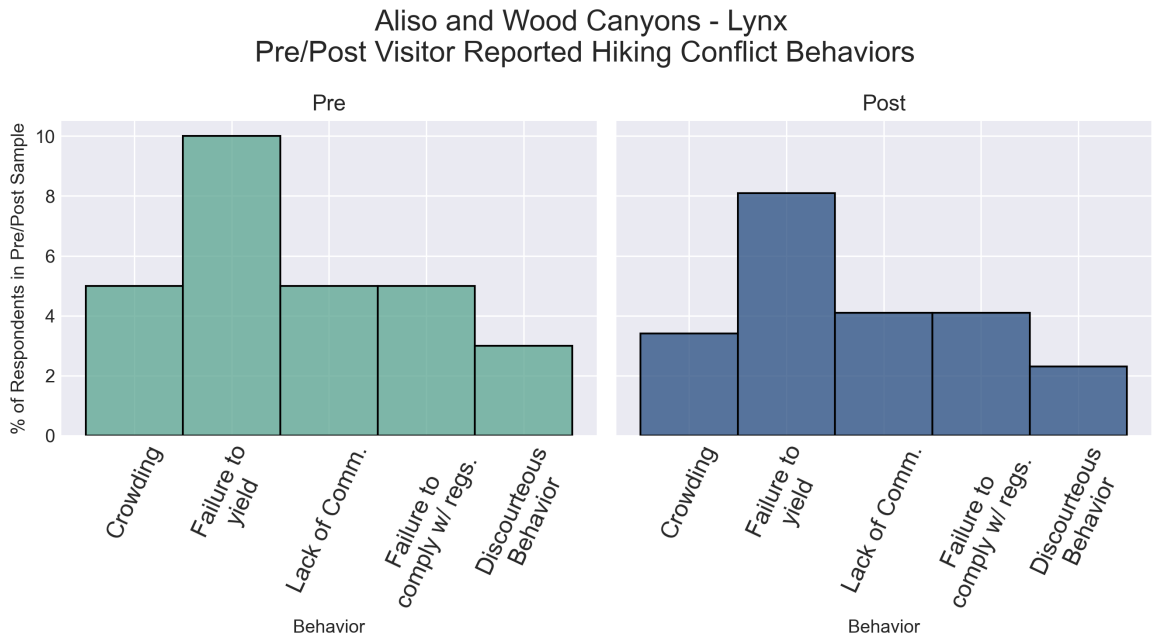


**Figure A.15:** Specific behaviors visitors report are the source of conflict with bikers on the Lynx trail.

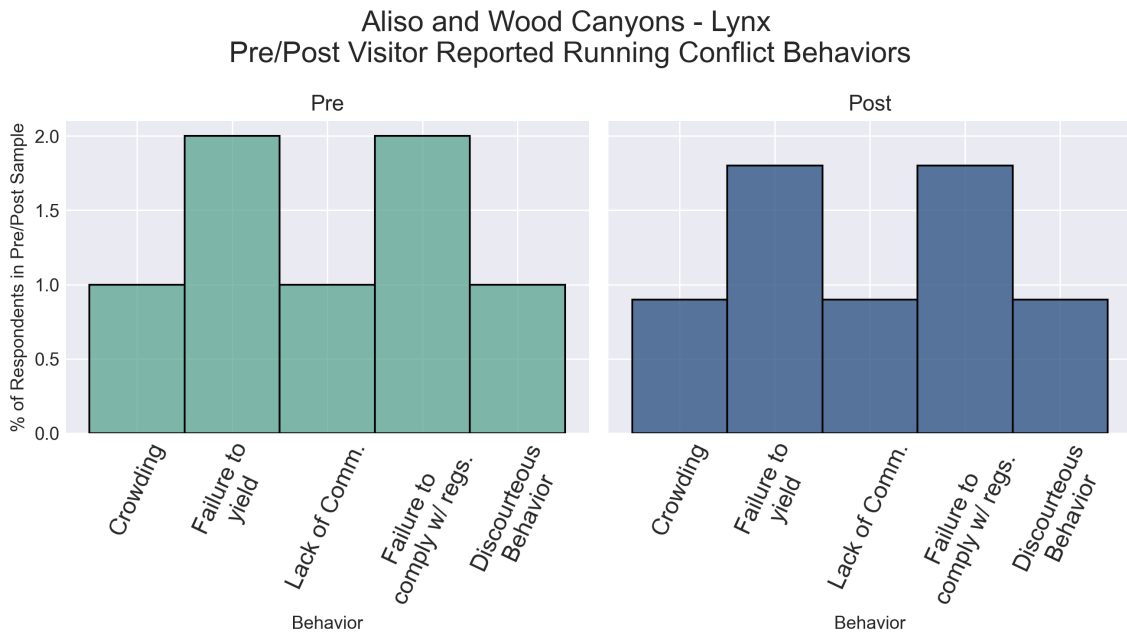


# A.1. Aliso and Wood Canyons Wilderness Park

## Supplementary Figures



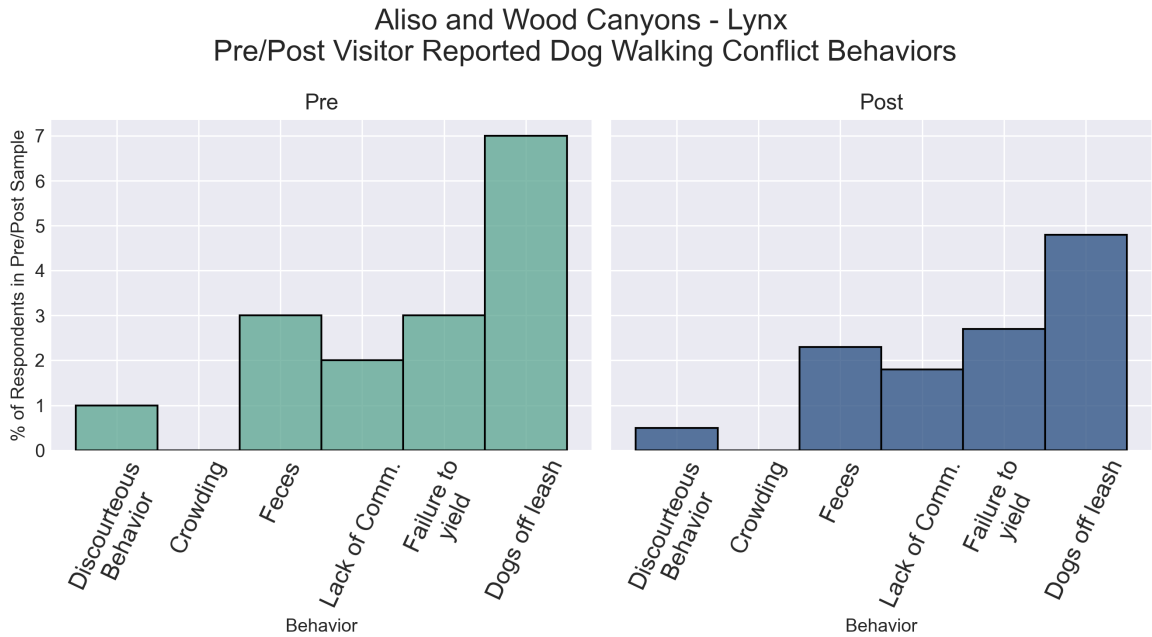
**Figure A.16:** Specific behaviors visitors report are the source of conflict with hikers on the Lynx trail.



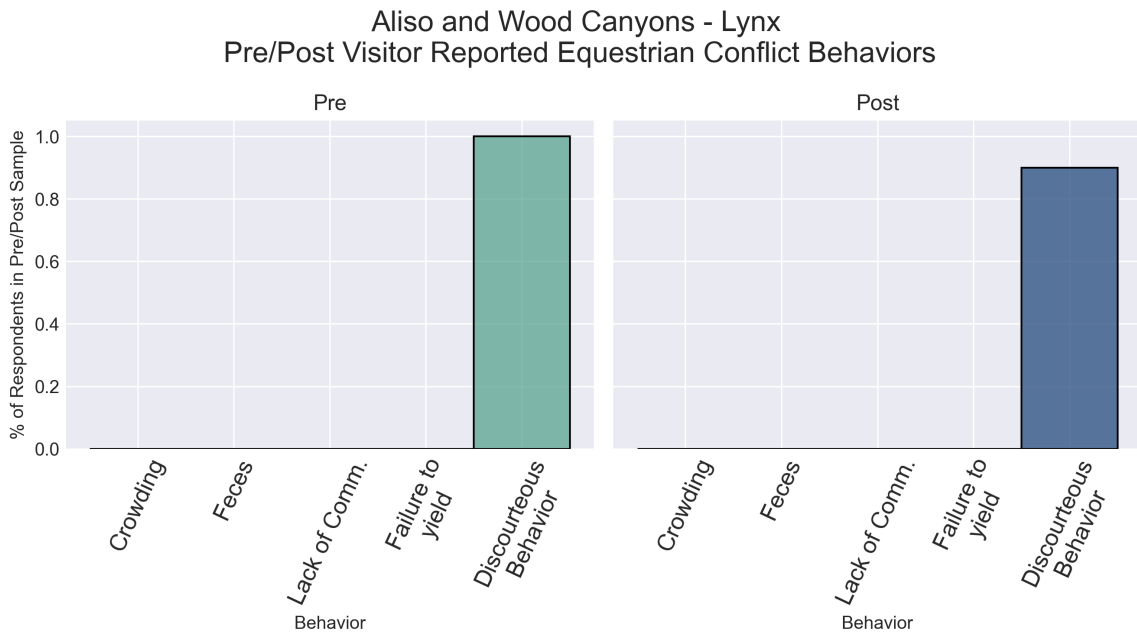
**Figure A.17:** Specific behaviors visitors report are the source of conflict with runners on the Lynx Trail.

# A.1. Aliso and Wood Canyons Wilderness Park

## Supplementary Figures



**Figure A.18:** Specific behaviors visitors report are the source of conflict with dog walkers on the Lynx Trail.

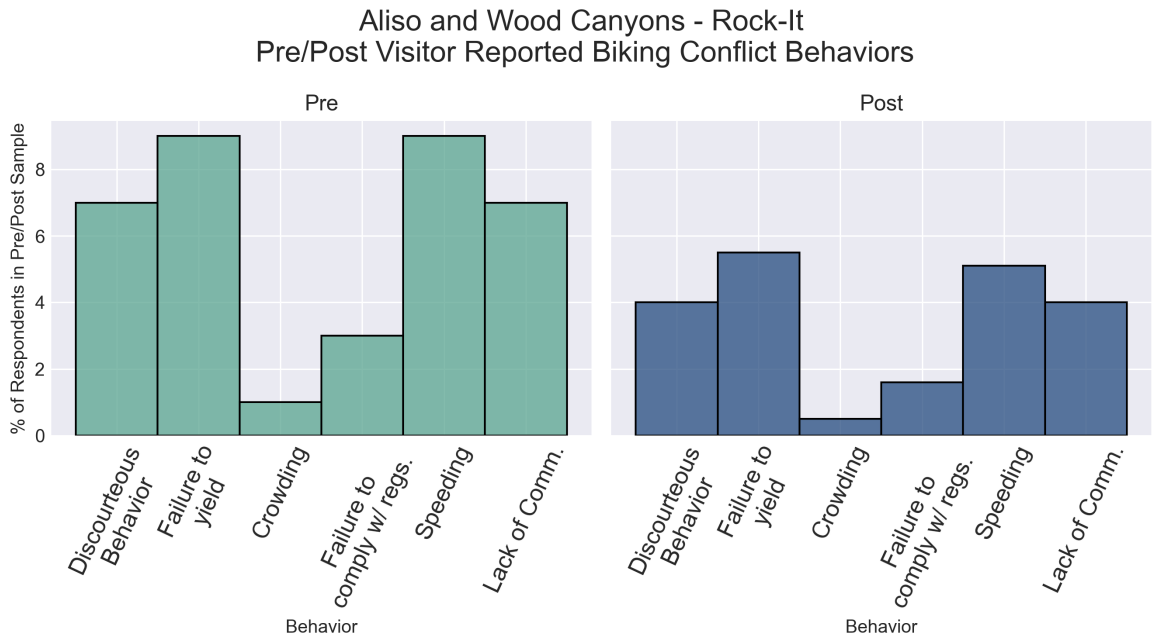


**Figure A.19:** Specific behaviors visitors report are the source of conflict with Equestrians on the Lynx Trail.

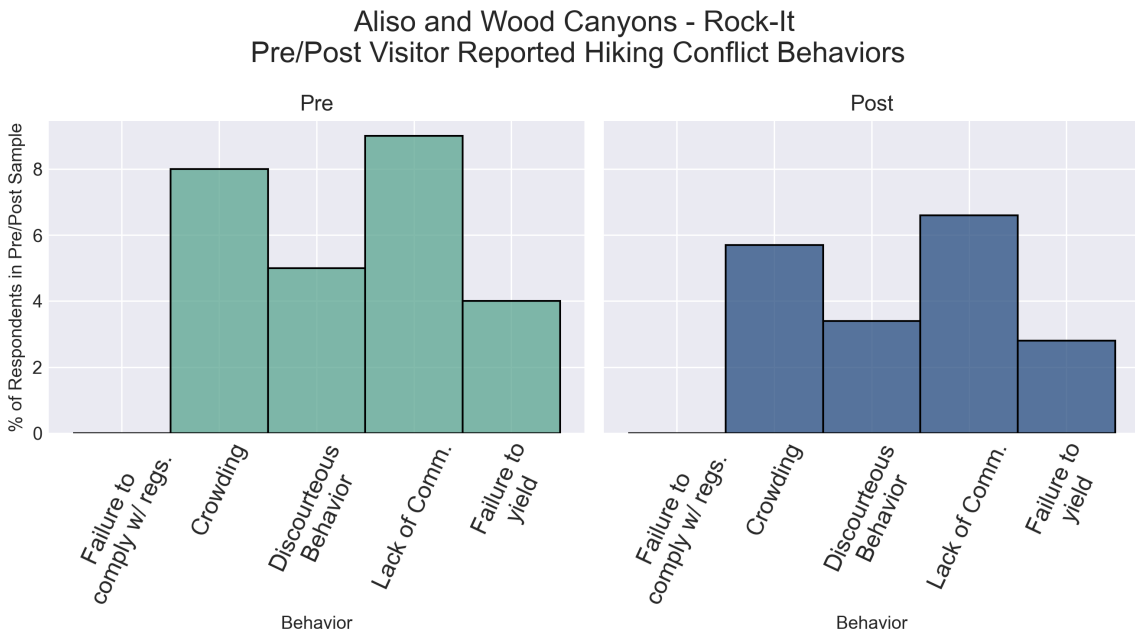
# A.1. Aliso and Wood Canyons Wilderness Park

## Supplementary Figures

### Rock-It



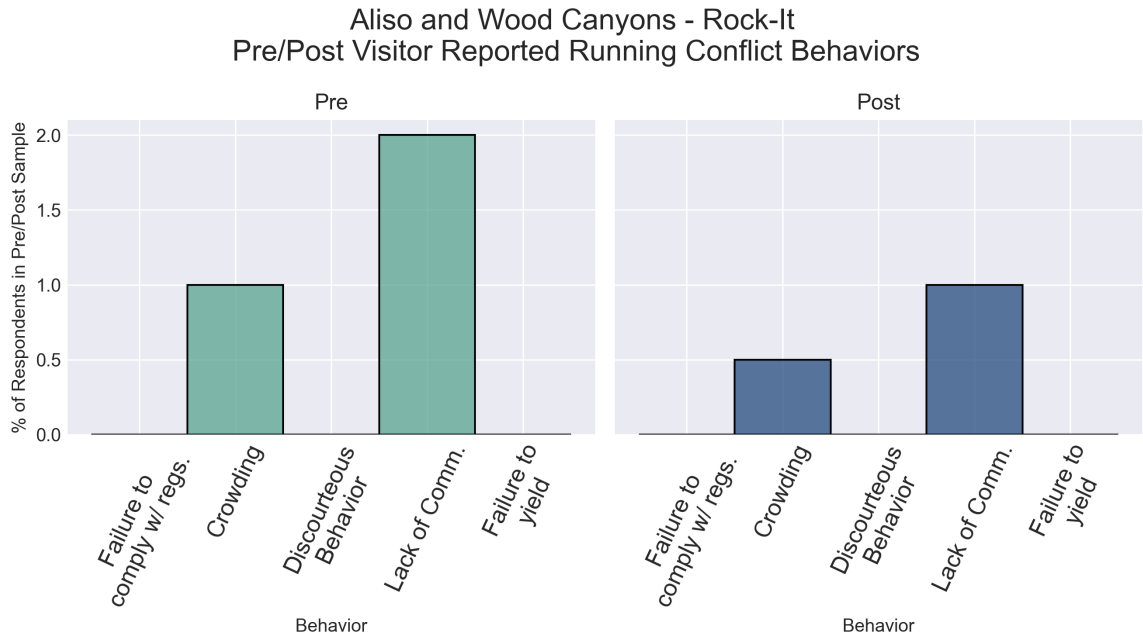
**Figure A.20:** Specific behaviors visitors report are the source of conflict with bikers on the Rock-It trail.



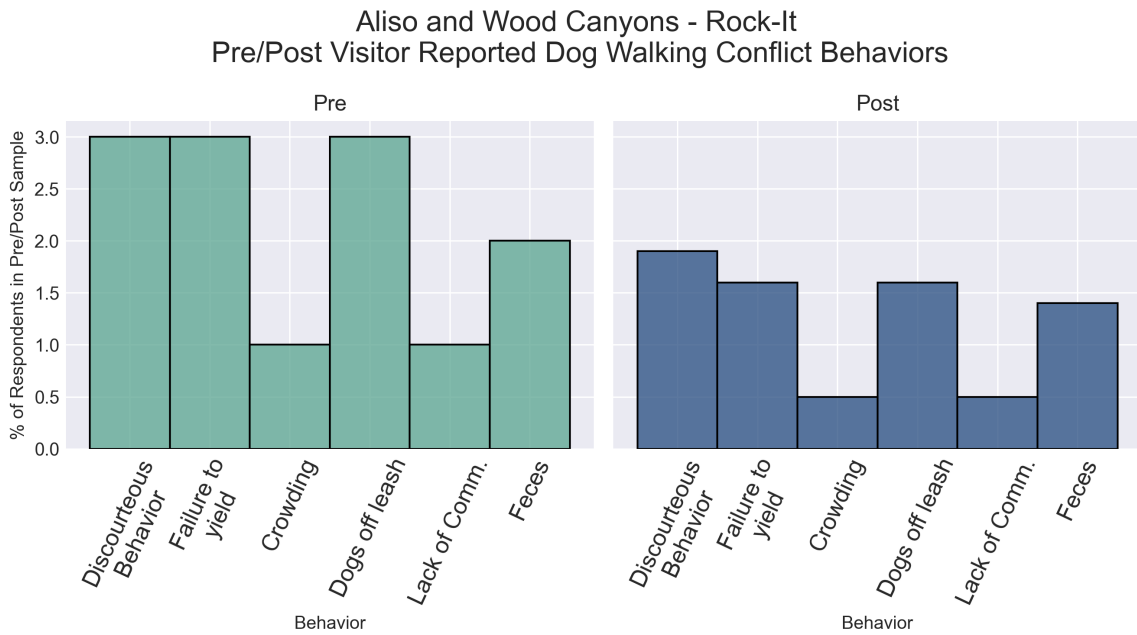
**Figure A.21:** Specific behaviors visitors report are the source of conflict with hikers on the Rock-It trail.

# A.1. Aliso and Wood Canyons Wilderness Park

## Supplementary Figures



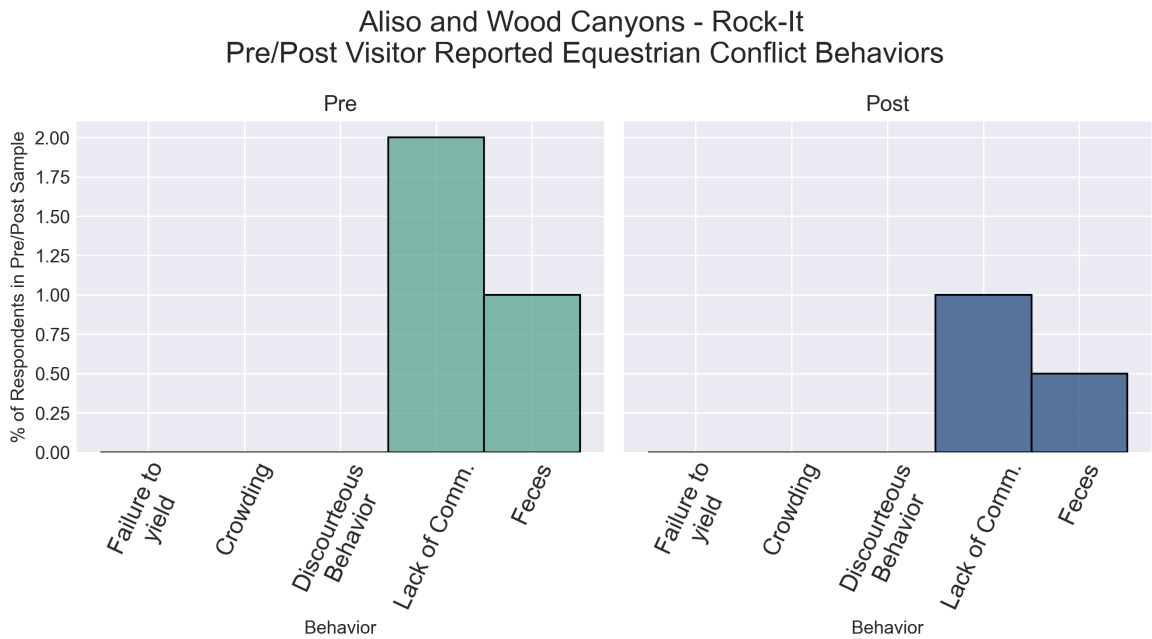
**Figure A.22:** Specific behaviors visitors report are the source of conflict with runners on the Rock-It Trail.



**Figure A.23:** Specific behaviors visitors report are the source of conflict with dog walkers on the Rock-It Trail.

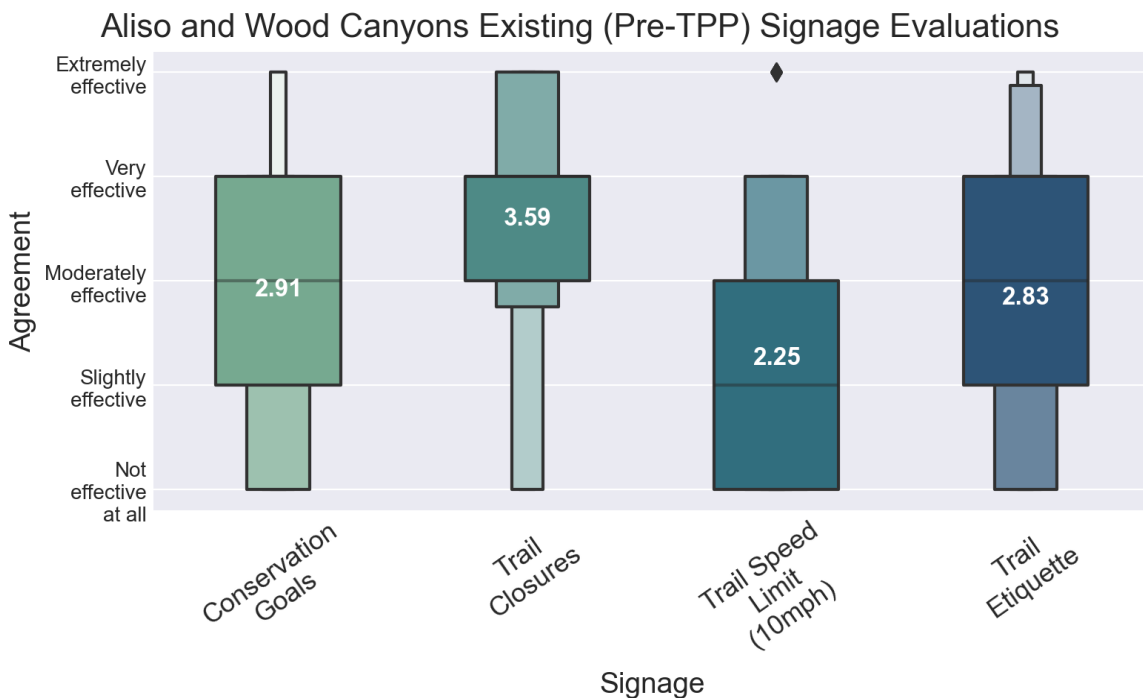
# A.1. Aliso and Wood Canyons Wilderness Park

## Supplementary Figures



**Figure A.24:** Specific behaviors visitors report are the source of conflict with Equestrians on the Rock-It Trail.

### A.1.4 Signage

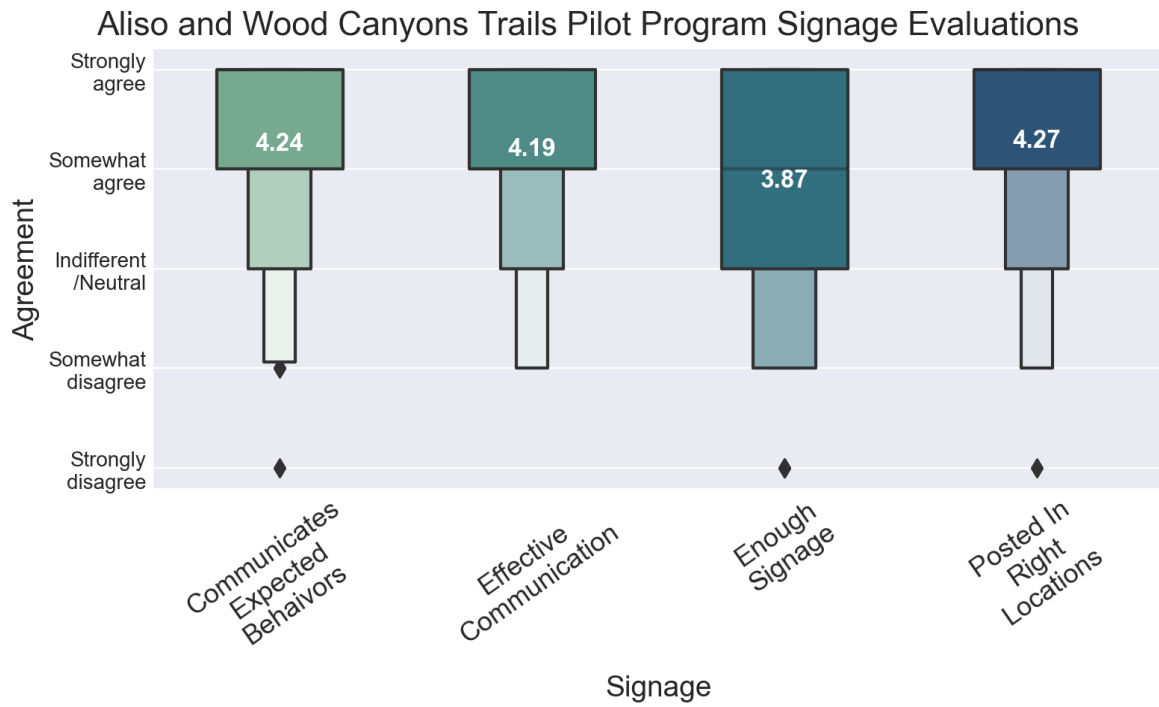


**Figure A.25:** Visitor evaluations of the effectiveness of signage at communicating the following trail management regulations and goals.



# A.1. Aliso and Wood Canyons Wilderness Park

## Supplementary Figures

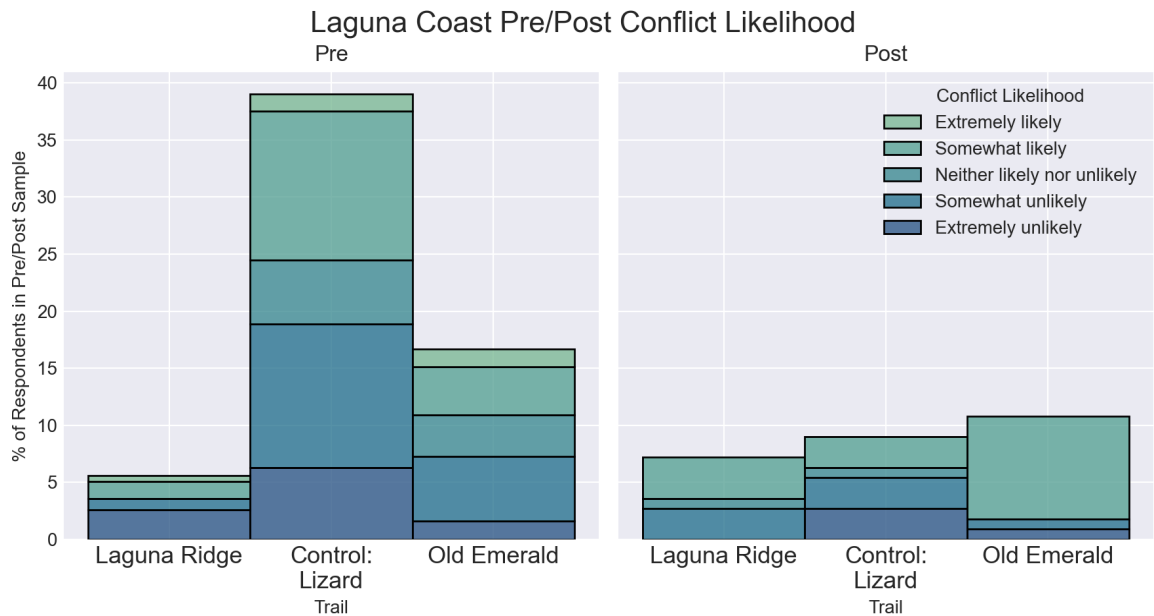


**Figure A.26:** Visitor evaluations of the adequacy and effectiveness of TPP signage.

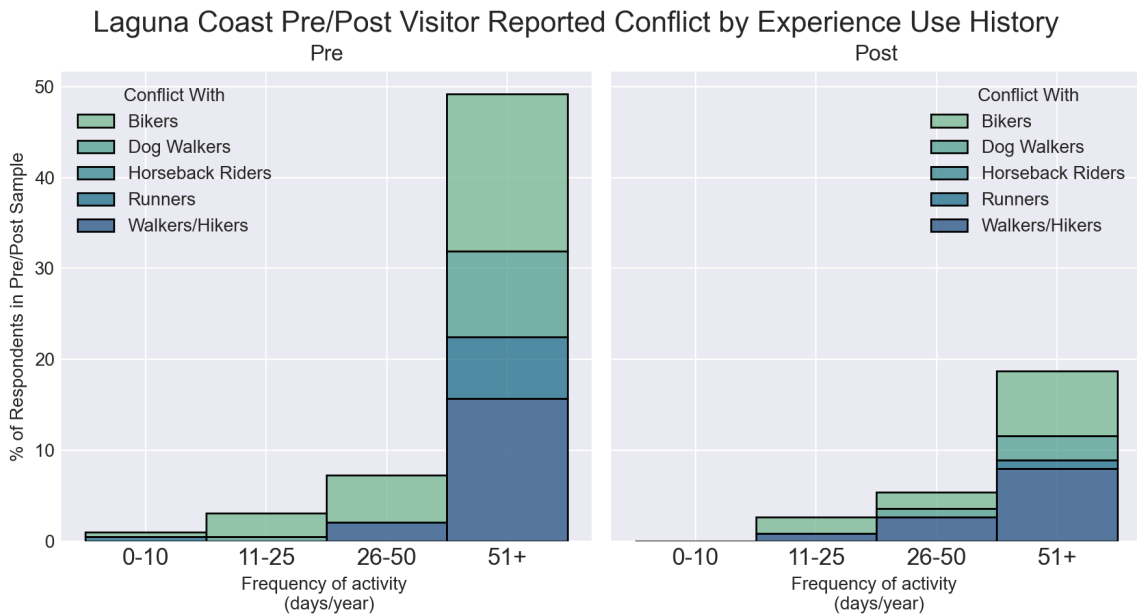
## A.2. Laguna Coast Wilderness Park

### Supplementary Figures

#### A.2.1 Visitor Reported Conflict

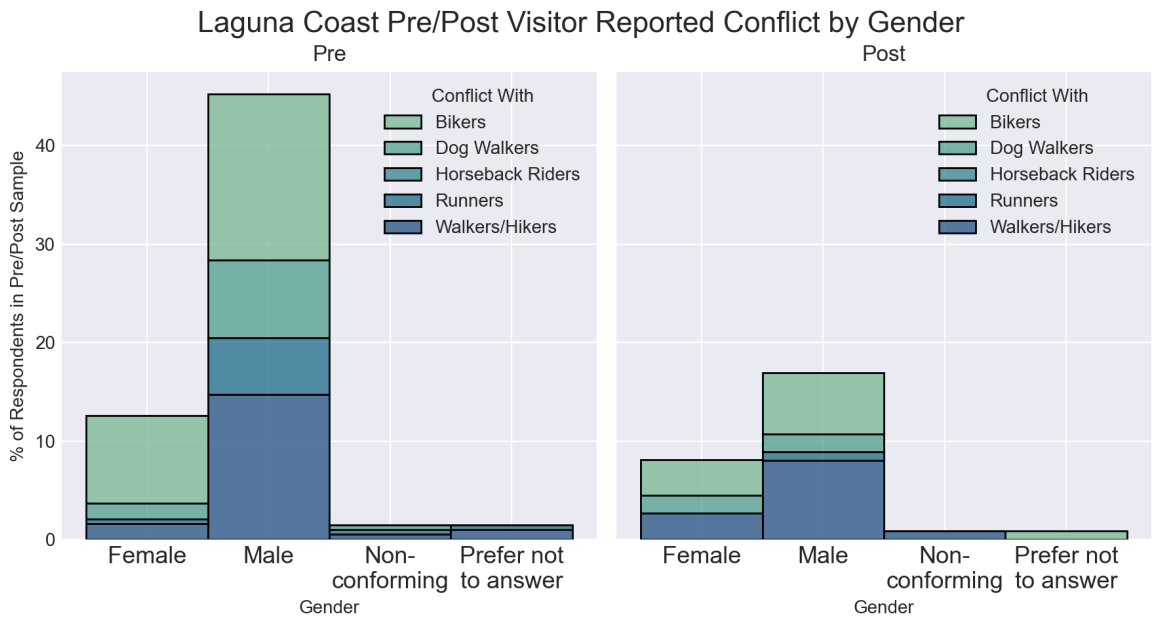


**Figure A.27:** Visitor reported likelihood of conflict. The hue of the bar represents the likelihood of conflict.

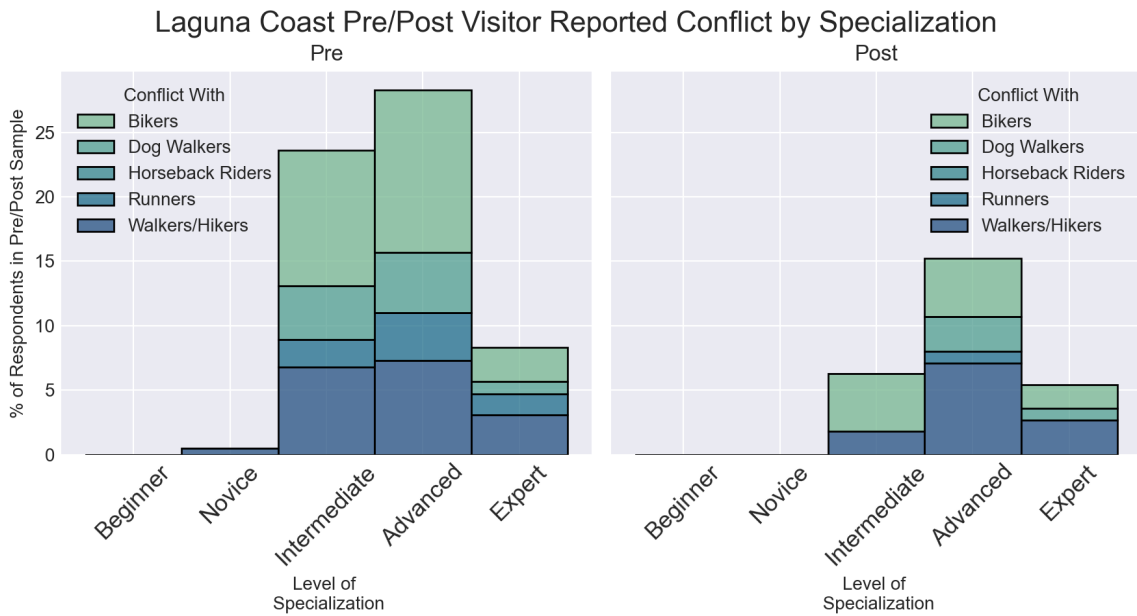


**Figure A.28:** LACO visitor reported conflict by Experience Use History, or the frequency (in days/year) a visitor participates in their preferred activity type.

## A.2. Laguna Coast Wilderness Park Supplementary Figures



**Figure A.29:** LACO visitor reported conflict by a visitors' self-identified gender.

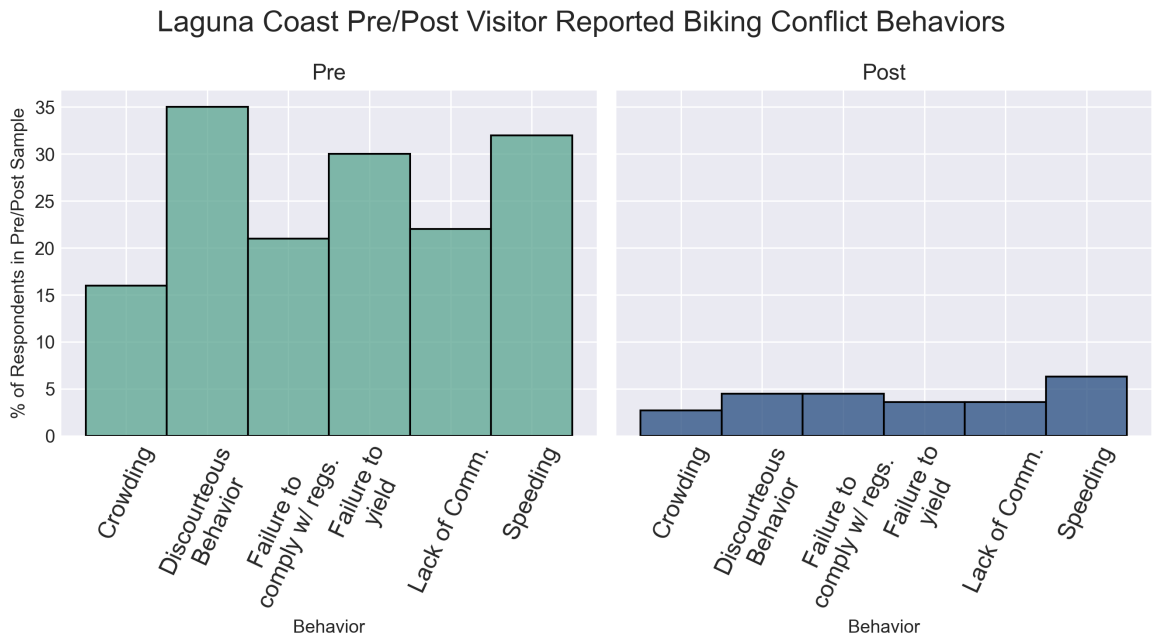


**Figure A.30:** LACO visitor reported conflict by a visitors' self-reported Specialization, or skill/ability level in their activity-type.

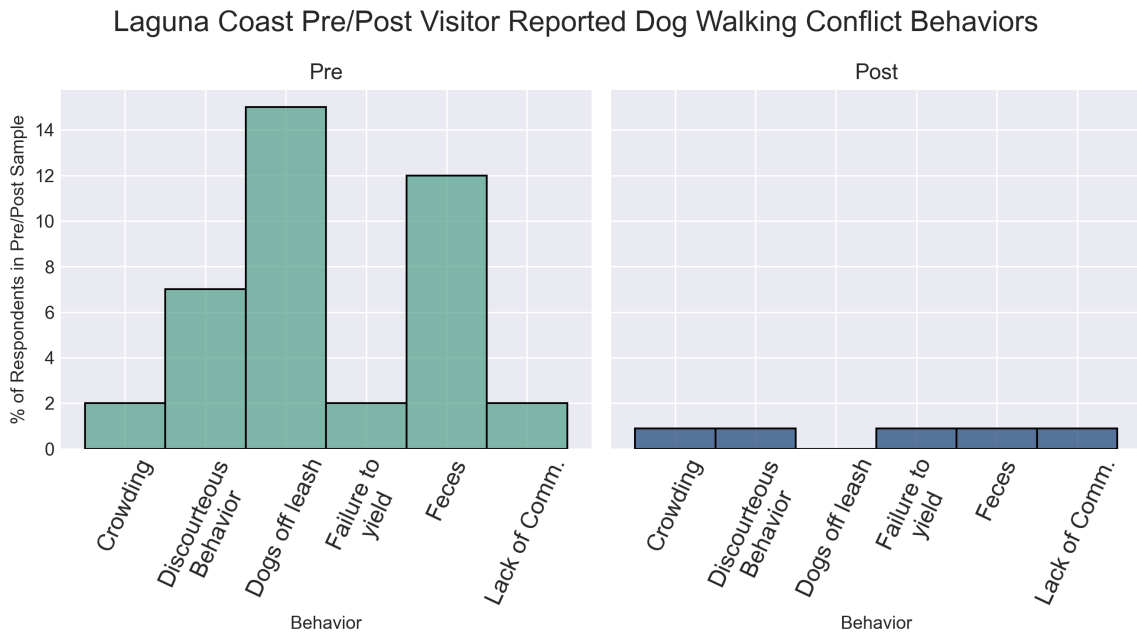
## A.2. Laguna Coast Wilderness Park

### Supplementary Figures

#### A.2.2 Conflict Behaviors

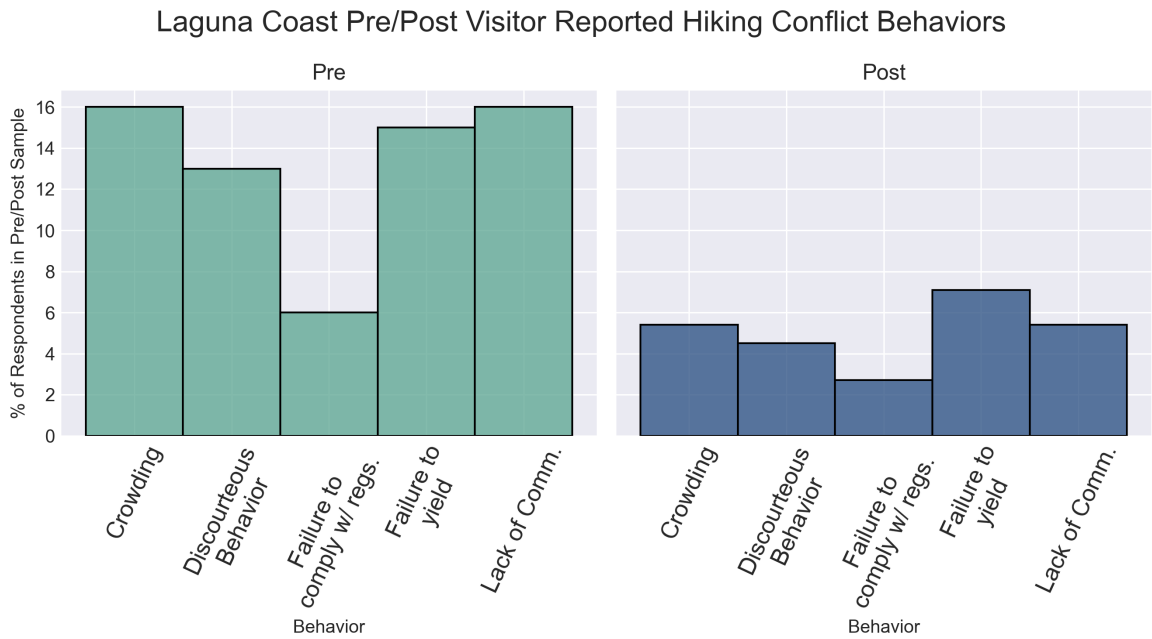


**Figure A.31:** Specific behaviors visitors report are the source of conflict with bikers.

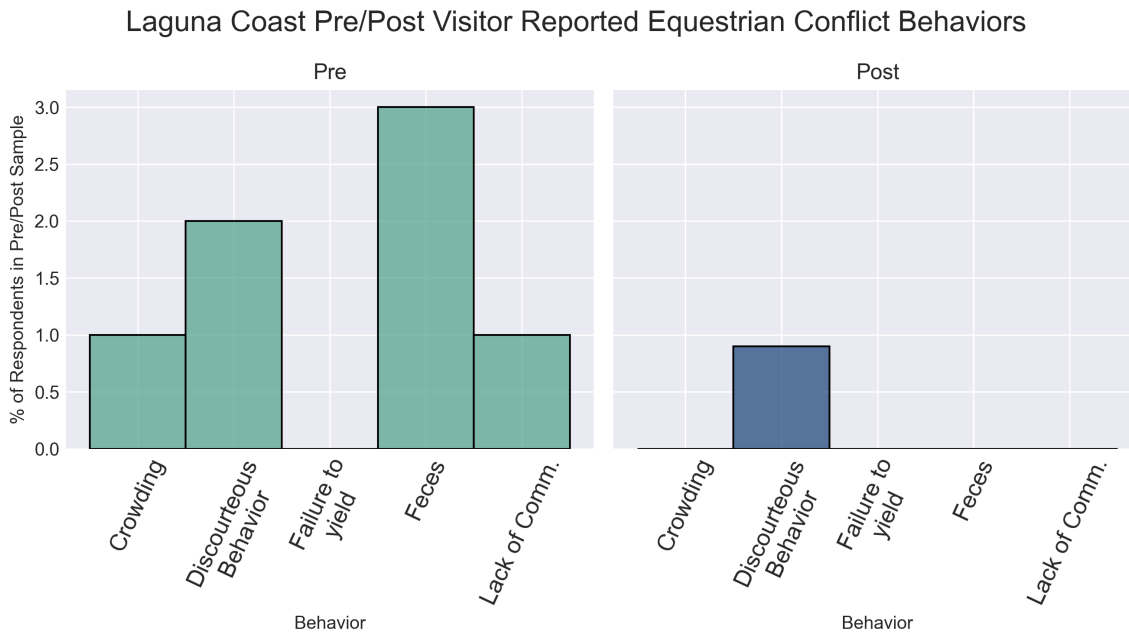


**Figure A.32:** Specific behaviors visitors report are the source of conflict with dog walkers.

## A.2. Laguna Coast Wilderness Park Supplementary Figures



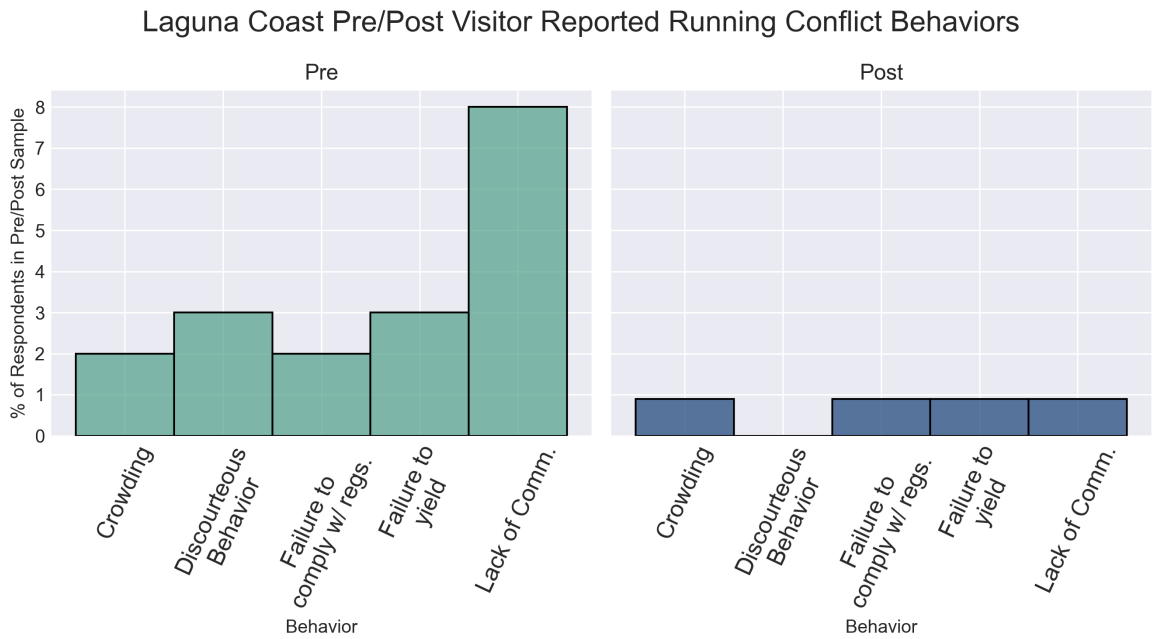
**Figure A.33:** Specific behaviors visitors report are the source of conflict with hikers.



**Figure A.34:** Specific behaviors visitors report are the source of conflict with equestrians.



## A.2. Laguna Coast Wilderness Park Supplementary Figures

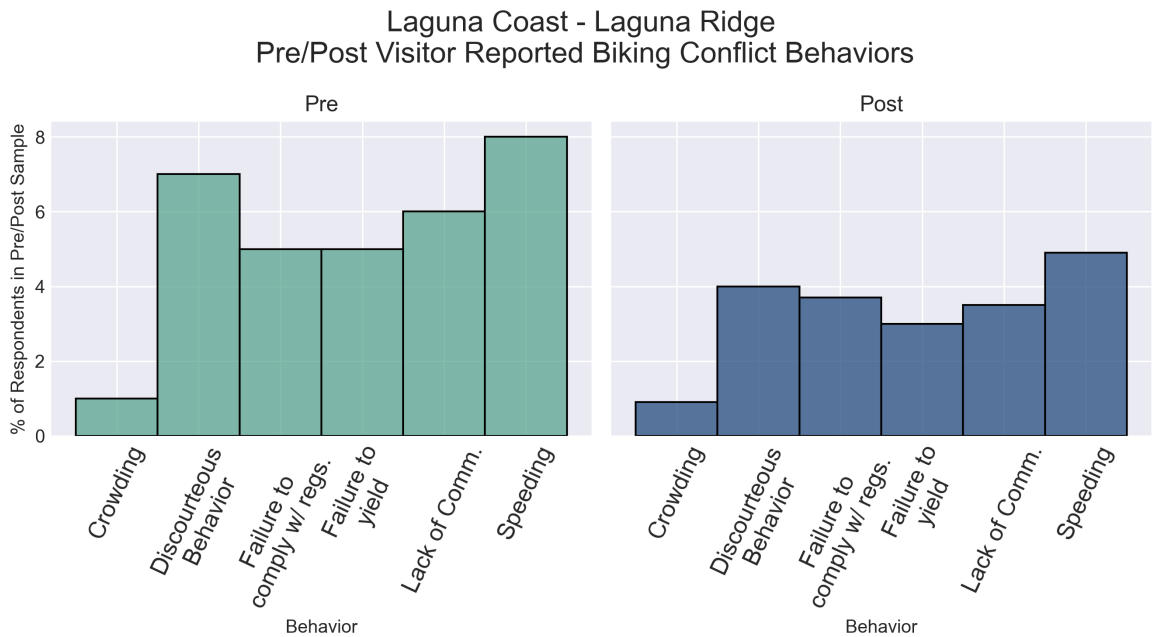


**Figure A.35:** Specific behaviors visitors report are the source of conflict with runners.

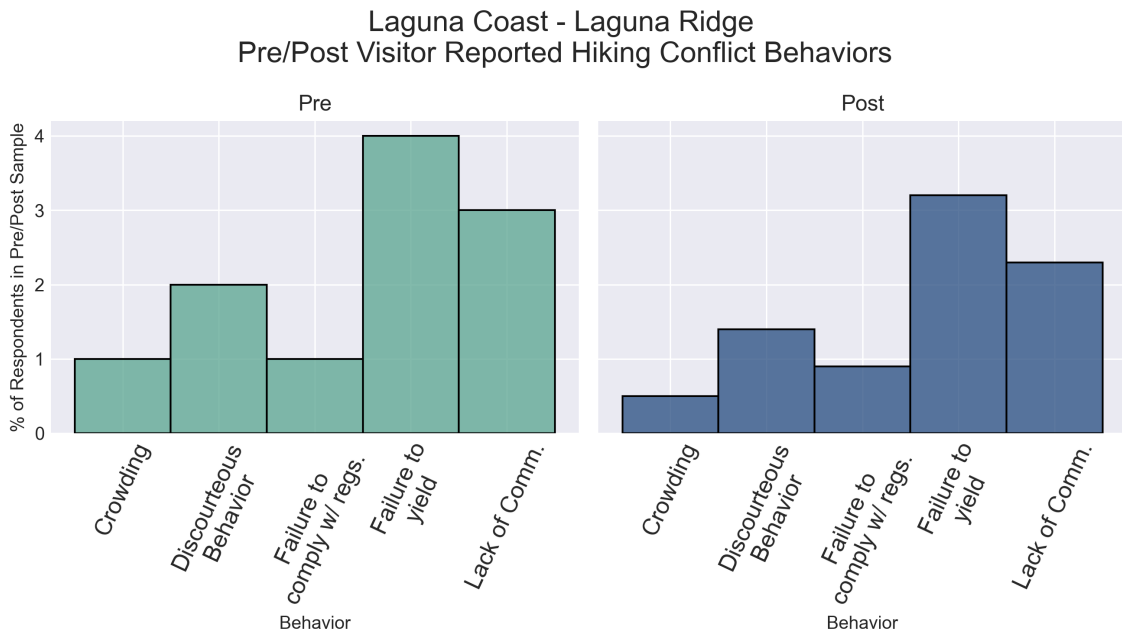
## A.2. Laguna Coast Wilderness Park

### Supplementary Figures

#### A.2.3 Conflict Behaviors by Trail by Activity Type

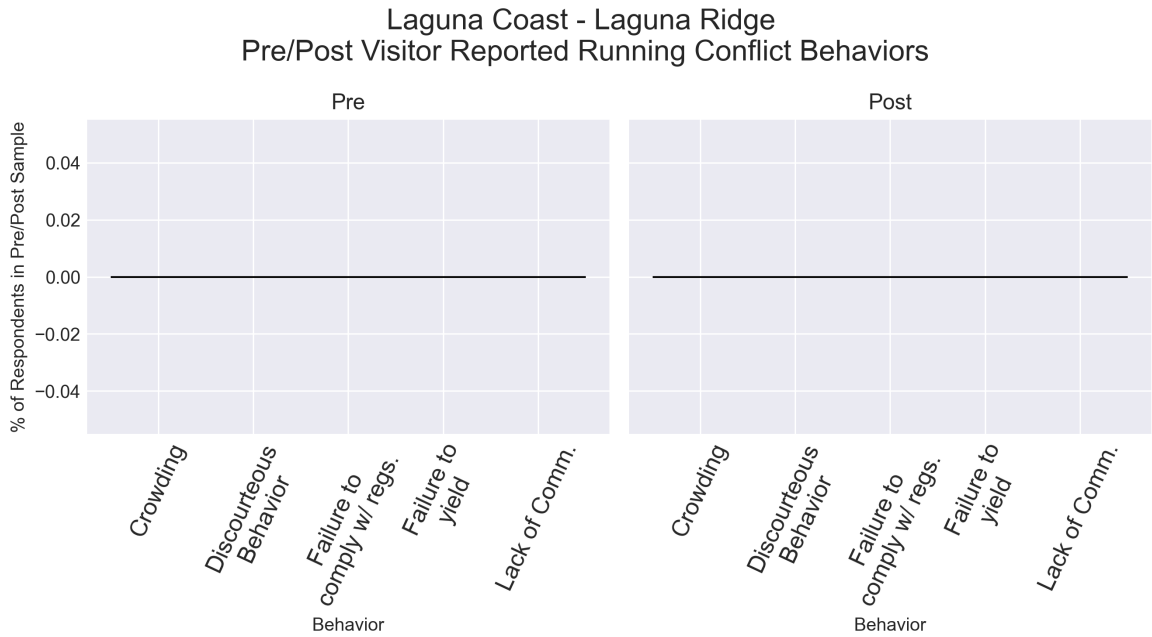


**Figure A.36:** Specific behaviors visitors report are the source of conflict with bikers on the Laguna Ridge trail.

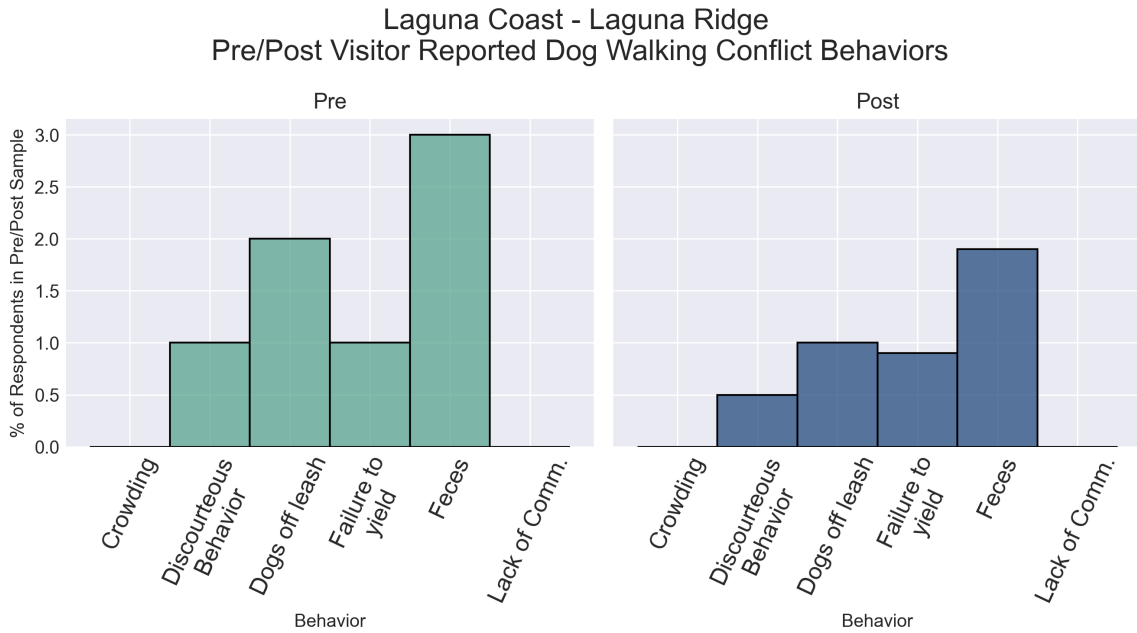


**Figure A.37:** Specific behaviors visitors report are the source of conflict with hikers on the Laguna Ridge trail.

## A.2. Laguna Coast Wilderness Park Supplementary Figures



**Figure A.38:** Specific behaviors visitors report are the source of conflict with runners on the Laguna Ridge Trail.  
Note: No conflicts with runners were reported in either the Pre or Post-TPP survey on the Laguna Ridge Trail

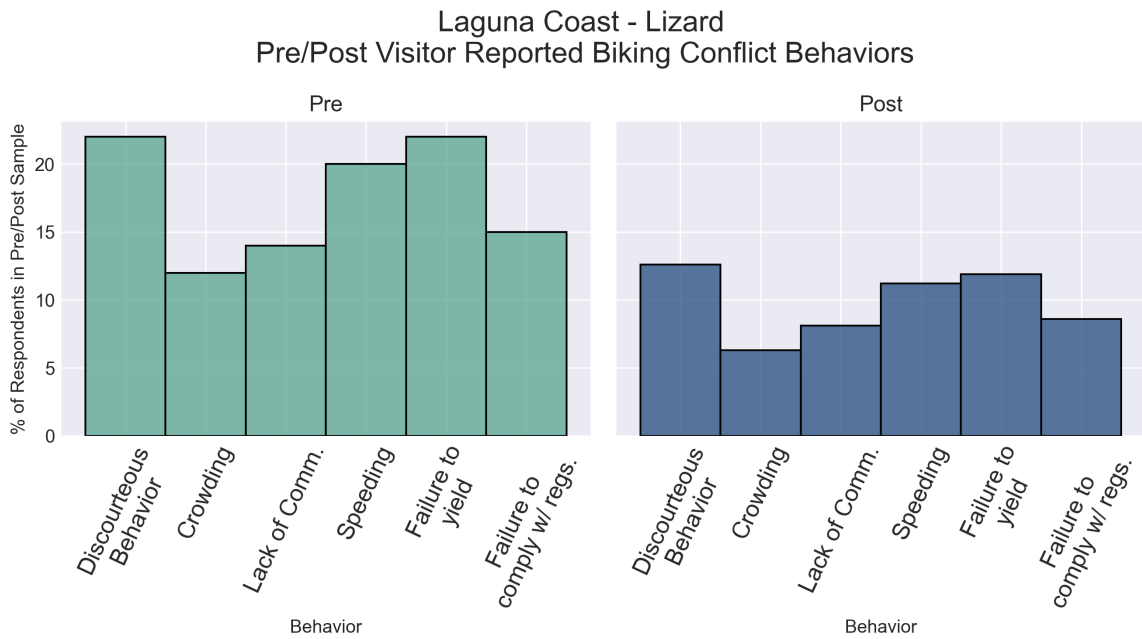


**Figure A.39:** Specific behaviors visitors report are the source of conflict with dog walkers on the Laguna Ridge Trail.

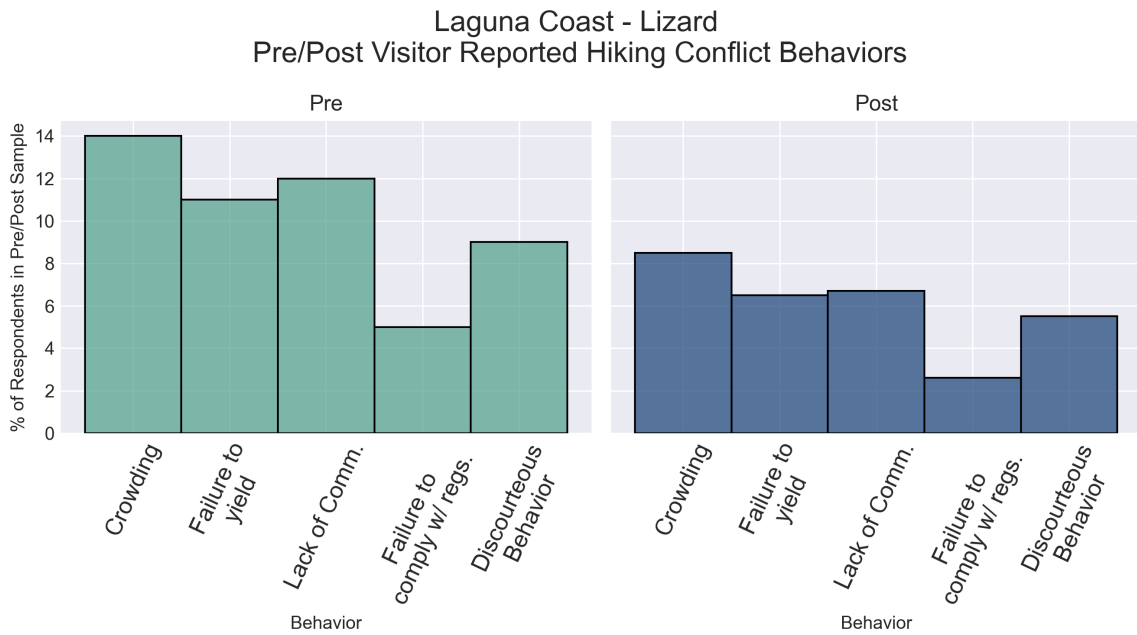
## A.2. Laguna Coast Wilderness Park

### Supplementary Figures

#### Lizard

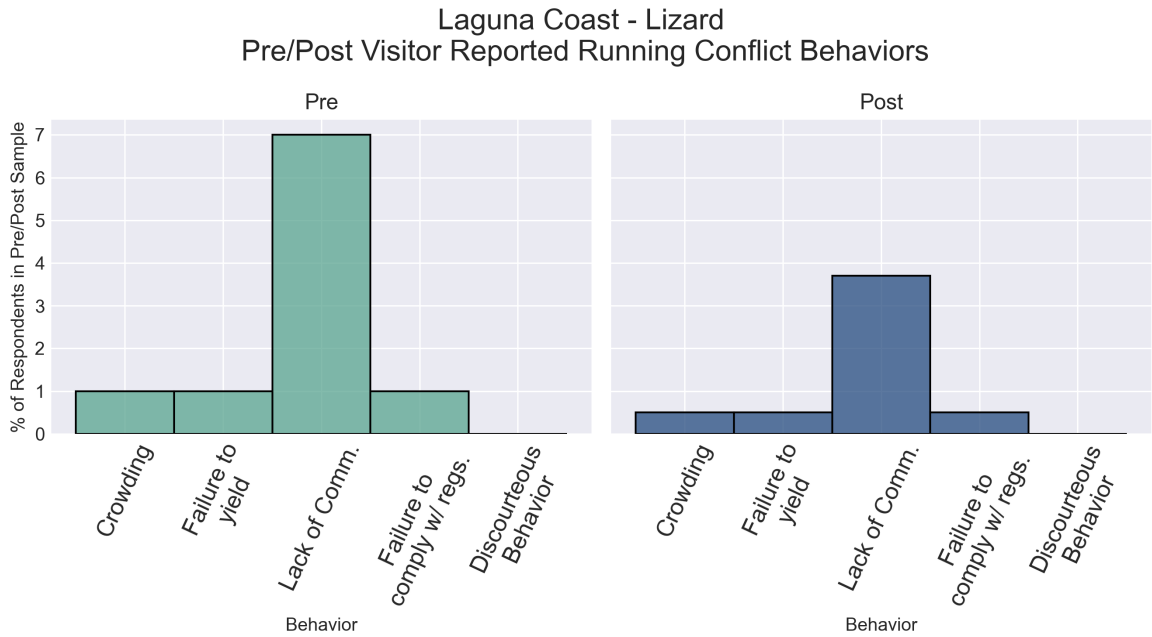


**Figure A.40:** Specific behaviors visitors report are the source of conflict with bikers on the Lizard trail.

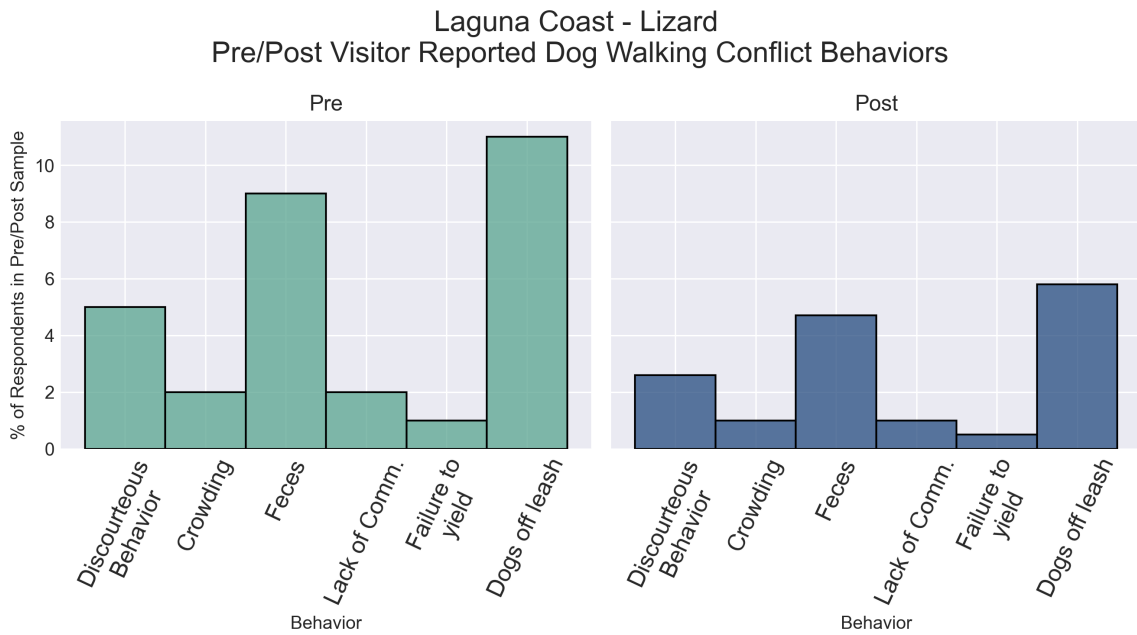


**Figure A.41:** Specific behaviors visitors report are the source of conflict with hikers on the Lizard trail.

## A.2. Laguna Coast Wilderness Park Supplementary Figures



**Figure A.42:** Specific behaviors visitors report are the source of conflict with runners on the Lizard Trail



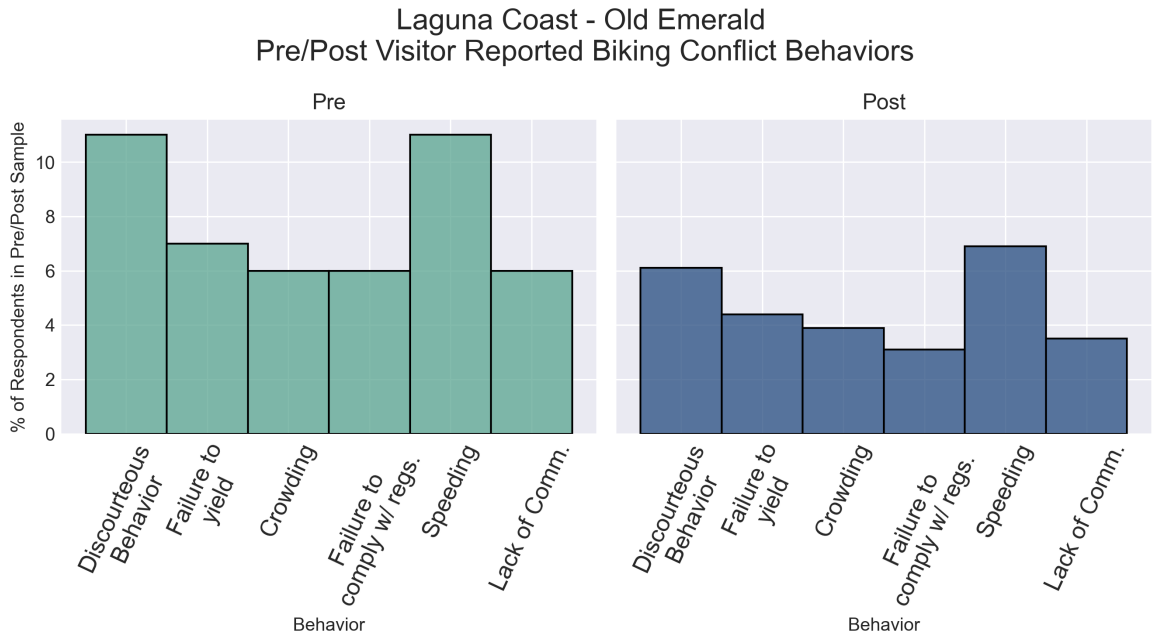
**Figure A.43:** Specific behaviors visitors report are the source of conflict with dog walkers on the Lizard Trail.



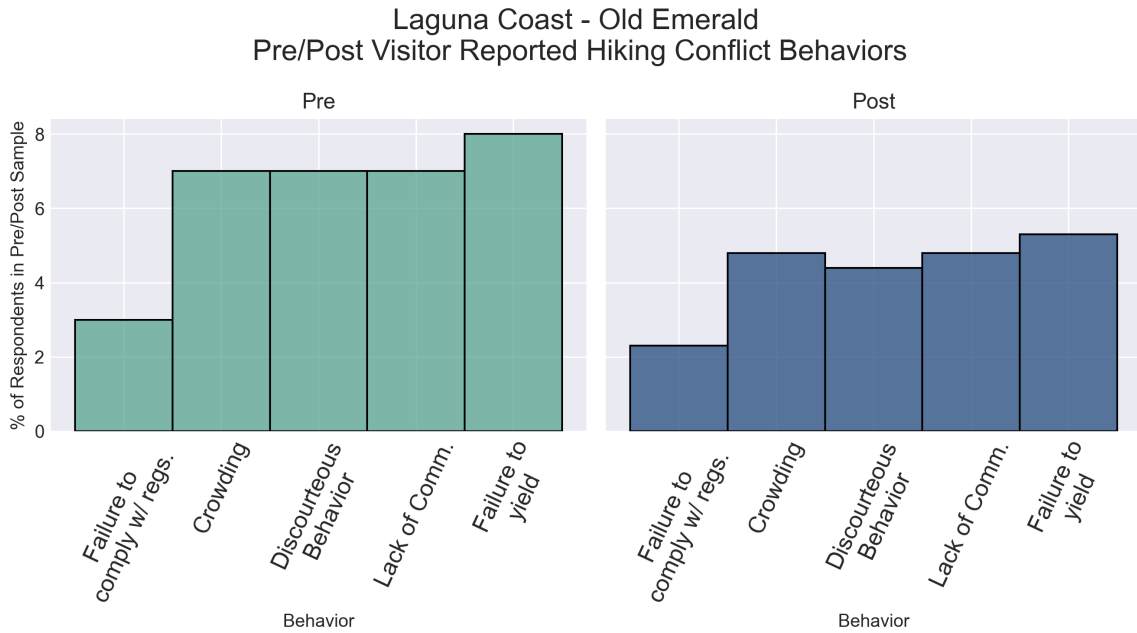
## A.2. Laguna Coast Wilderness Park

### Supplementary Figures

#### Old Emerald

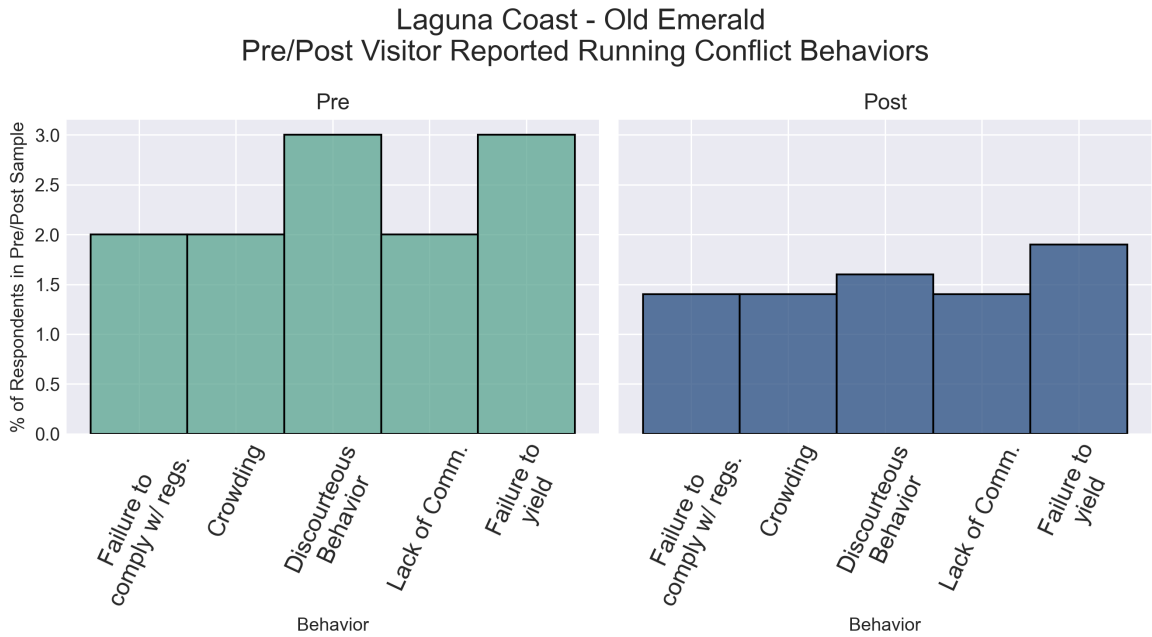


**Figure A.44:** Specific behaviors visitors report are the source of conflict with bikers on the Old Emerald trail.

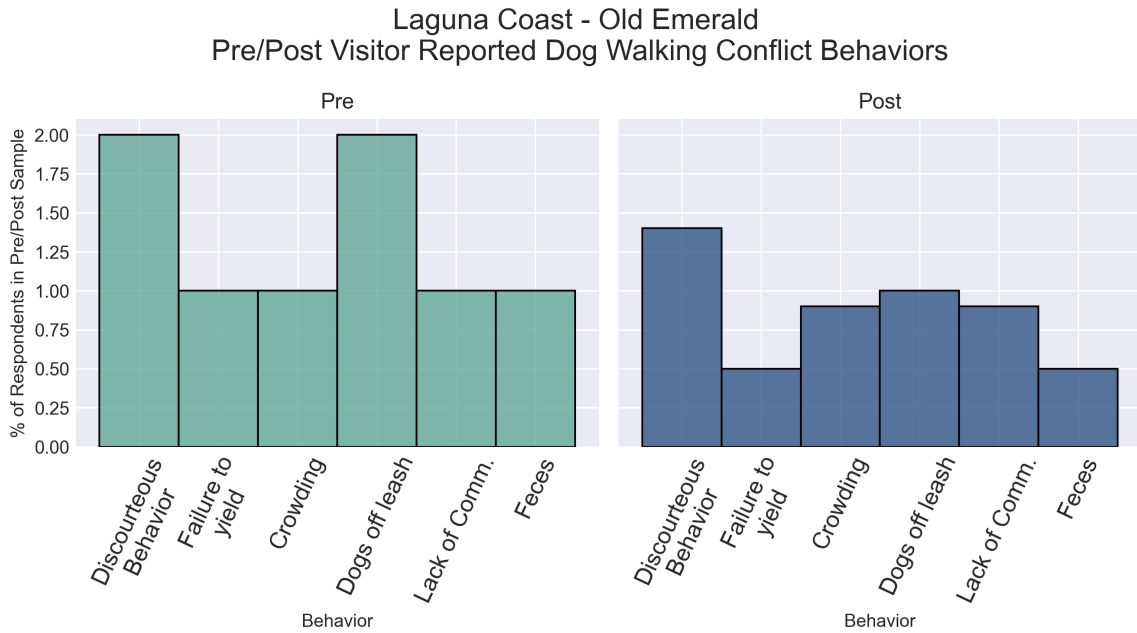


**Figure A.45:** Specific behaviors visitors report are the source of conflict with hikers on the Old Emerald trail.

## A.2. Laguna Coast Wilderness Park Supplementary Figures



**Figure A.46:** Specific behaviors visitors report are the source of conflict with runners on the Old Emerald Trail

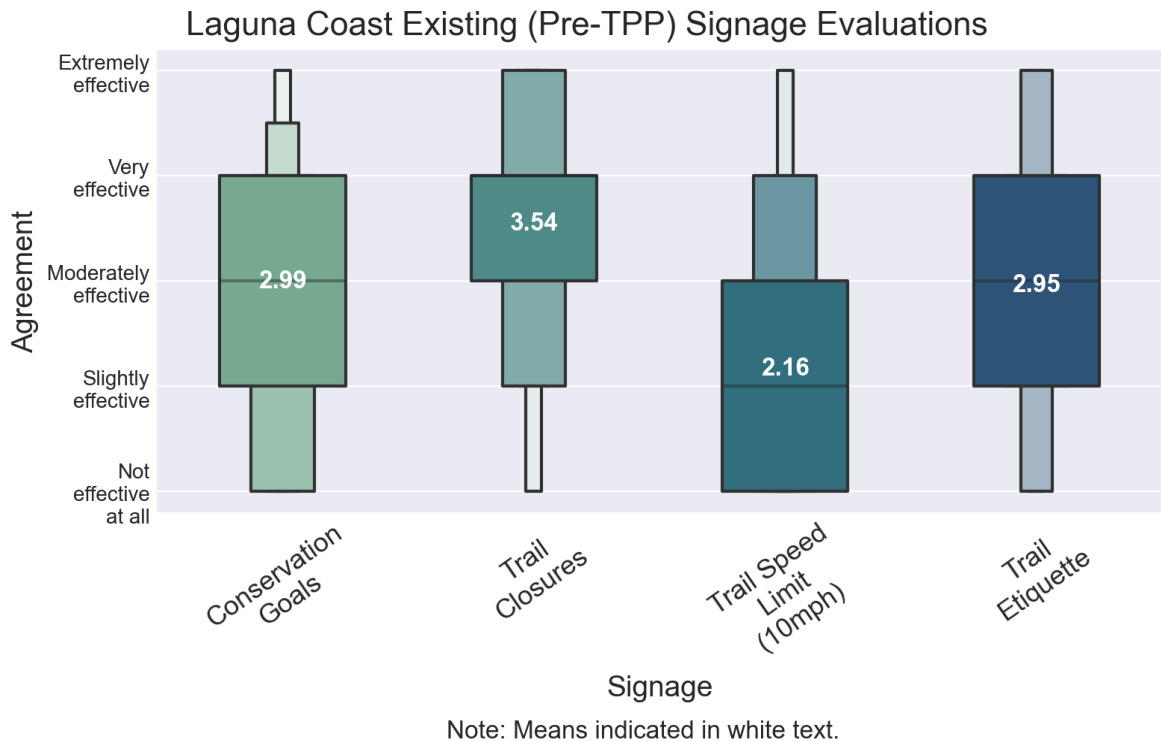


**Figure A.47:** Specific behaviors visitors report are the source of conflict with dog walkers on the Old Emerald Trail.

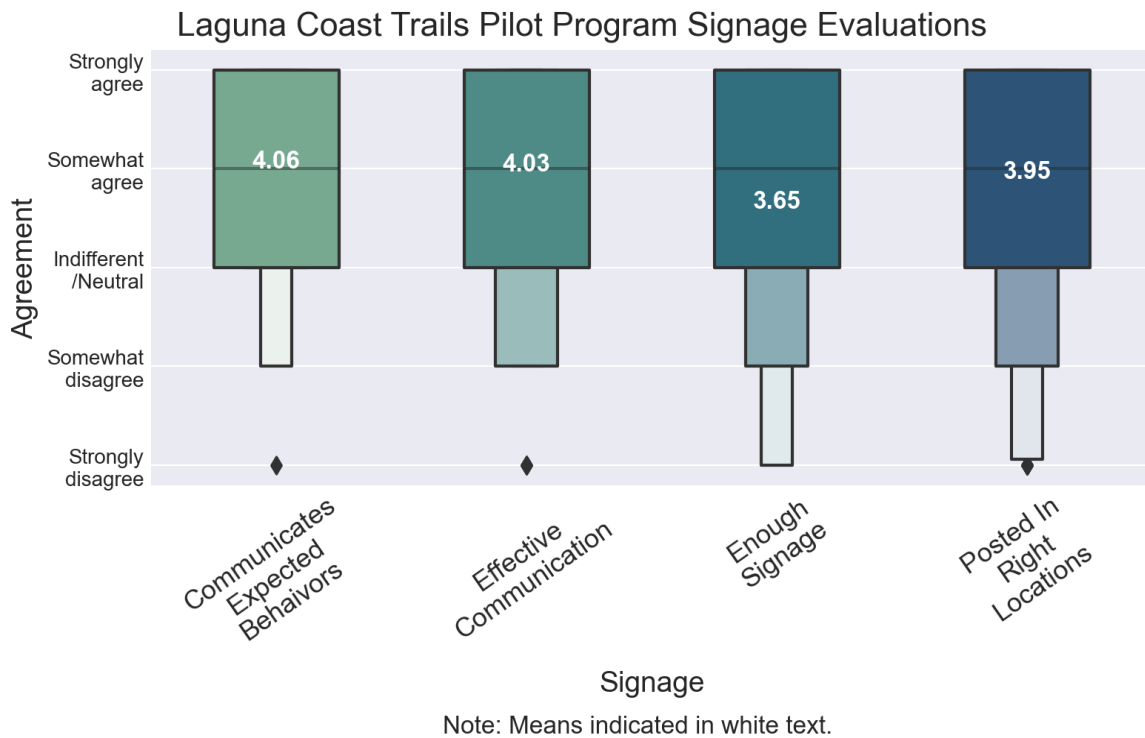
## A.2. Laguna Coast Wilderness Park

### Supplementary Figures

#### A.2.4 Signage



**Figure A.48:** Visitor evaluations of the effectiveness of signage at communicating the following trail management regulations and goals.

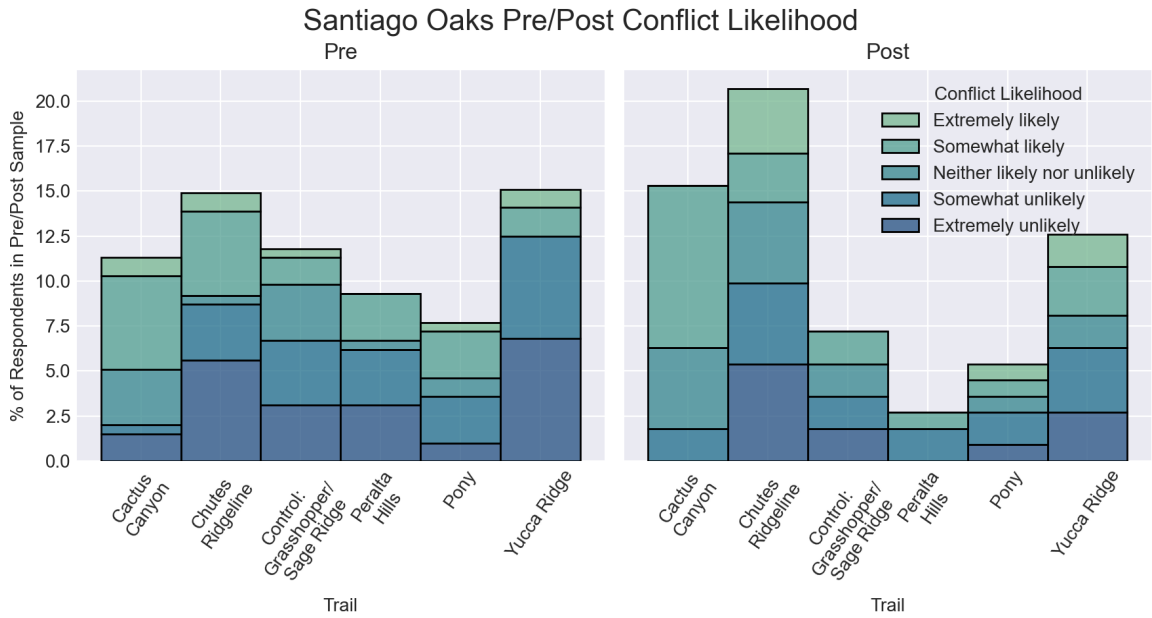


**Figure A.49:** Visitor evaluations of the adequacy and effectiveness of TPP signage.

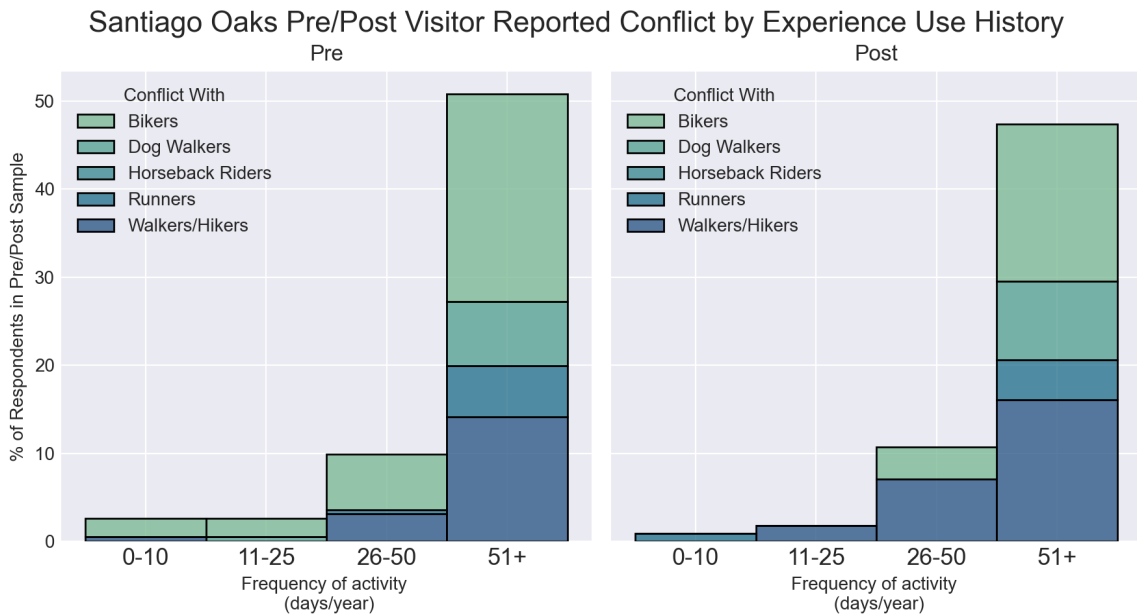
# A.3. Santiago Oaks Regional Park

## Supplementary Figures

### A.3.1 Visitor Reported Conflict



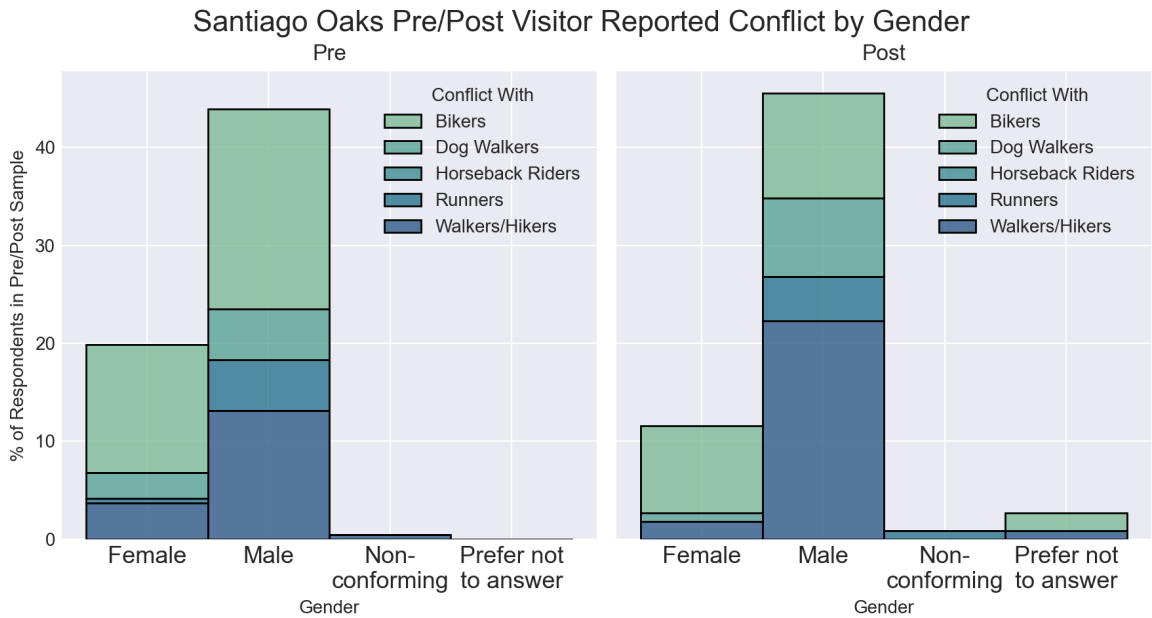
**Figure A.50:** Visitor reported likelihood of conflict. The hue of the bar represents the likelihood of conflict.



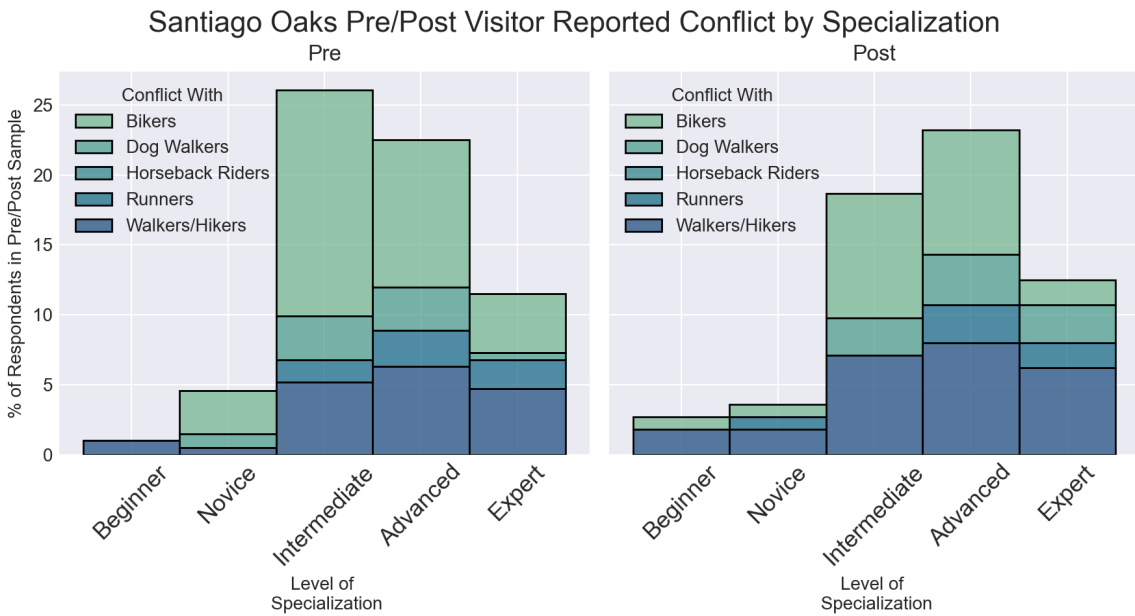
**Figure A.51:** SAOA visitor reported conflict by Experience Use History, or the frequency (in days/year) a visitor participates in their preferred activity type.

# A.3. Santiago Oaks Regional Park

## Supplementary Figures



**Figure A.52:** SAOA visitor reported conflict by a visitors' self-identified gender.



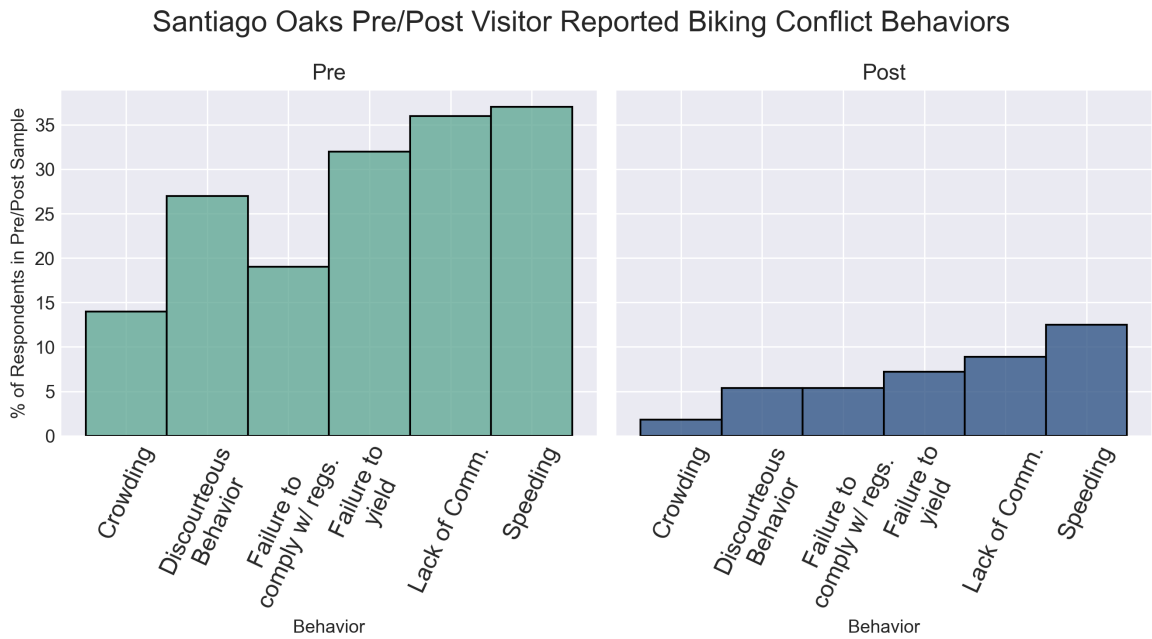
**Figure A.53:** SAOA visitor reported conflict by a visitors' self-reported Specialization, or skill/ability level in their activity-type.



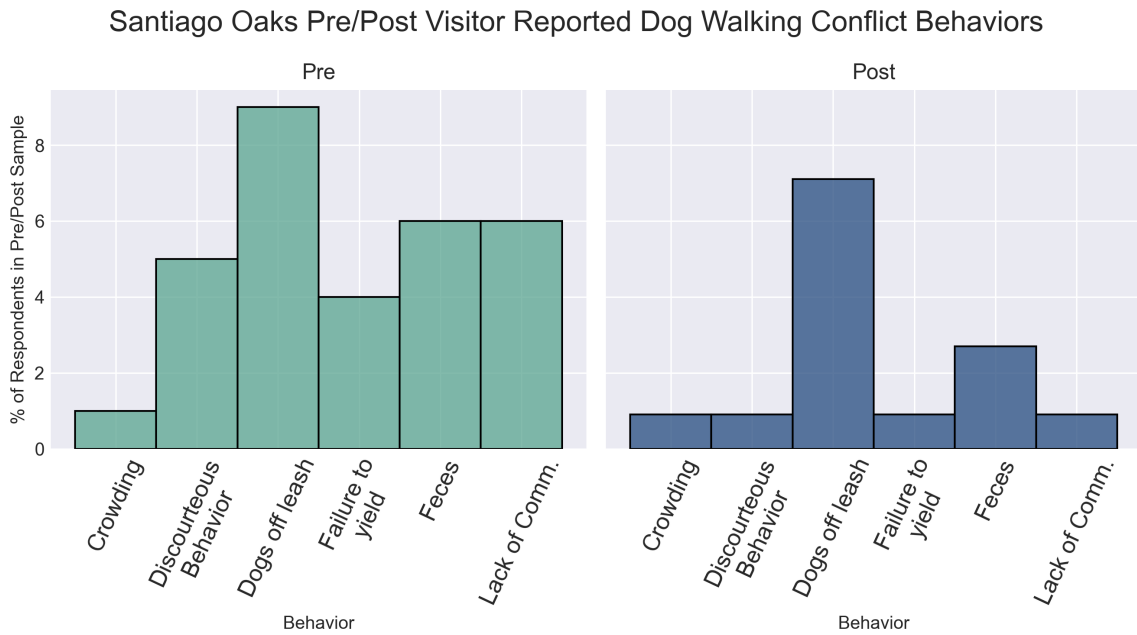
## A.3. Santiago Oaks Regional Park

### Supplementary Figures

#### A.3.2 Conflict Behaviors

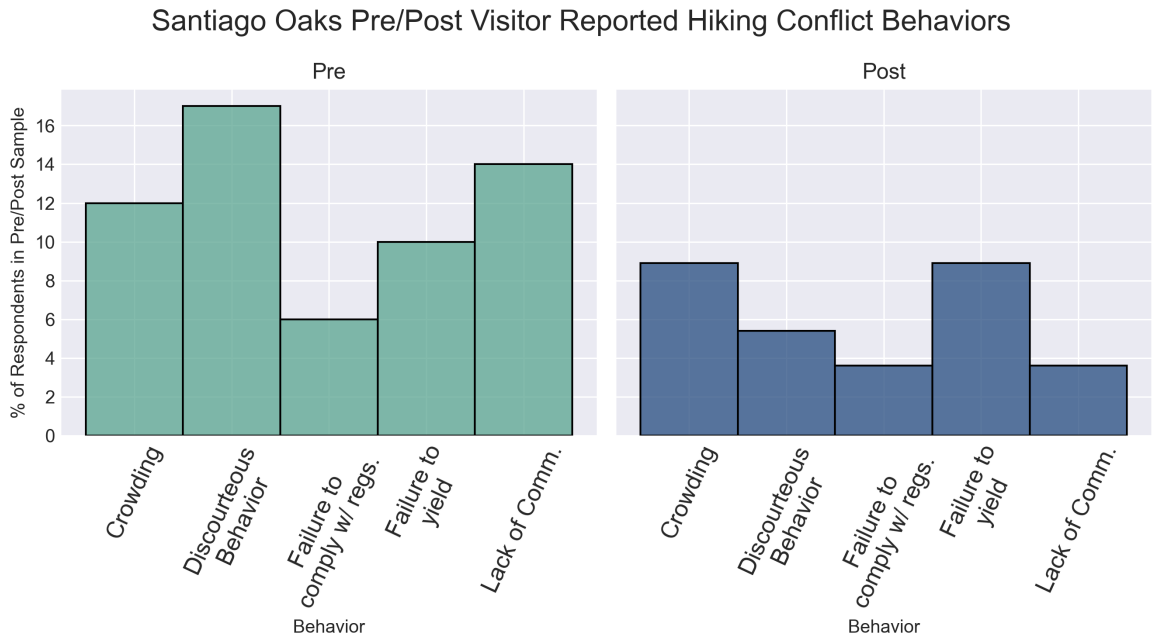


**Figure A.54:** Specific behaviors visitors report are the source of conflict with bikers.

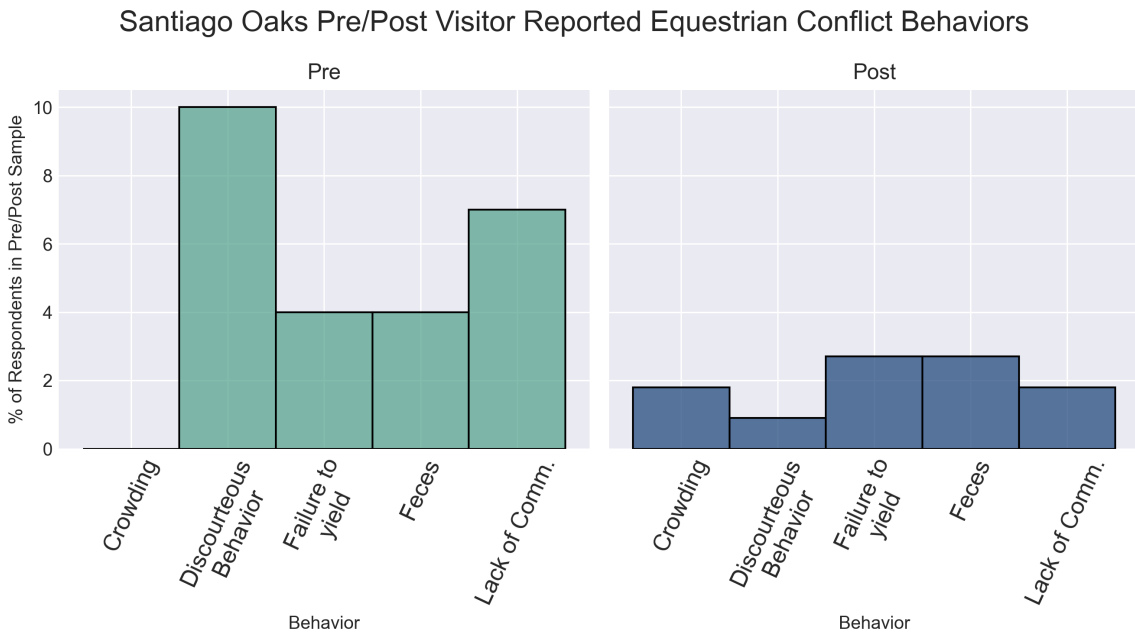


**Figure A.55:** Specific behaviors visitors report are the source of conflict with dog walkers.

## A.3. Santiago Oaks Regional Park Supplementary Figures

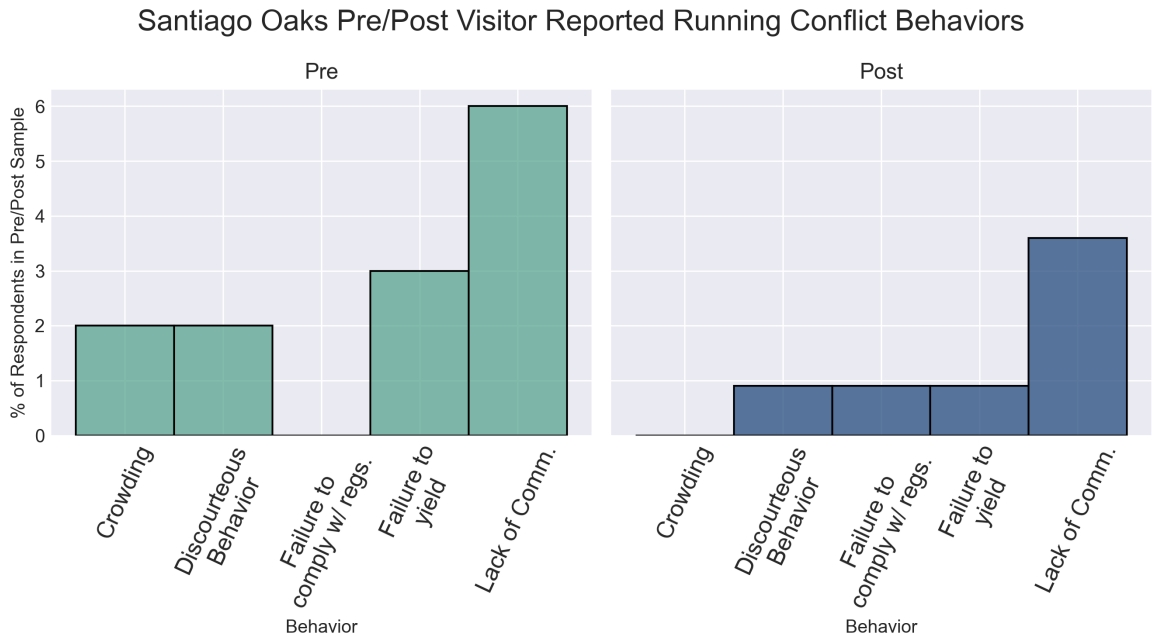


**Figure A.56:** Specific behaviors visitors report are the source of conflict with hikers.



**Figure A.57:** Specific behaviors visitors report are the source of conflict with equestrians.

## A.3. Santiago Oaks Regional Park Supplementary Figures



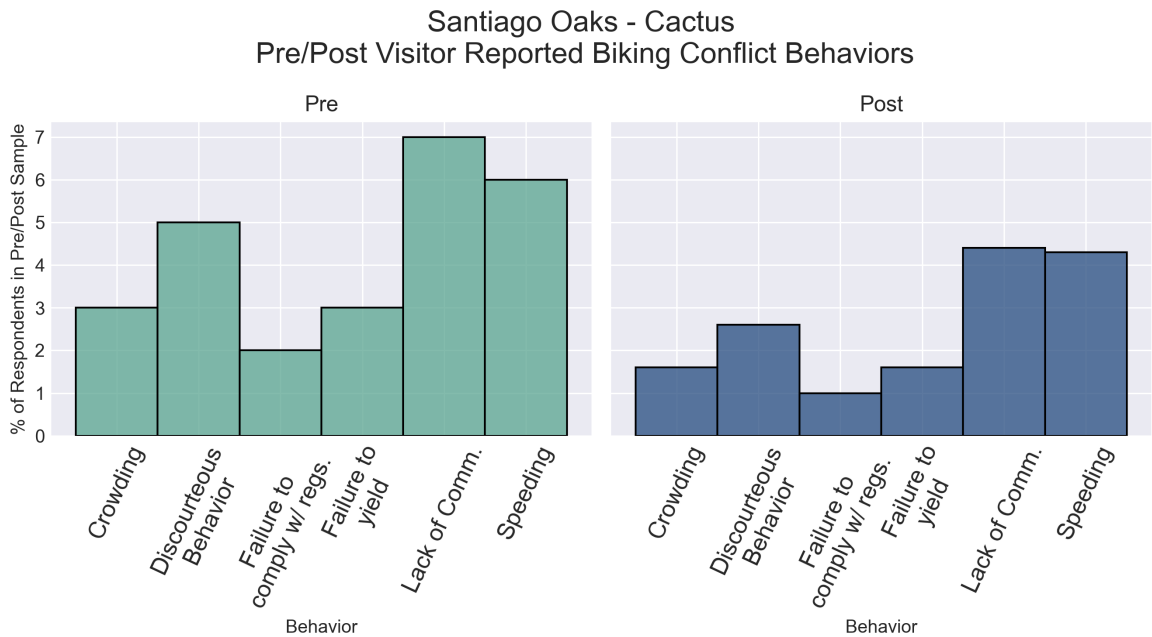
**Figure A.58:** Specific behaviors visitors report are the source of conflict with runners.

## A.3. Santiago Oaks Regional Park

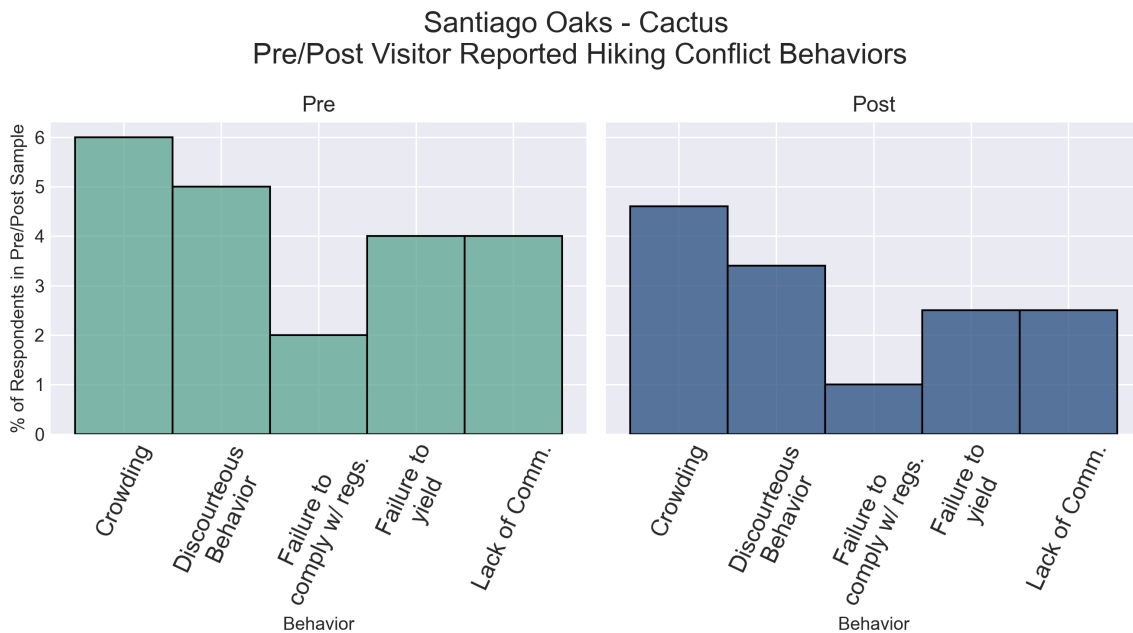
### Supplementary Figures

#### A.3.2 Conflict Behaviors

##### Cactus Canyon

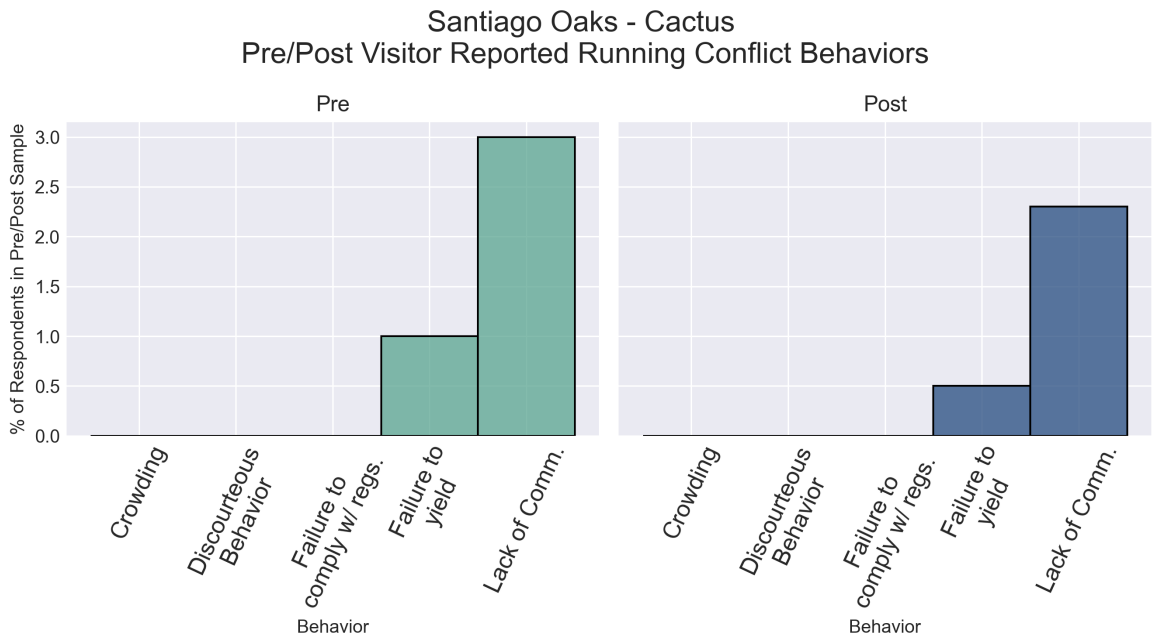


**Figure A.59:** Specific behaviors visitors report are the source of conflict with bikers on the Cactus Canyon trail.

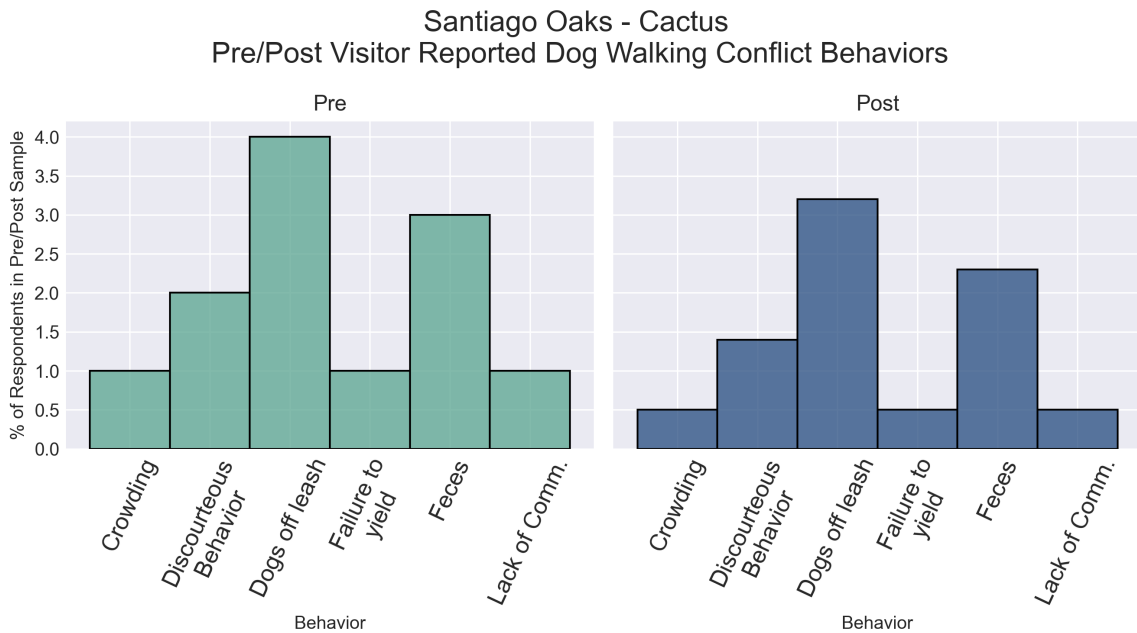


**Figure A.60:** Specific behaviors visitors report are the source of conflict with hikers on the Cactus Canyon trail.

## A.3. Santiago Oaks Regional Park Supplementary Figures



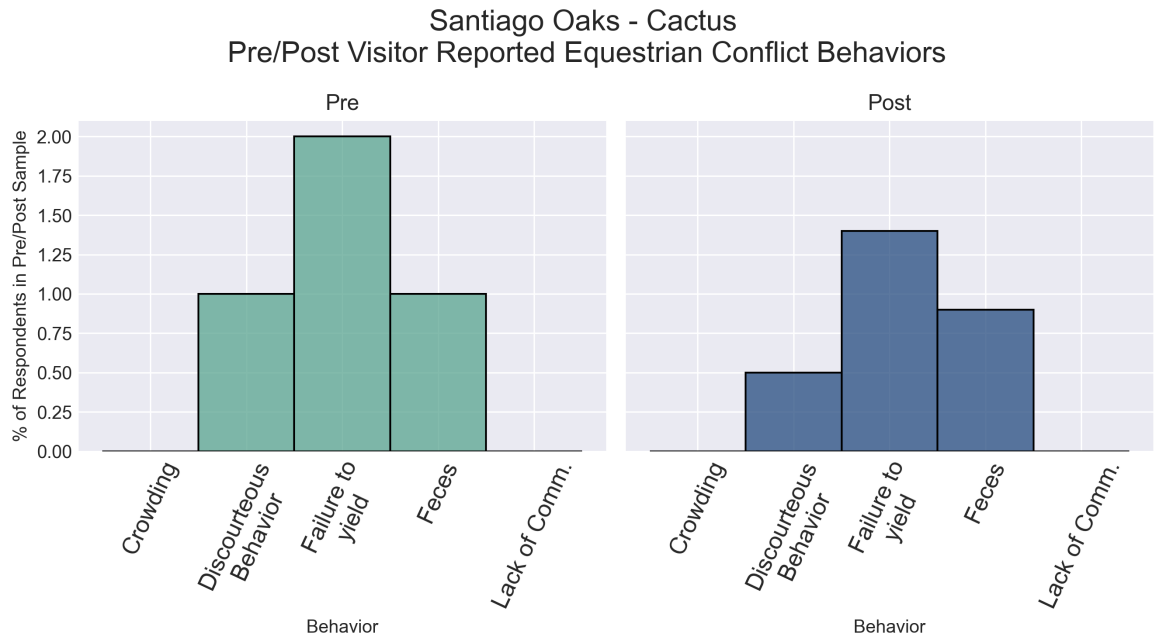
**Figure A.61:** Specific behaviors visitors report are the source of conflict with runners on the Cactus Canyon Trail.



**Figure A.62:** Specific behaviors visitors report are the source of conflict with dog walkers on the Cactus Canyon Trail.

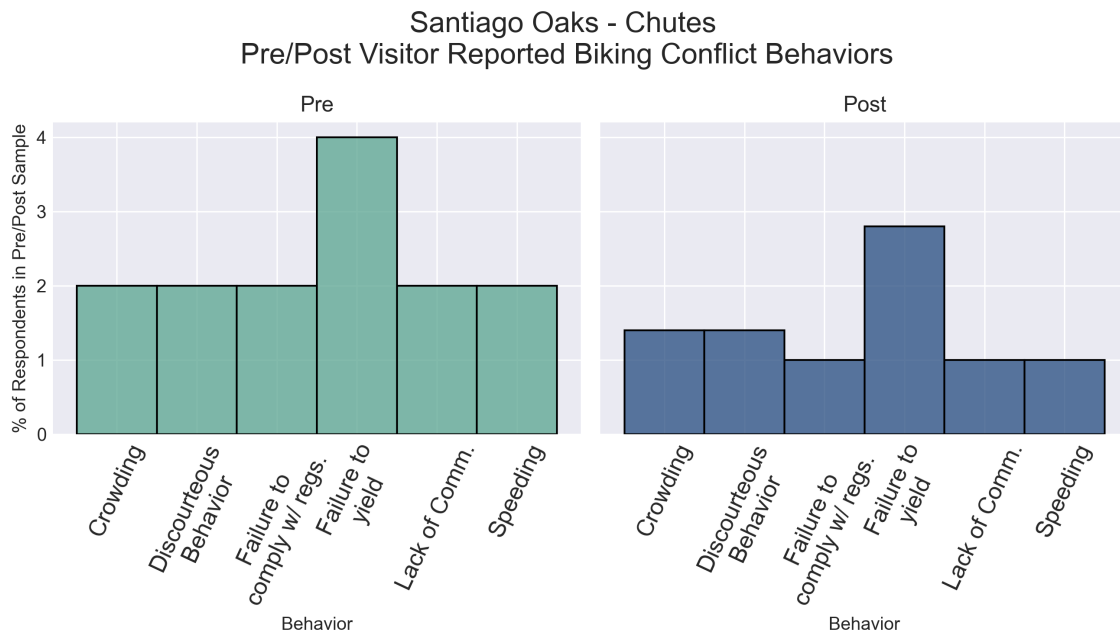
## A.3. Santiago Oaks Regional Park

### Supplementary Figures



**Figure A.63:** Specific behaviors visitors report are the source of conflict with Equestrians on the Cactus Canyon Trail.

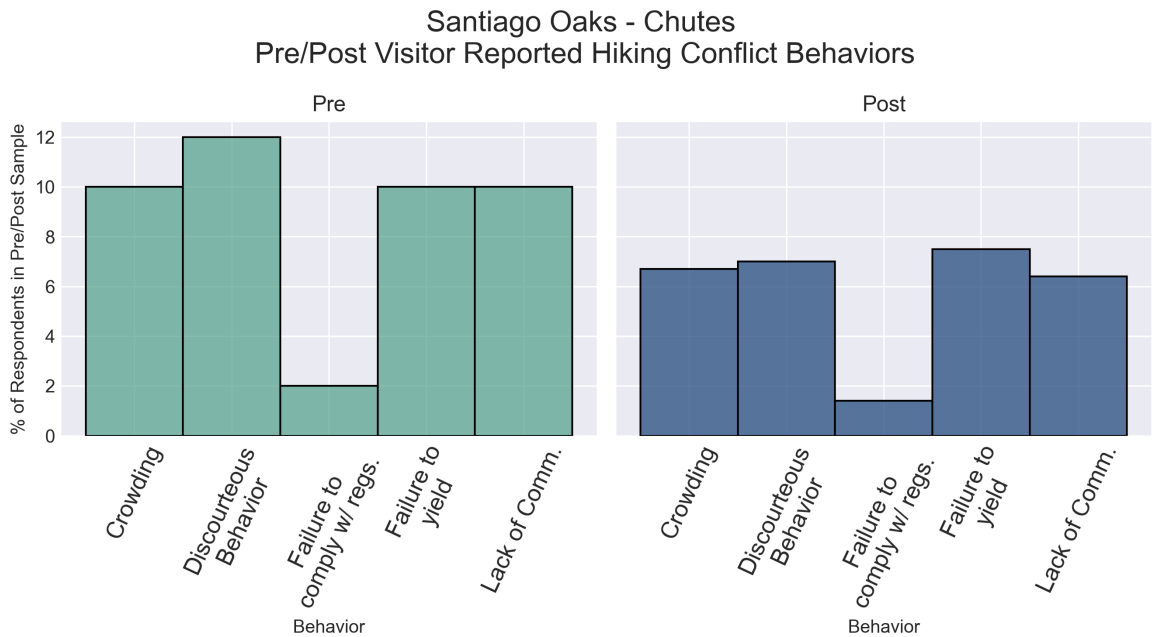
### Chutes Ridgeline



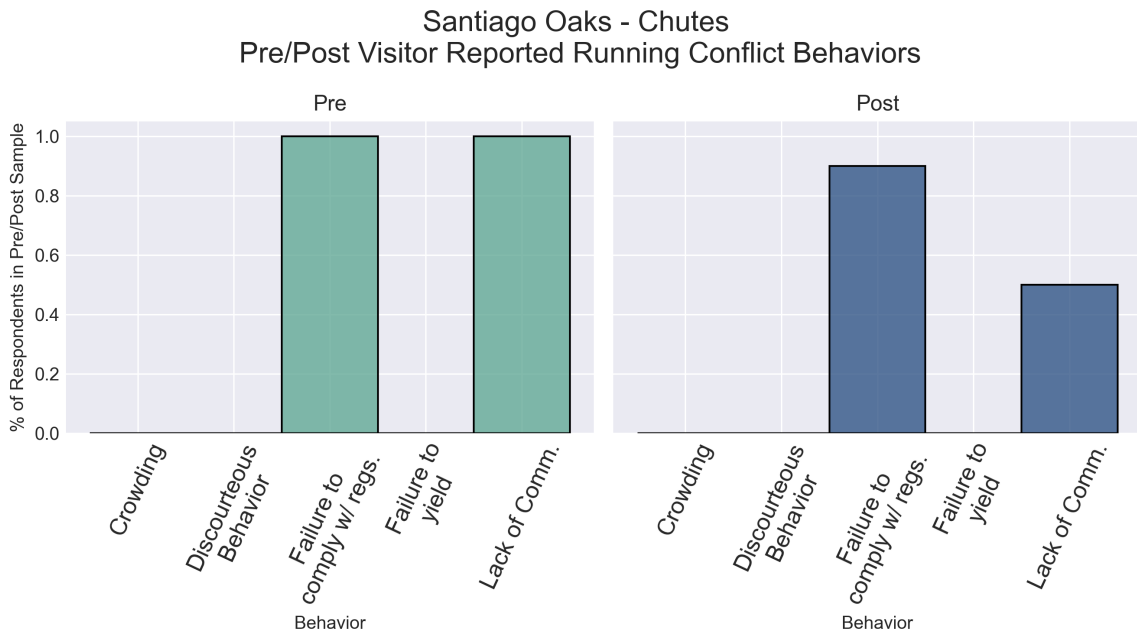
**Figure A.64:** Specific behaviors visitors report are the source of conflict with bikers on the Chutes Ridgeline trail.



## A.3. Santiago Oaks Regional Park Supplementary Figures



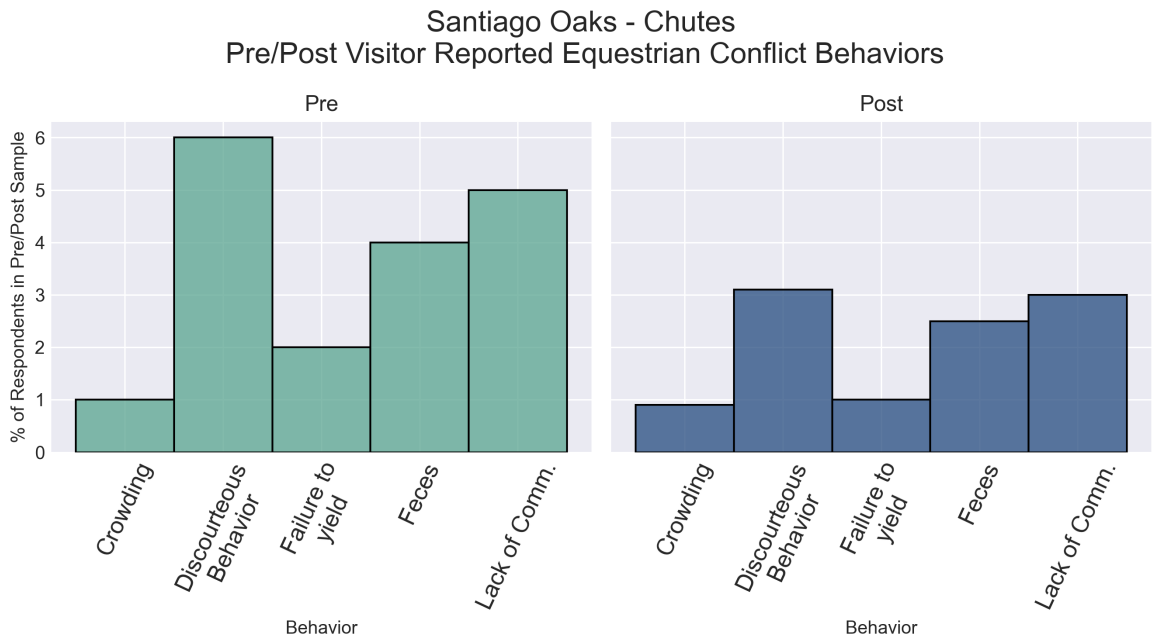
**Figure A.65:** Specific behaviors visitors report are the source of conflict with hikers on the Chutes Ridgeline trail.



**Figure A.66:** Specific behaviors visitors report are the source of conflict with runners on the Chutes Ridgeline Trail.

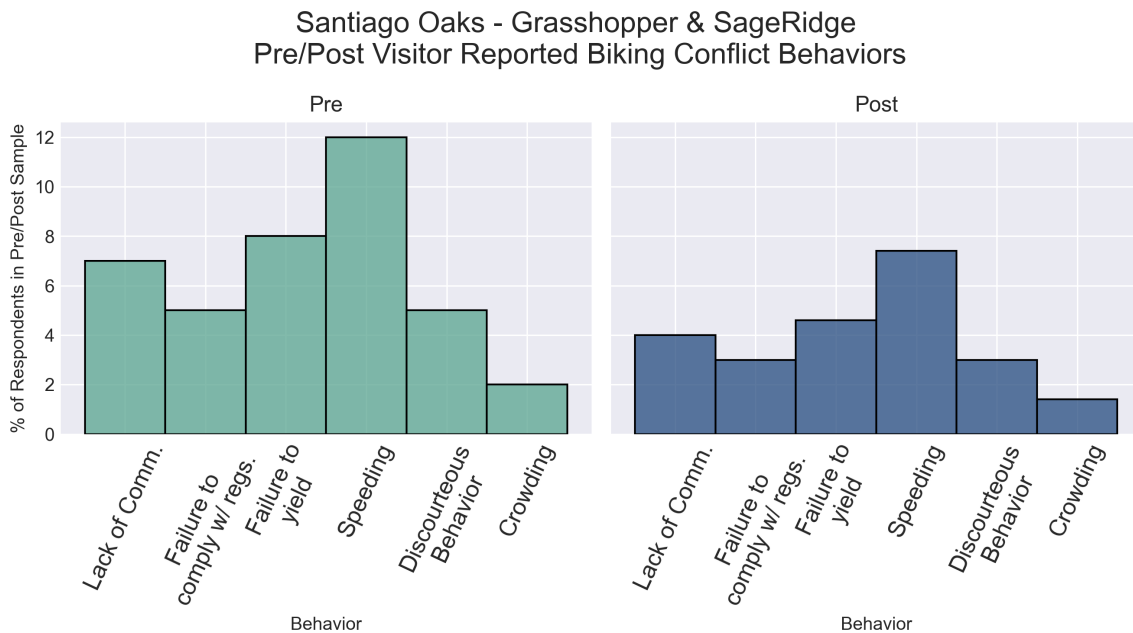
## A.3. Santiago Oaks Regional Park

### Supplementary Figures



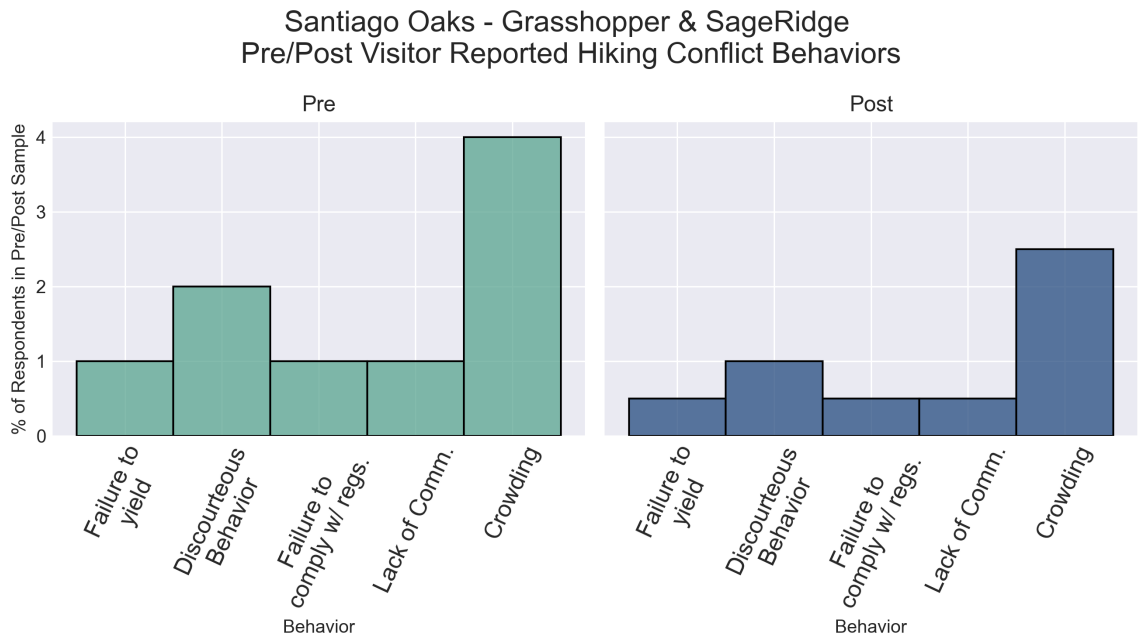
**Figure A.67:** Specific behaviors visitors report are the source of conflict with Equestrians on the Chutes Ridgeline Trail.

### Grasshopper & Sage Ridge

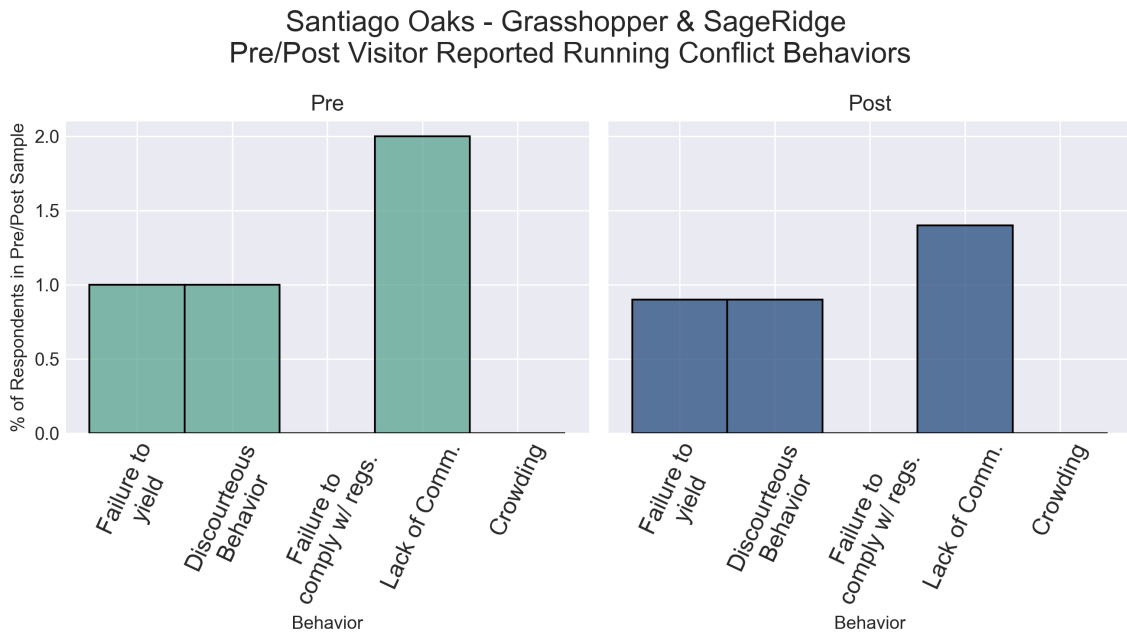


**Figure A.68:** Specific behaviors visitors report are the source of conflict with bikers on the Grasshopper & Sage Ridge trail.

## A.3. Santiago Oaks Regional Park Supplementary Figures

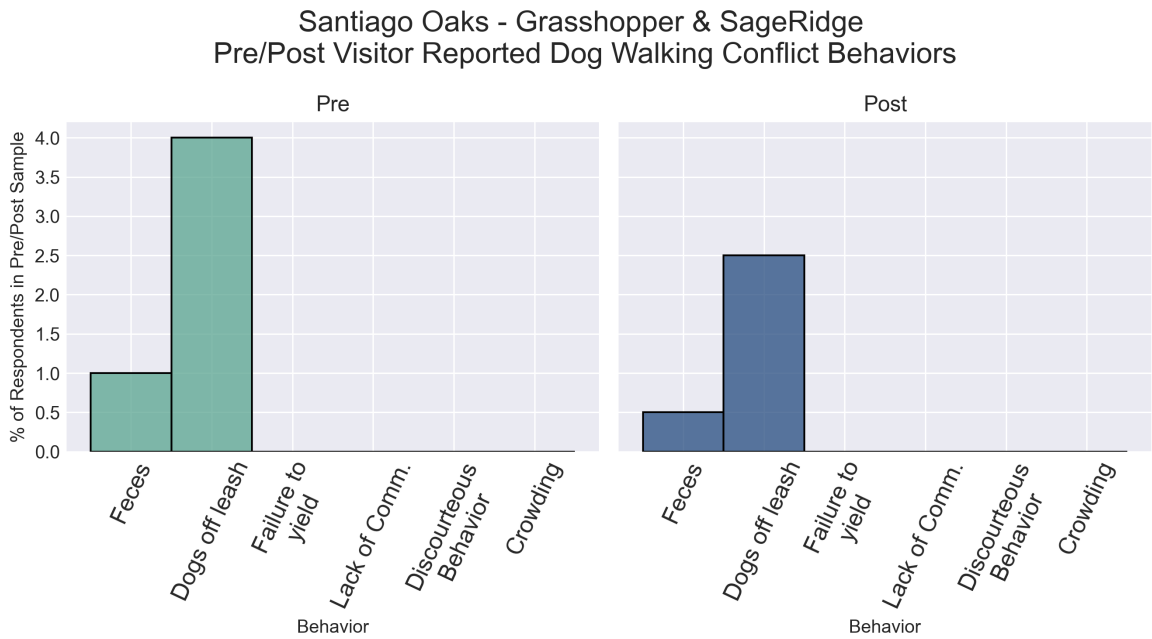


**Figure A.69:** Specific behaviors visitors report are the source of conflict with hikers on the Grasshopper & Sage Ridge trail.

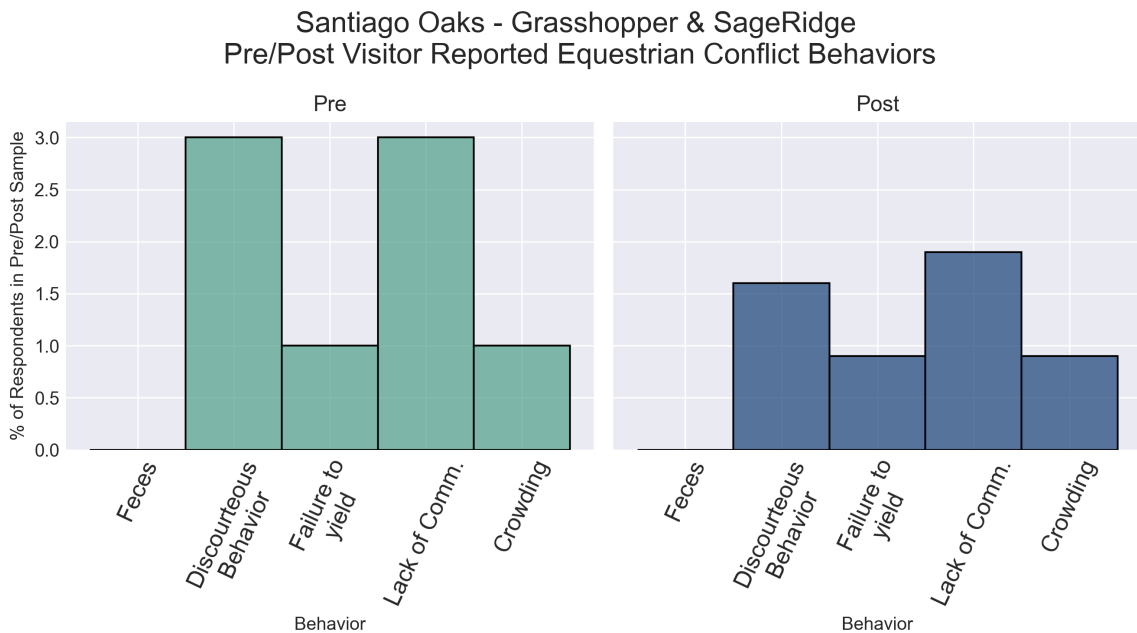


**Figure A.70:** Specific behaviors visitors report are the source of conflict with runners on the Grasshopper & Sage Ridge Trail.

## A.3. Santiago Oaks Regional Park Supplementary Figures



**Figure A.71:** Specific behaviors visitors report are the source of conflict with dog walkers on the Grasshopper & Sage Ridge Trail.

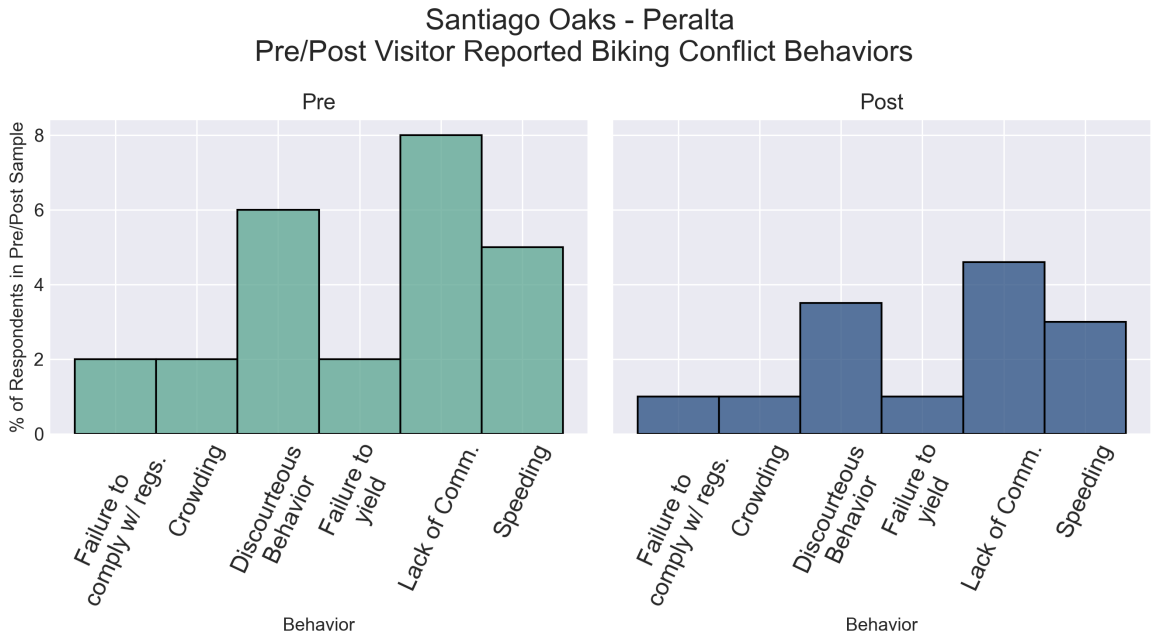


**Figure A.72:** Specific behaviors visitors report are the source of conflict with Equestrians on the Grasshopper & Sage Ridge Trail.

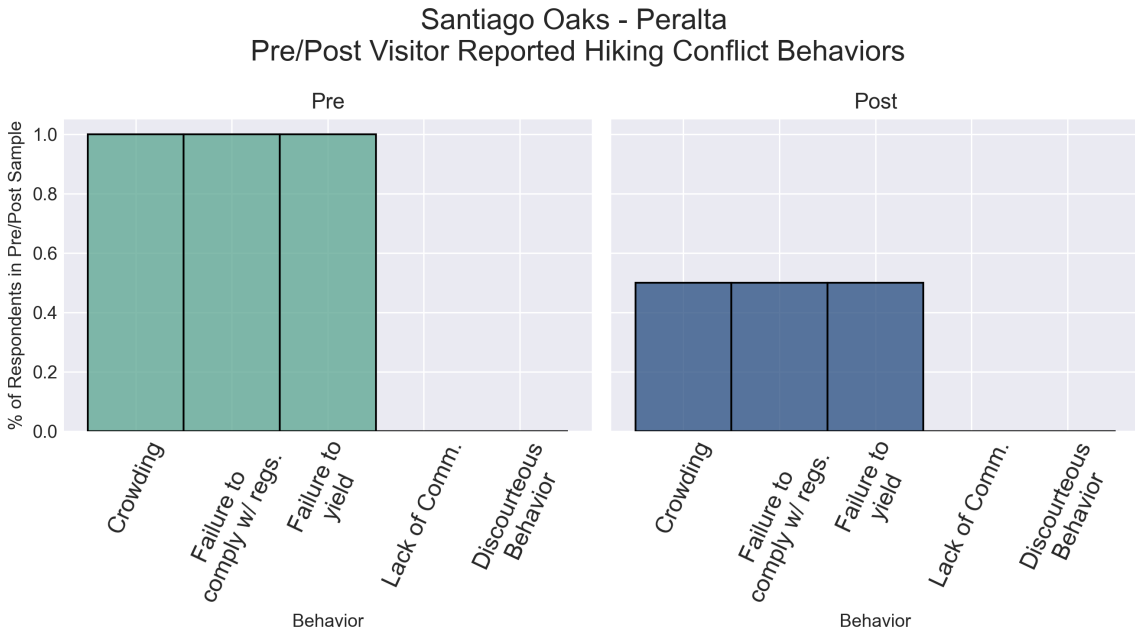
# A.3. Santiago Oaks Regional Park

## Supplementary Figures

### Peralta hills

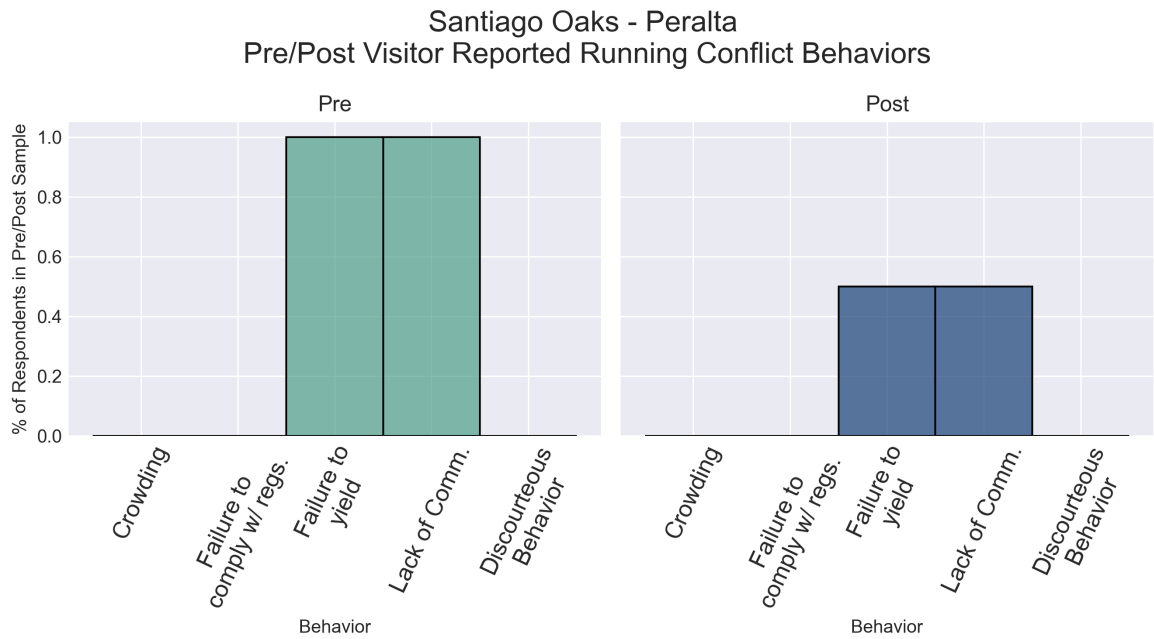


**Figure A.73:** Specific behaviors visitors report are the source of conflict with bikers on the Peralta Hills trail.

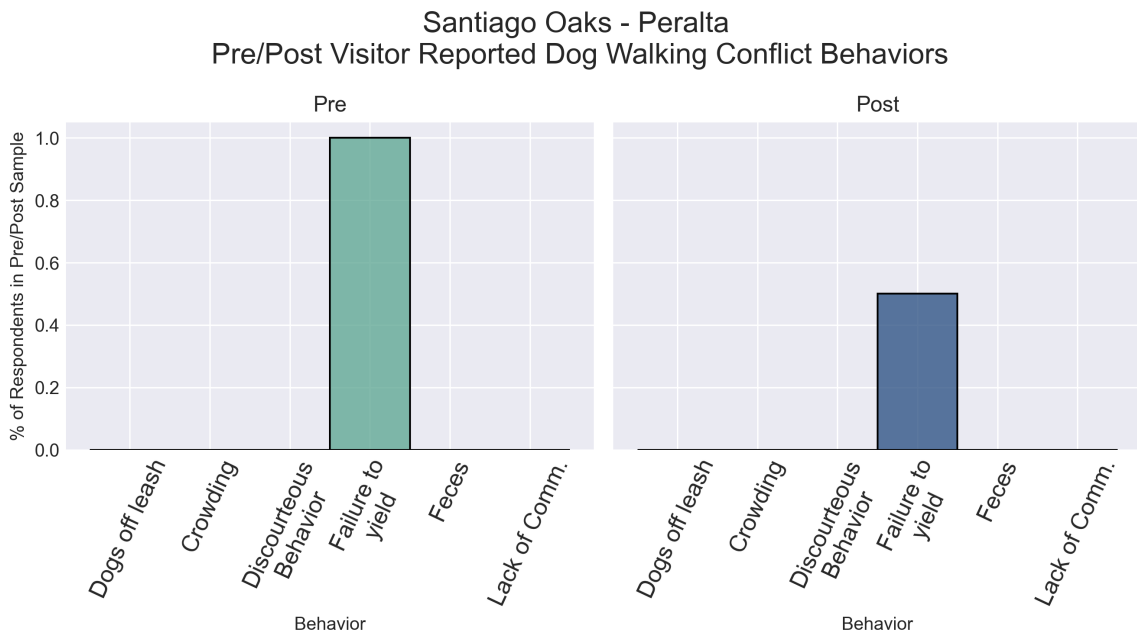


**Figure A.74:** Specific behaviors visitors report are the source of conflict with hikers on the Peralta Hills trail.

## A.3. Santiago Oaks Regional Park Supplementary Figures



**Figure A.75:** Specific behaviors visitors report are the source of conflict with runners on the Peralta Hills Trail.

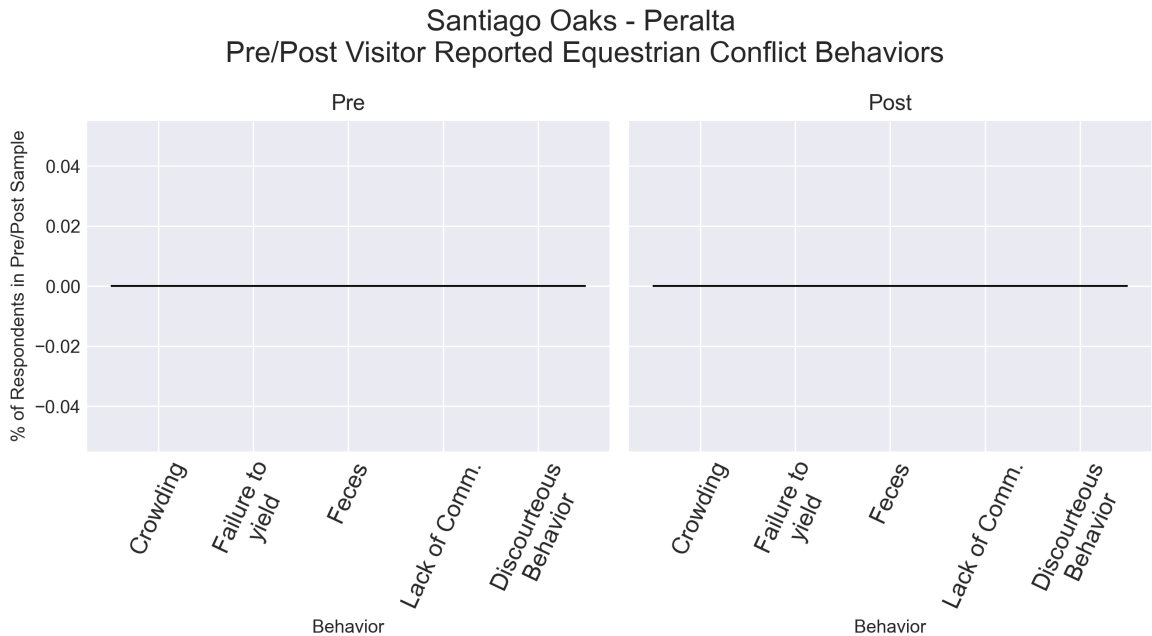


**Figure A.76:** Specific behaviors visitors report are the source of conflict with dog walkers on the Peralta Hills Trail.



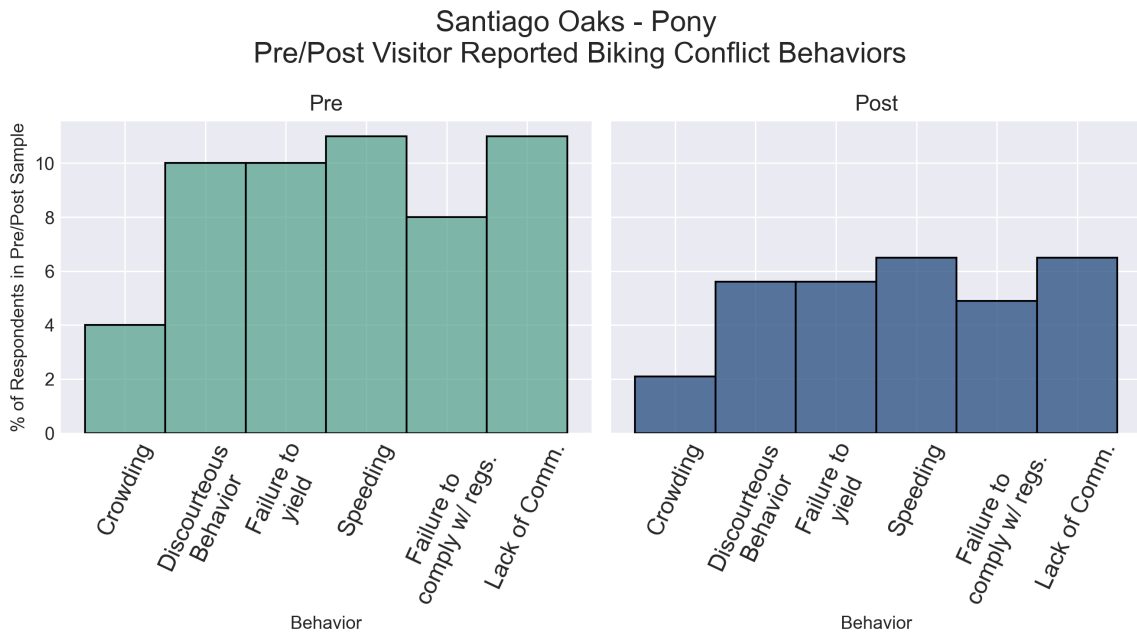
## A.3. Santiago Oaks Regional Park

### Supplementary Figures



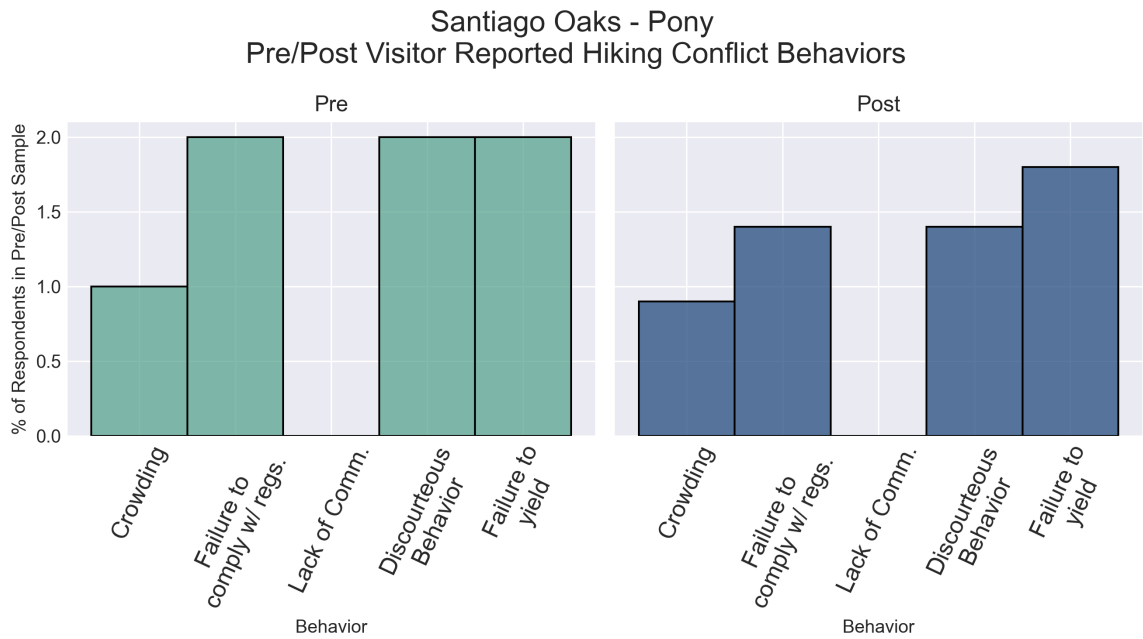
**Figure A.77:** Specific behaviors visitors report are the source of conflict with Equestrians on the Peralta Hills Trail. Note: No conflicts with equestrians were reported in either the Pre or Post-TPP survey on the Peralta Hills Trail.

### Pony

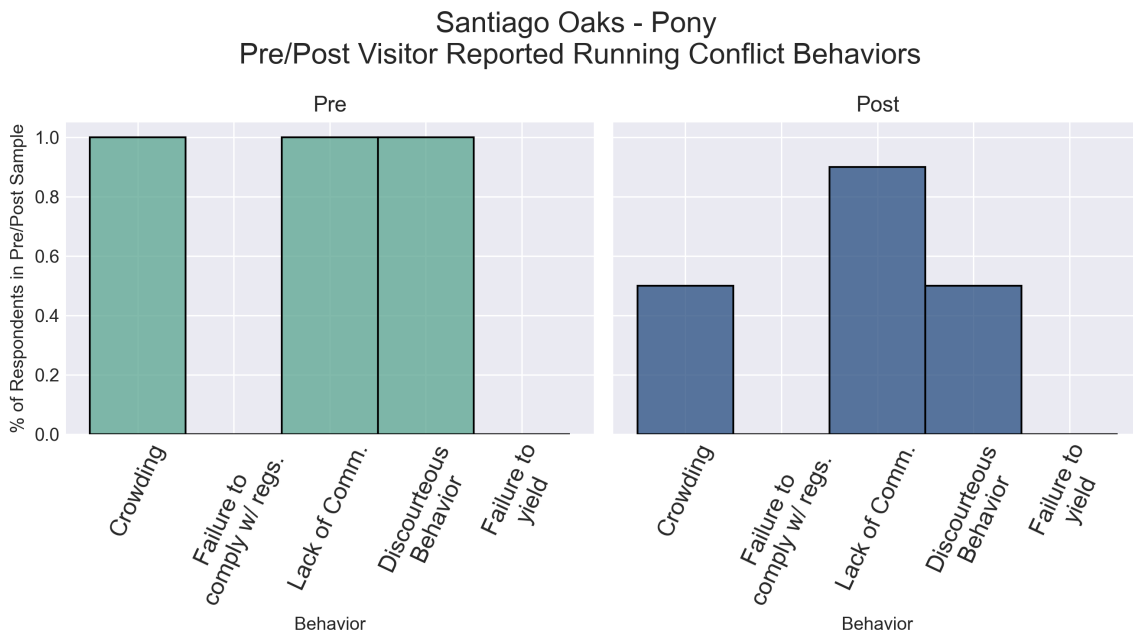


**Figure A.78:** Specific behaviors visitors report are the source of conflict with bikers on the Pony trail.

## A.3. Santiago Oaks Regional Park Supplementary Figures

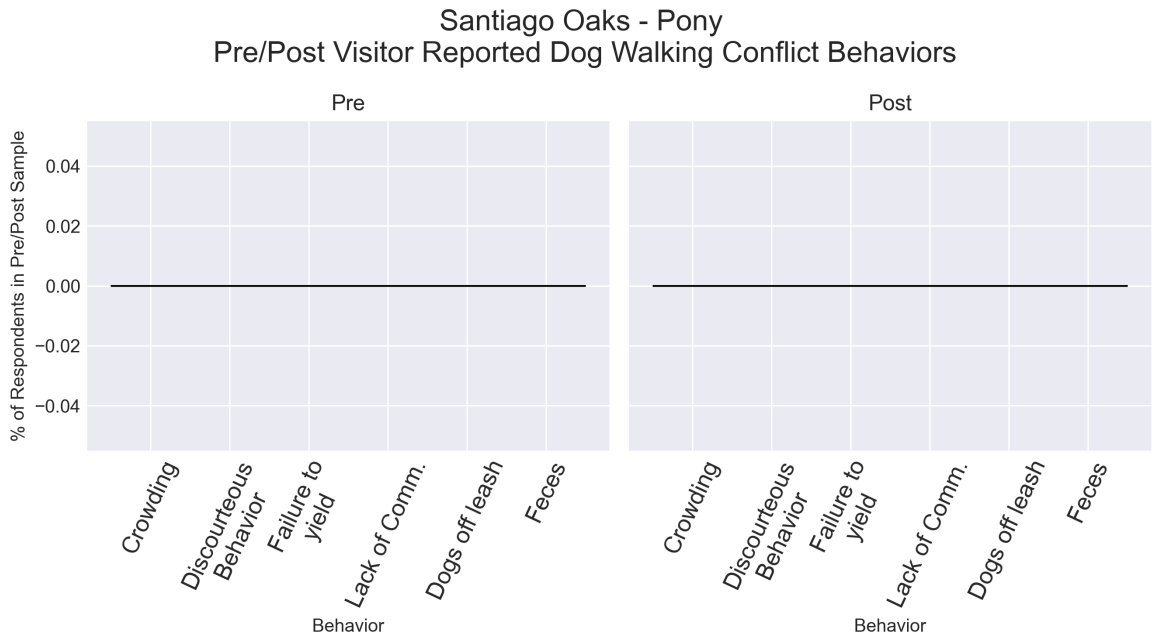


**Figure A.79:** Specific behaviors visitors report are the source of conflict with hikers on the Pony trail.

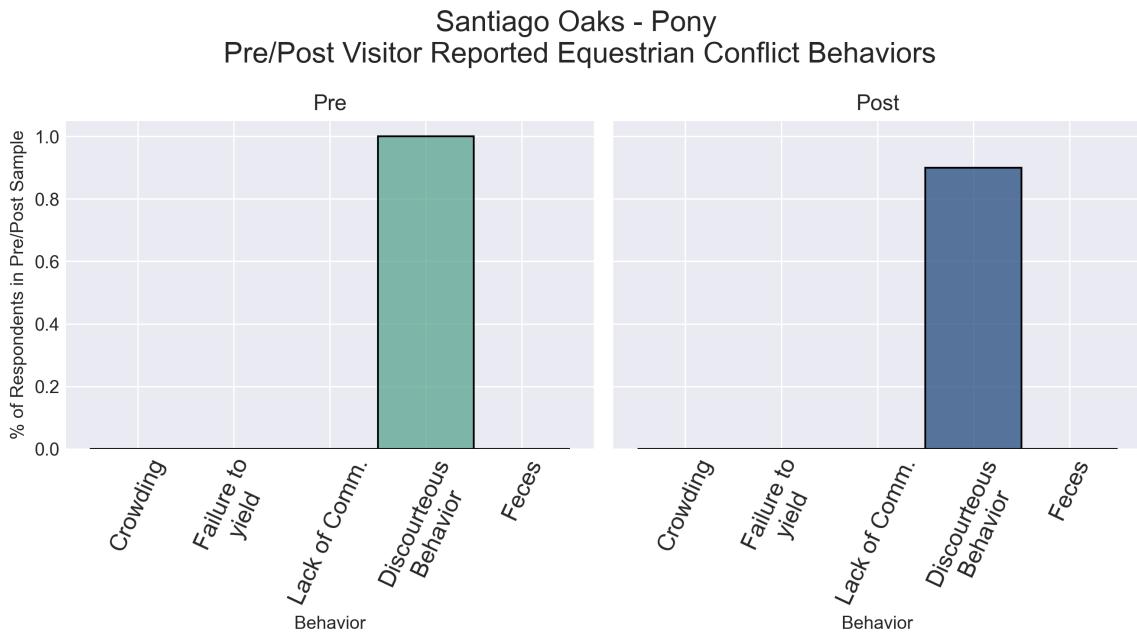


**Figure A.80:** Specific behaviors visitors report are the source of conflict with runners on the Pony Trail..

### A.3. Santiago Oaks Regional Park Supplementary Figures



**Figure A.81:** Specific behaviors visitors report are the source of conflict with dog walkers on the Pony Trail.  
Note: No conflicts with dog walkers were reported on the Pony trail in either the Pre or Post-TPP survey.

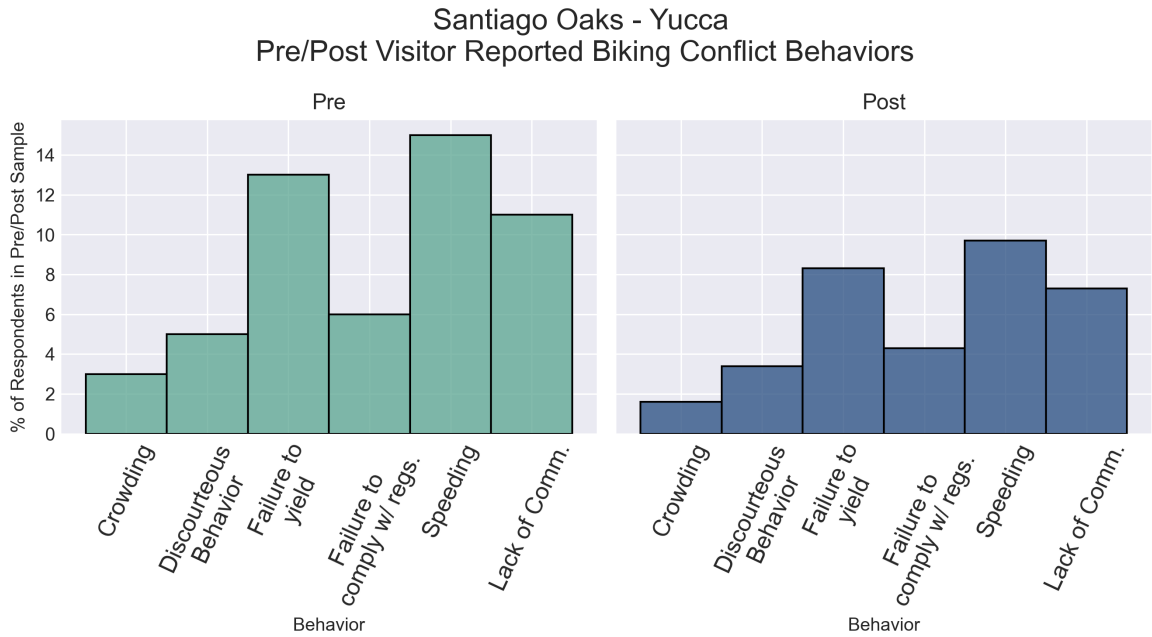


**Figure A.82:** Specific behaviors visitors report are the source of conflict with Equestrians on the Pony Trail.

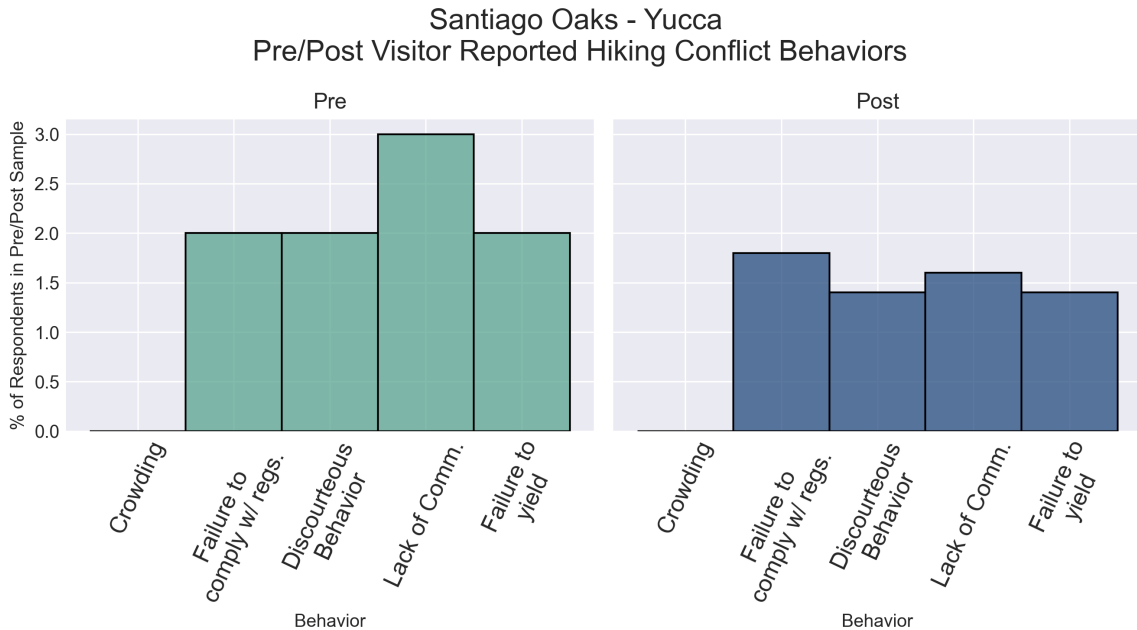
## A.3. Santiago Oaks Regional Park

### Supplementary Figures

#### Yucca Ridge

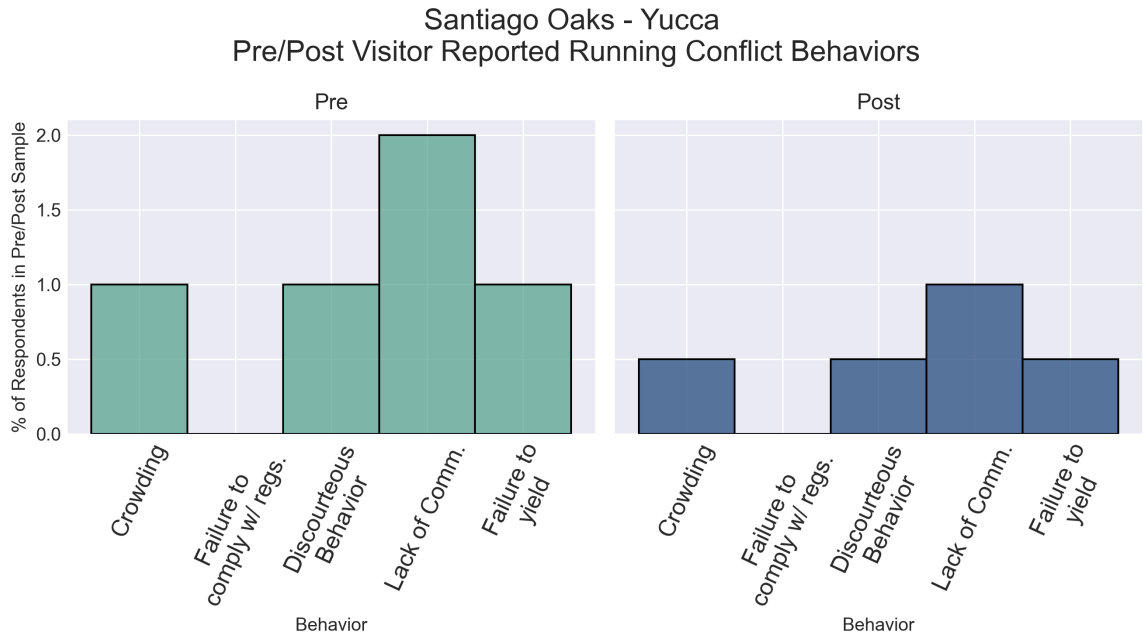


**Figure A.83:** Specific behaviors visitors report are the source of conflict with bikers on the Yucca Ridge Trail.

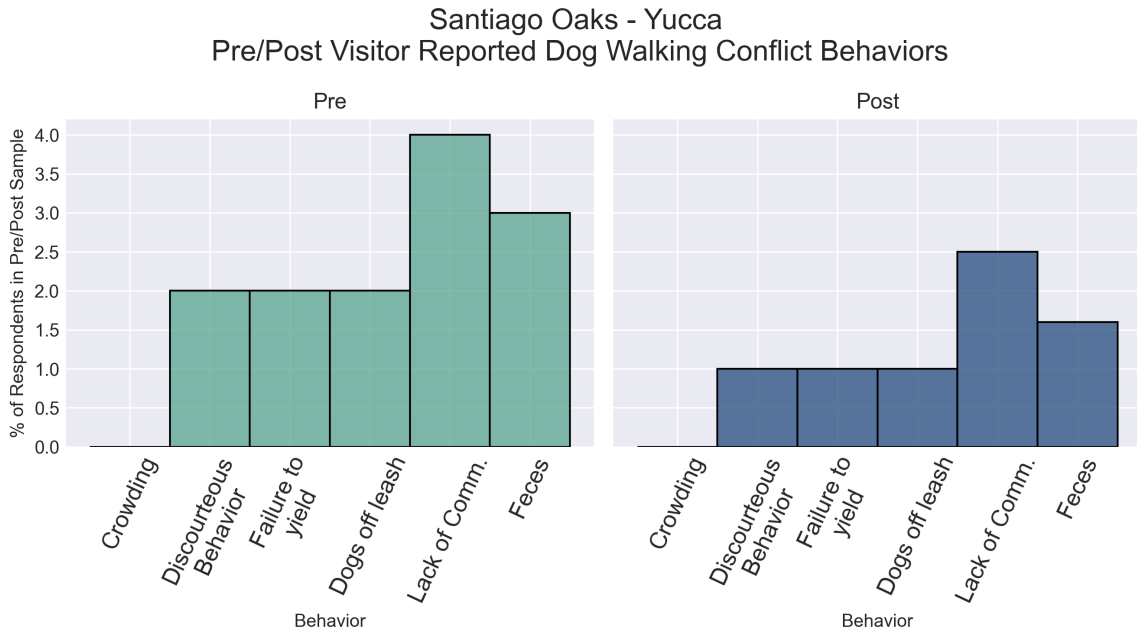


**Figure A.84:** Specific behaviors visitors report are the source of conflict with hikers on the Yucca Ridge Trail.

## A.3. Santiago Oaks Regional Park Supplementary Figures



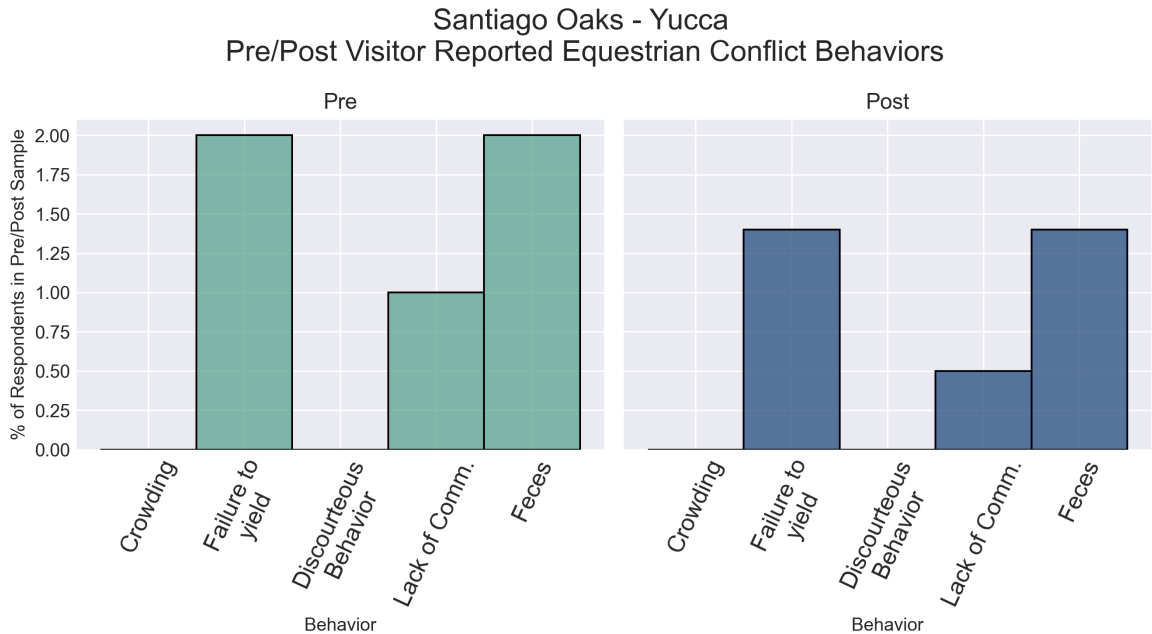
**Figure A.85:** Specific behaviors visitors report are the source of conflict with runners on the Yucca Ridge Trail.



**Figure A.86** Specific behaviors visitors report are the source of conflict with dog walkers on the Yucca Ridge Trail.

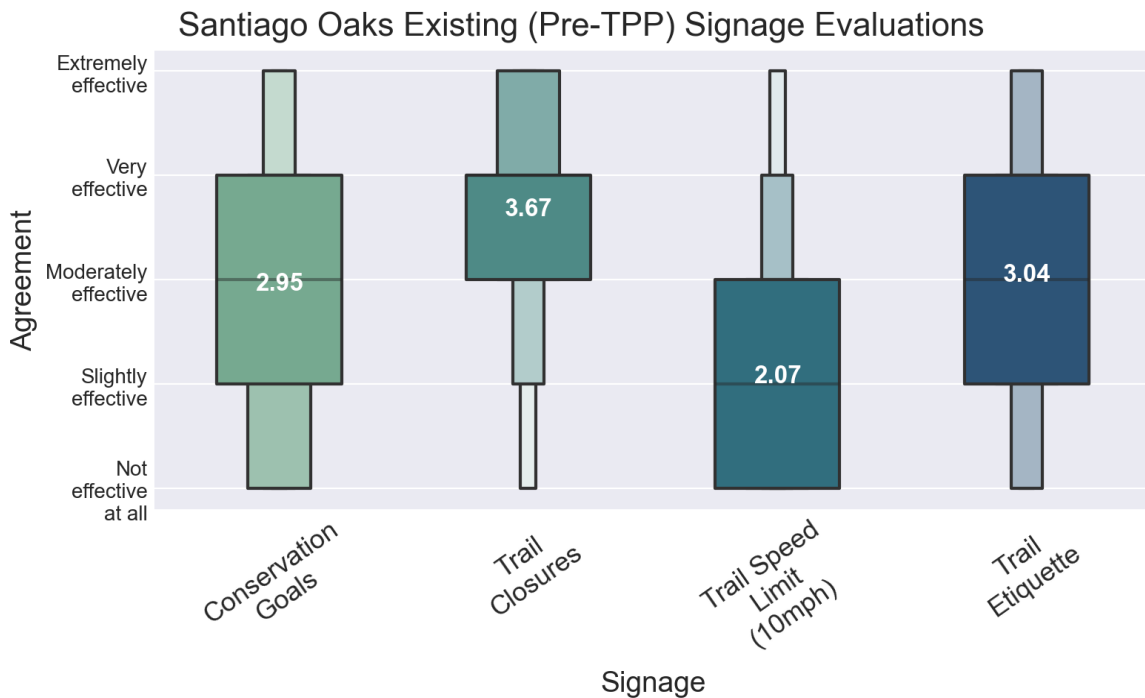
## A.3. Santiago Oaks Regional Park

### Supplementary Figures



**Figure A.87:** Specific behaviors visitors report are the source of conflict with Equestrians on the Yucca Ridge Trail.

### A.3.4 Signage

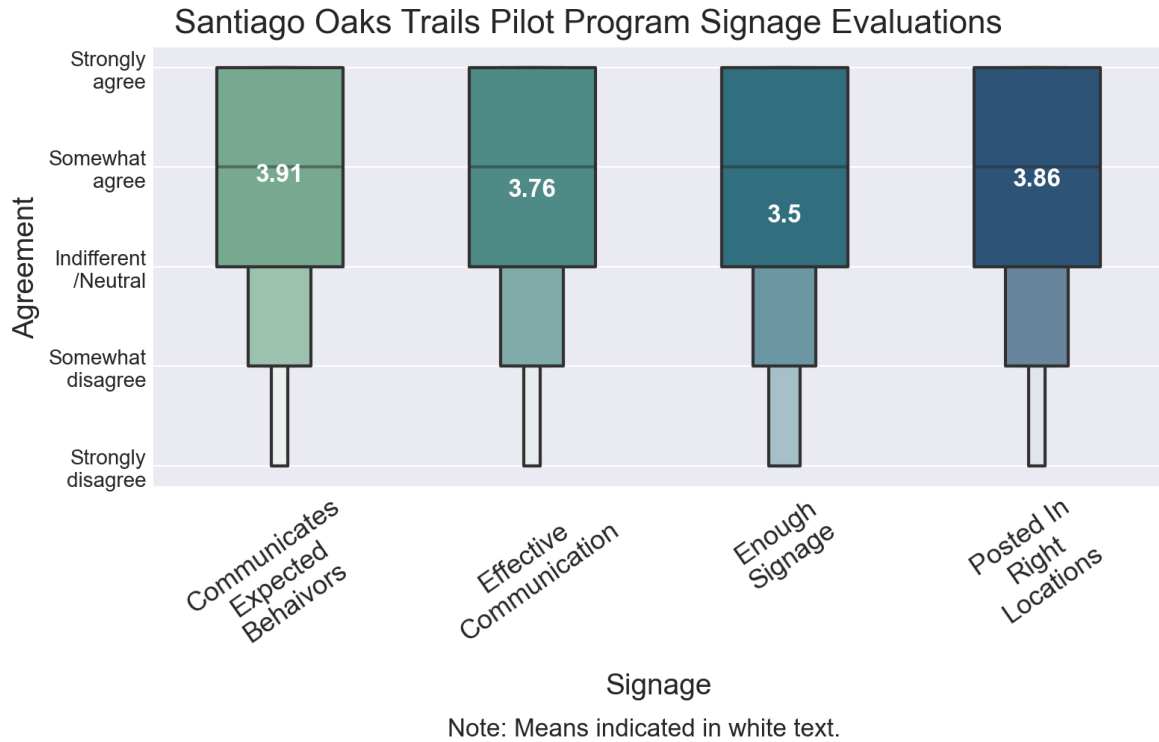


Note: Means indicated in white text.

**Figure A.88:** Visitor evaluations of the effectiveness of signage at communicating the following trail management regulations and goals.



## A.3. Santiago Oaks Regional Park Supplementary Figures

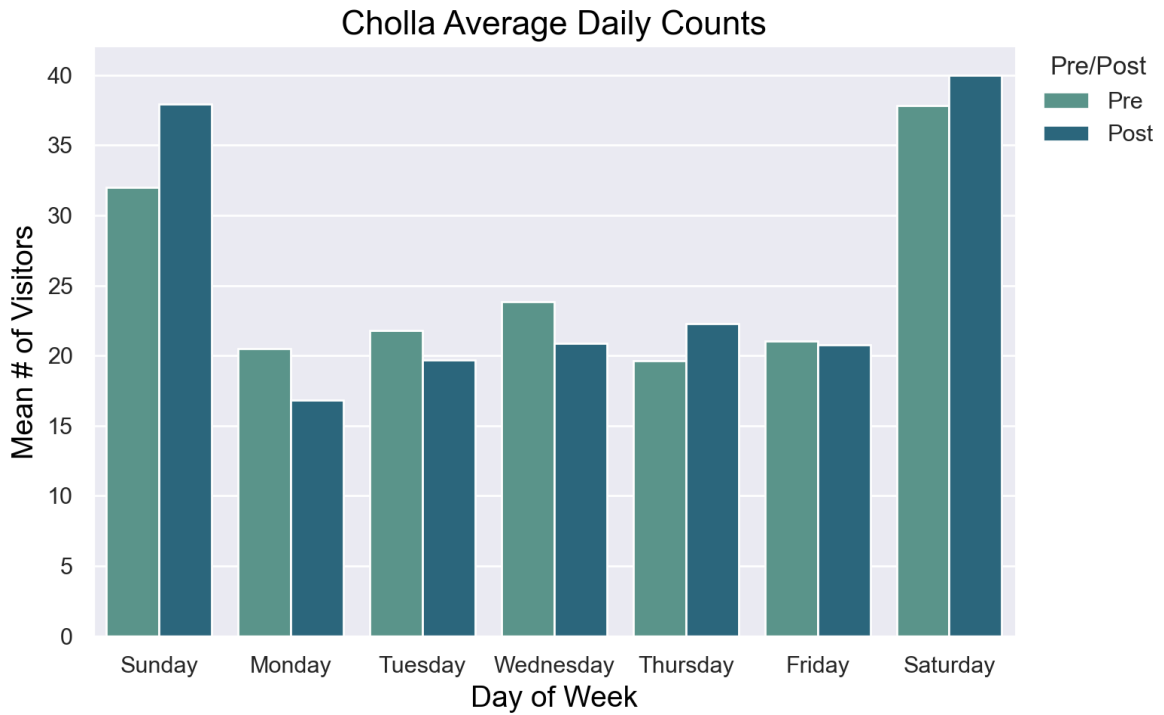


**Figure A.89:** Visitor evaluations of the adequacy and effectiveness of TPP signage.

## Appendix B: TRAFx Data

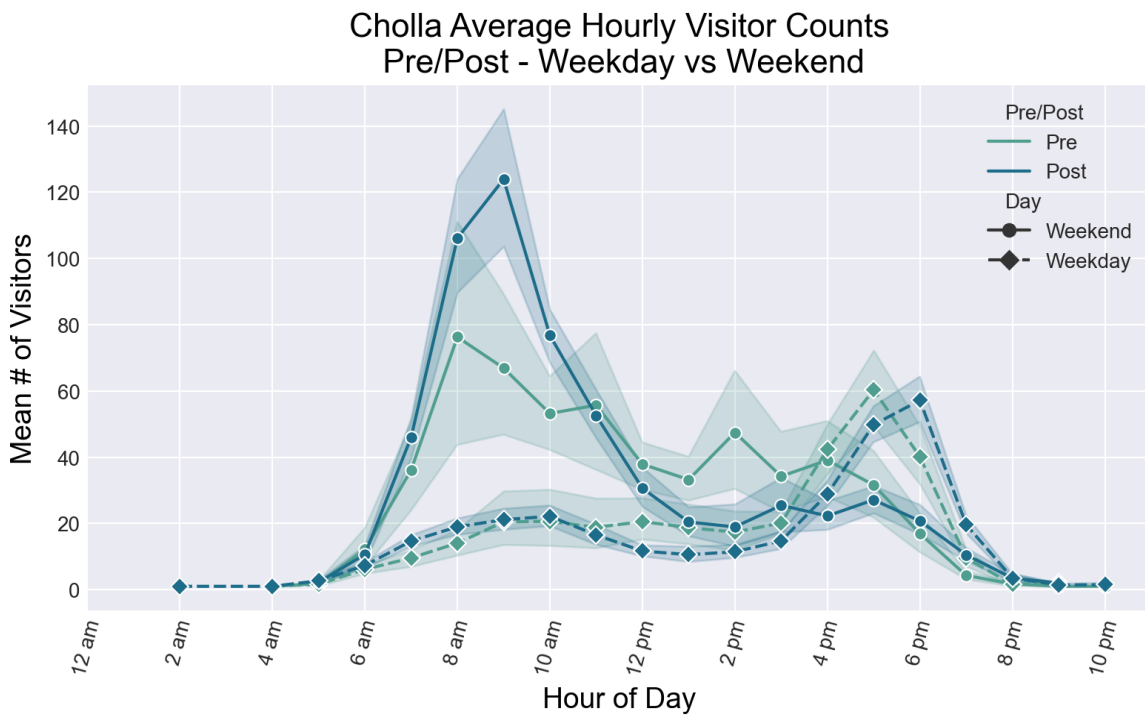
### B.1. Aliso and Wood Canyons Wilderness Park

#### B.1.1 Cholla



Note : Cholla corrected data from 05/01/21 to 08/31/21(123 days) omitting zero count hours.

**Figure B.1:** Cholla visitor counts by day of the week.

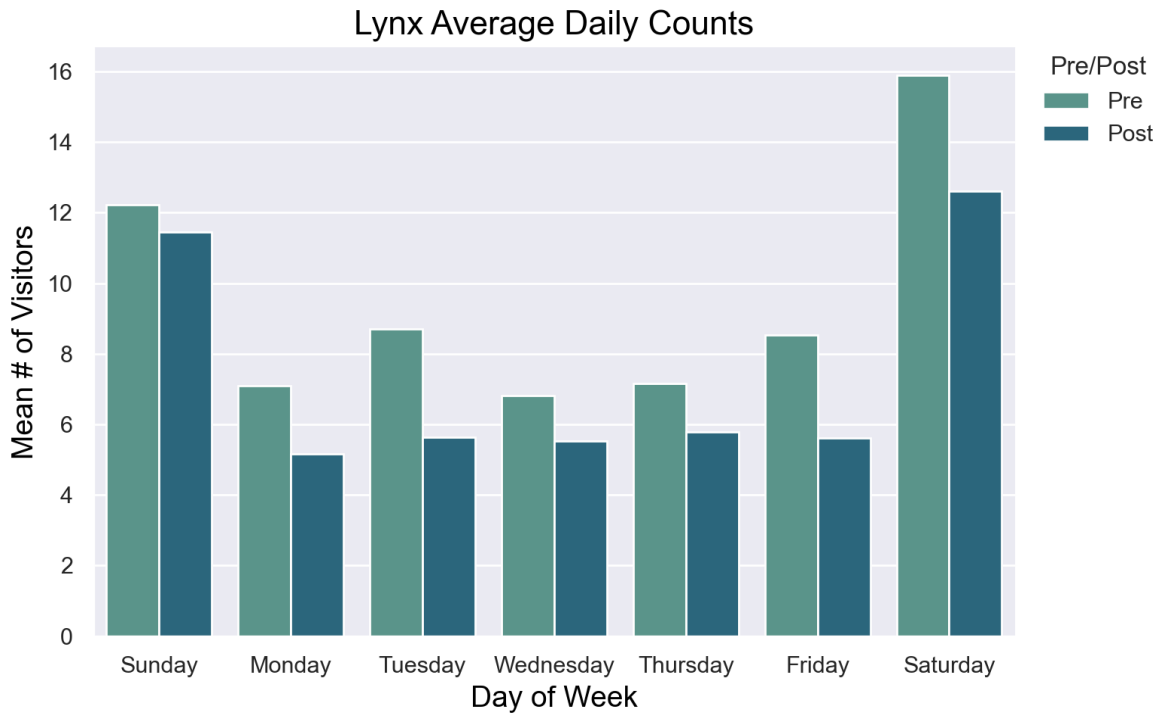


**Figure B.2:** Cholla visitor counts by Pre/Post pilot program hour of the day, weekday vs weekend.

# Appendix B.1. Aliso and Wood Canyons Wilderness Park

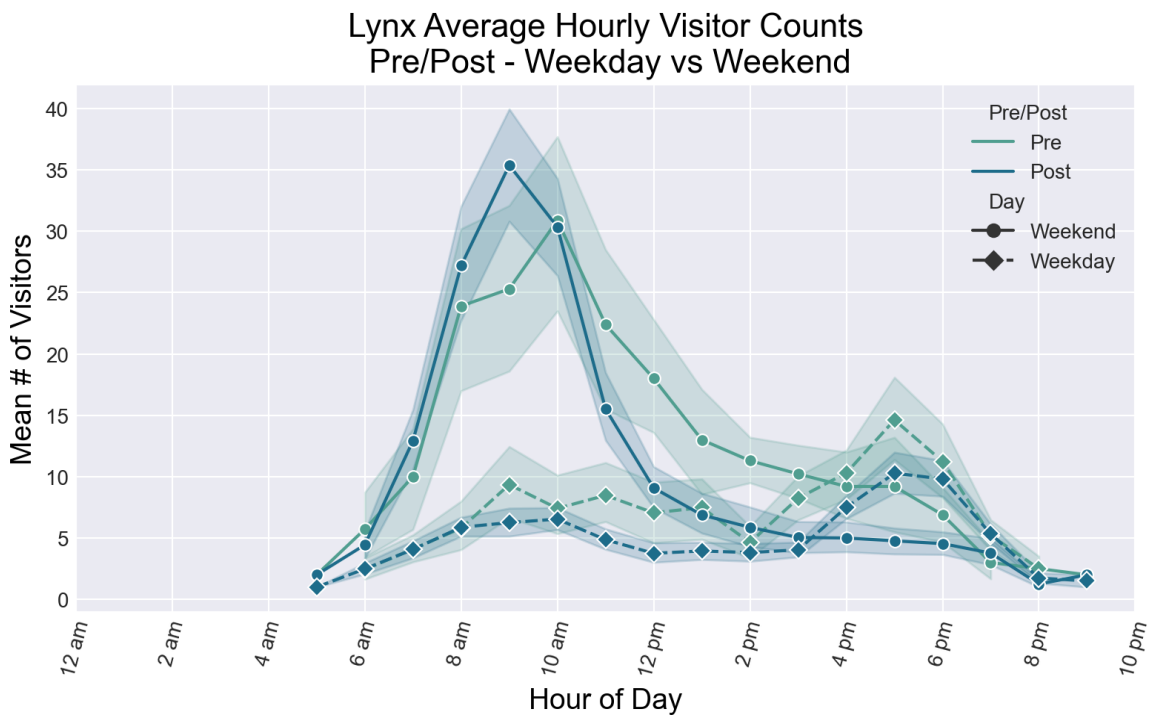
TRAFx Data

## B.1.2 Lynx



Note : Lynx corrected data from 05/01/21 to 08/31/21(123 days) omitting zero count hours.

**Figure B.3:** Lynx visitor counts by day of the week



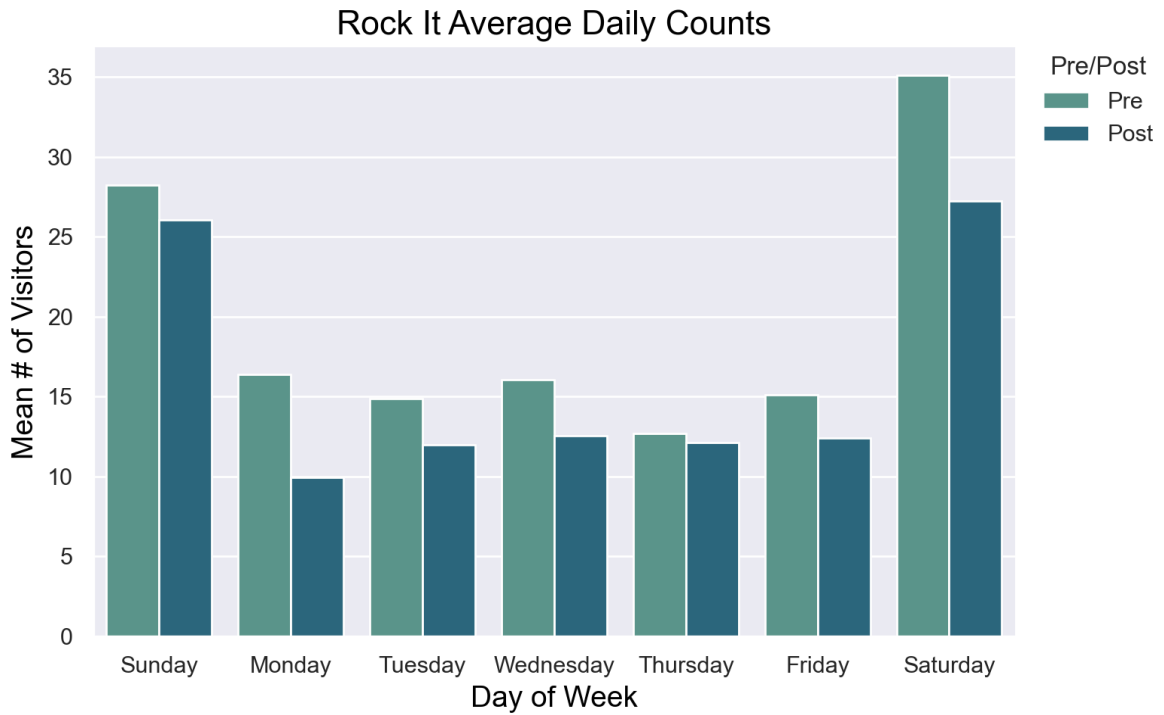
Note : Lynx corrected data from 05/01/21 to 08/31/21(123 days) omitting zero count hours.

**Figure B.4:** Lynx visitor counts by Pre/Post pilot program hour of the day, weekday vs weekend.

# Appendix B.1. Aliso and Wood Canyons Wilderness Park

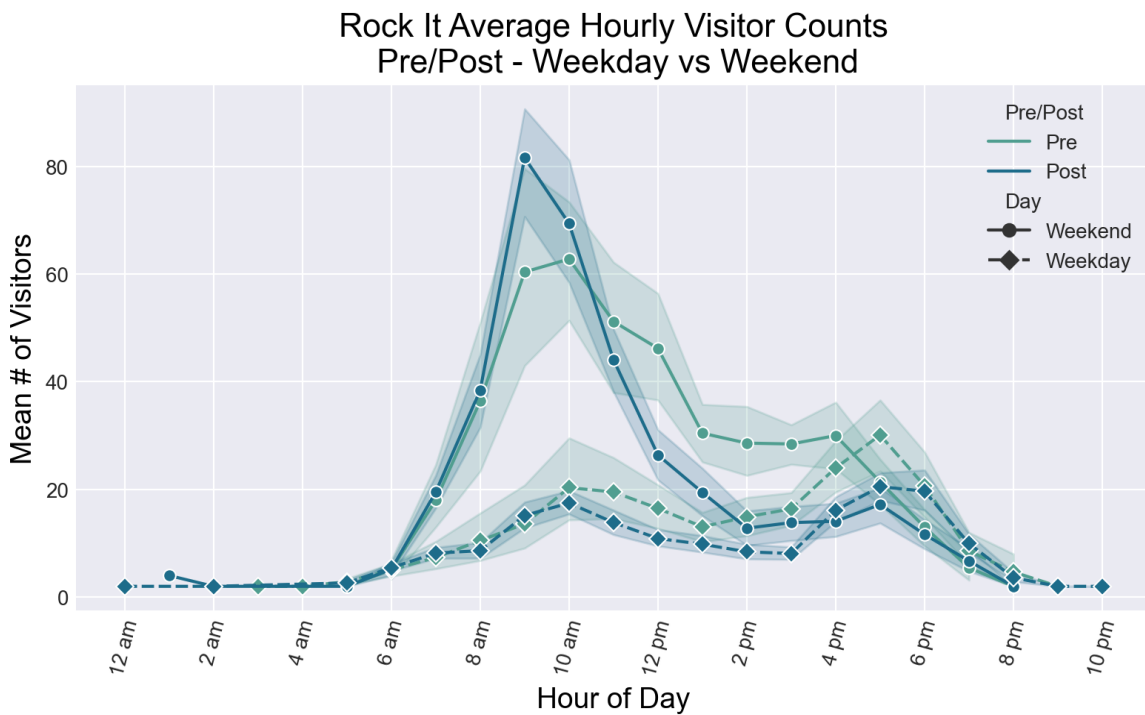
TRAFx Data

## B.1.3 Rock-It



Note : Rock It corrected data from 05/01/21 to 08/31/21(123 days) omitting zero count hours.

**Figure B.5:** Rock-It visitor counts by day of the week.



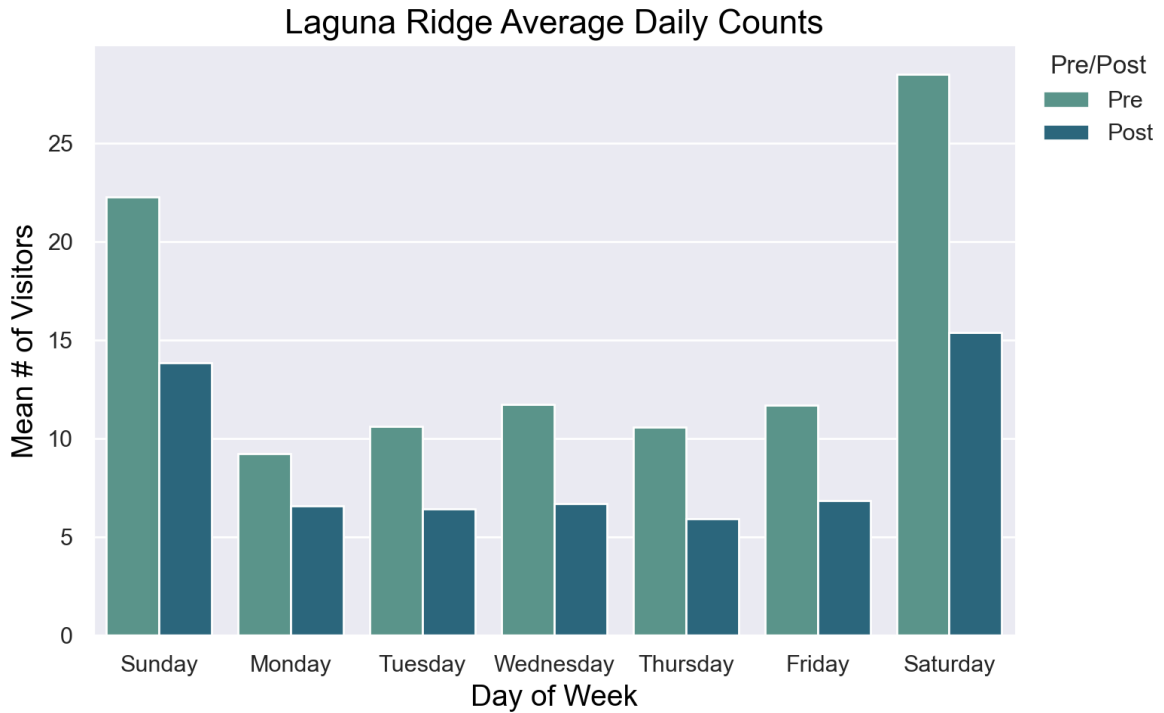
Note : Rock It corrected data from 05/01/21 to 08/31/21(123 days) omitting zero count hours.

**Figure B.6:** Rock-t visitor counts by Pre/Post pilot program hour of the day, weekday vs weekend.

# Appendix B.2. Laguna Coast Wilderness Park

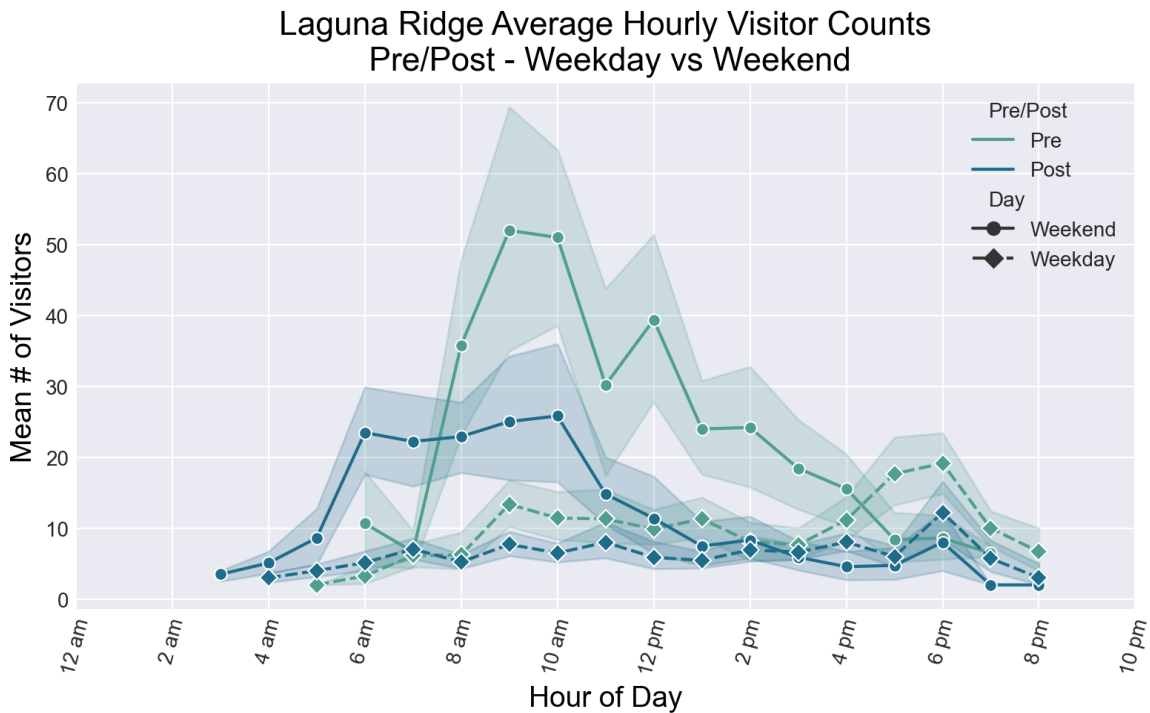
## TRAFx Data

### B.2.1 Laguna Ridge



Note : Laguna Ridge corrected data from 05/01/21 to 08/31/21(123 days) omitting zero count hours.

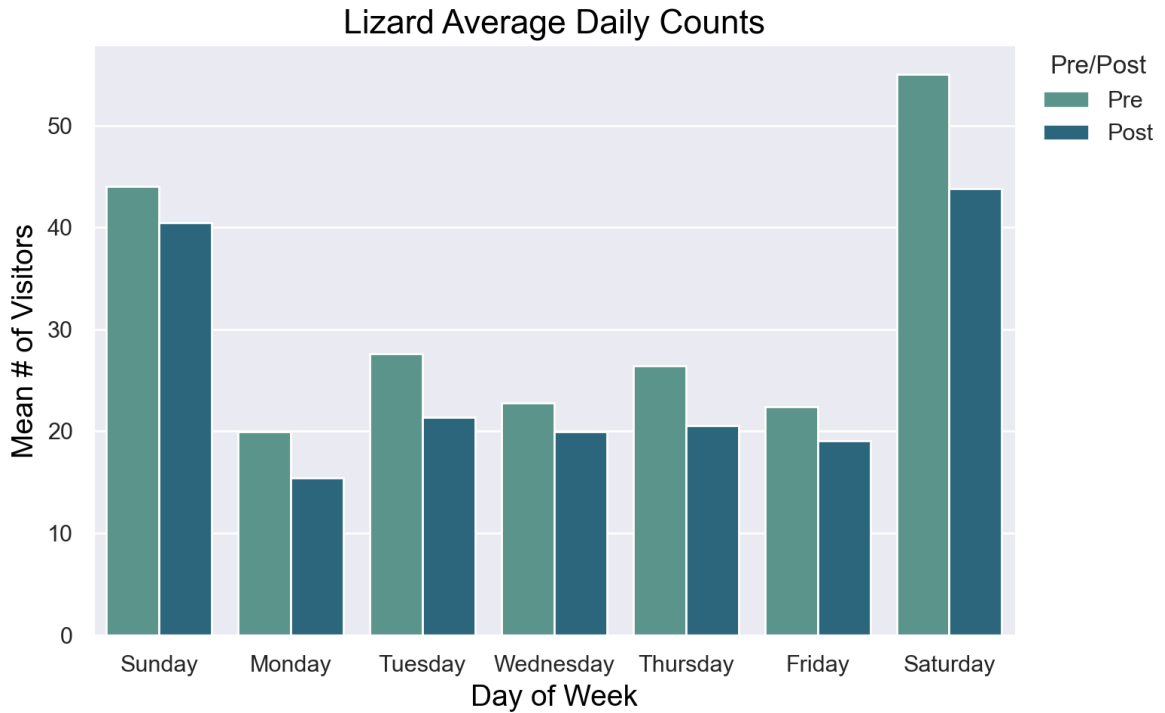
**Figure B.7:** Laguna Ridge visitor counts by day of the week.



**Figure B.8:** Laguna Ridge visitor counts by Pre/Post pilot program hour of the day, weekday vs weekend.

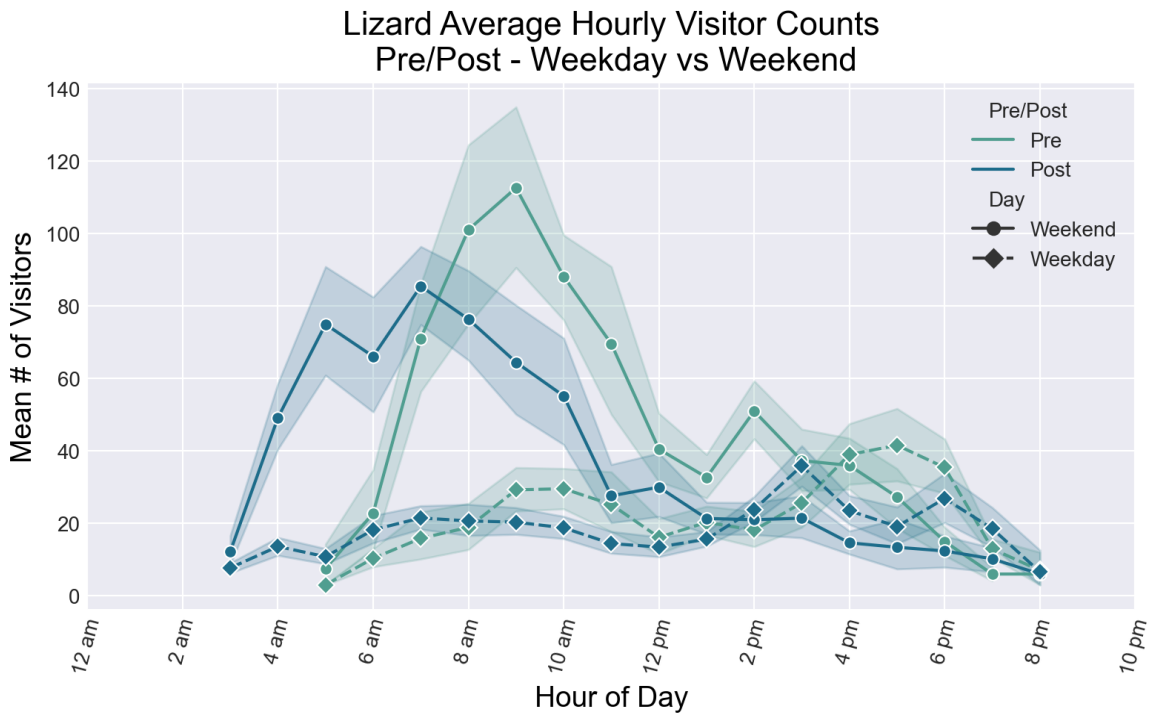
# Appendix B.2. Laguna Coast Wilderness Park

## TRAFx Data B.2.2 Lizard



Note : Lizard corrected data from 05/01/21 to 08/31/21(120 days) omitting zero count hours.

**Figure B.9:** Lizard visitor counts by day of the week.



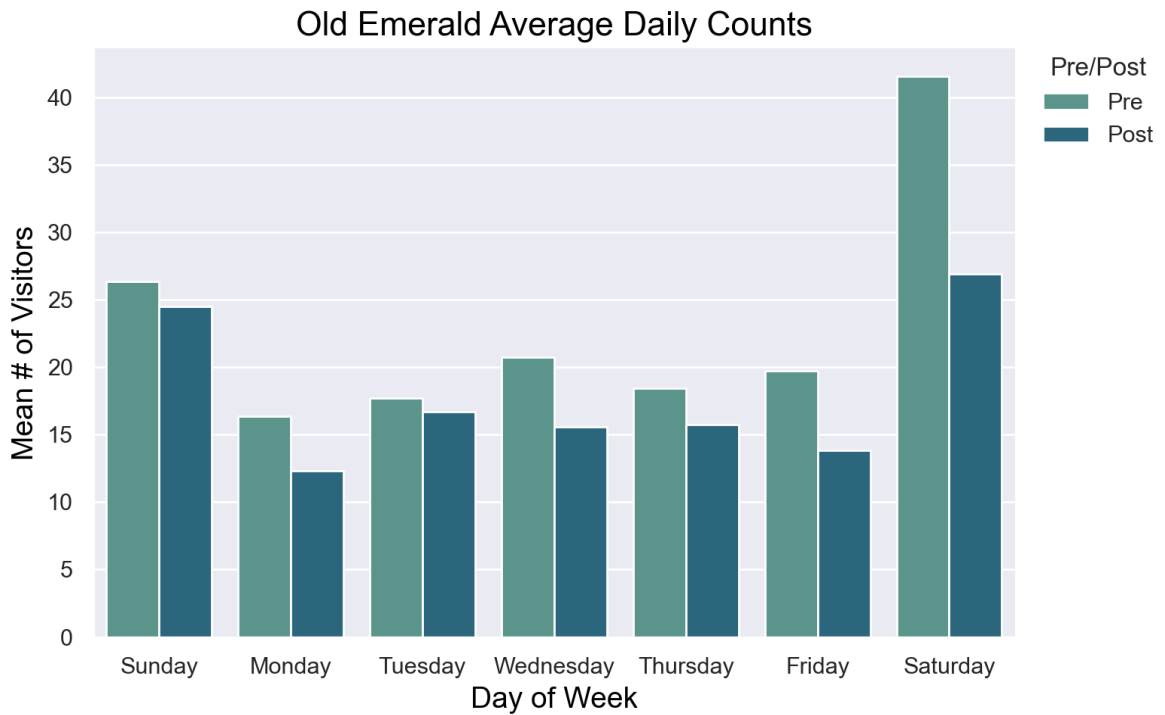
**Figure B.10:** Lizard visitor counts by Pre/Post pilot program hour of the day, weekday vs weekend.



# Appendix B.2. Laguna Coast Wilderness Park

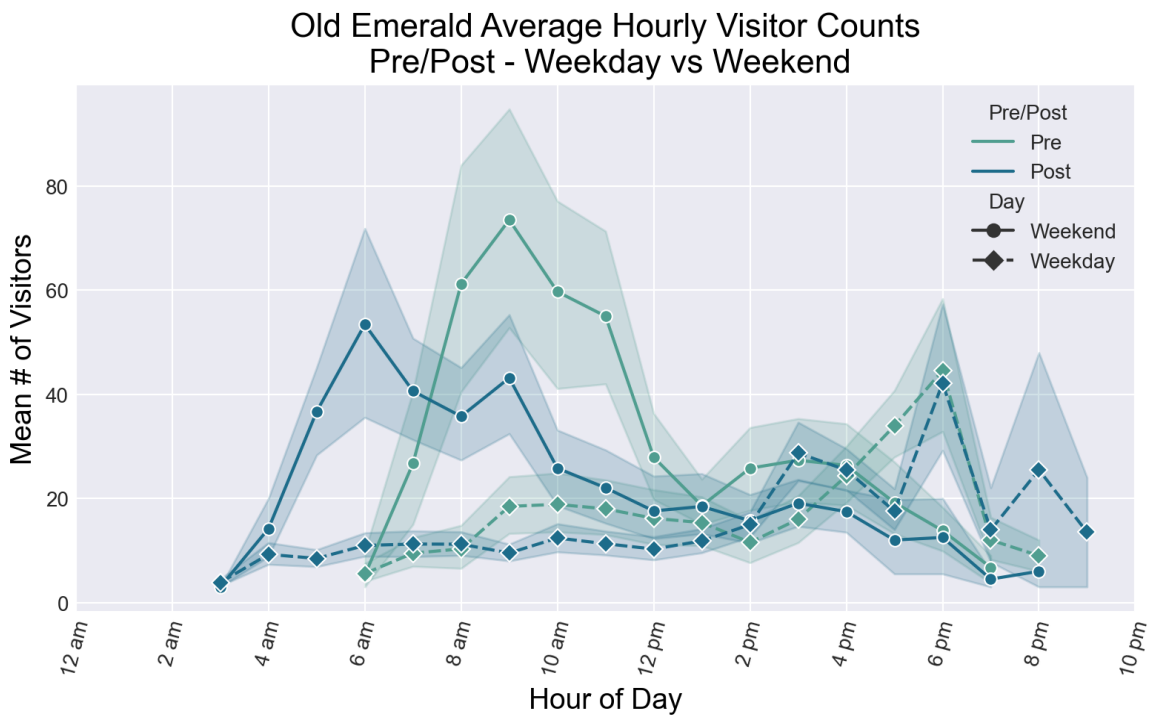
TRAFx Data

## B.2.3 Old Emerald



Note : Old Emerald corrected data from 05/01/21 to 08/31/21(123 days) omitting zero count hours.

**Figure B.11:** Old Emerald visitor counts by day of the week.

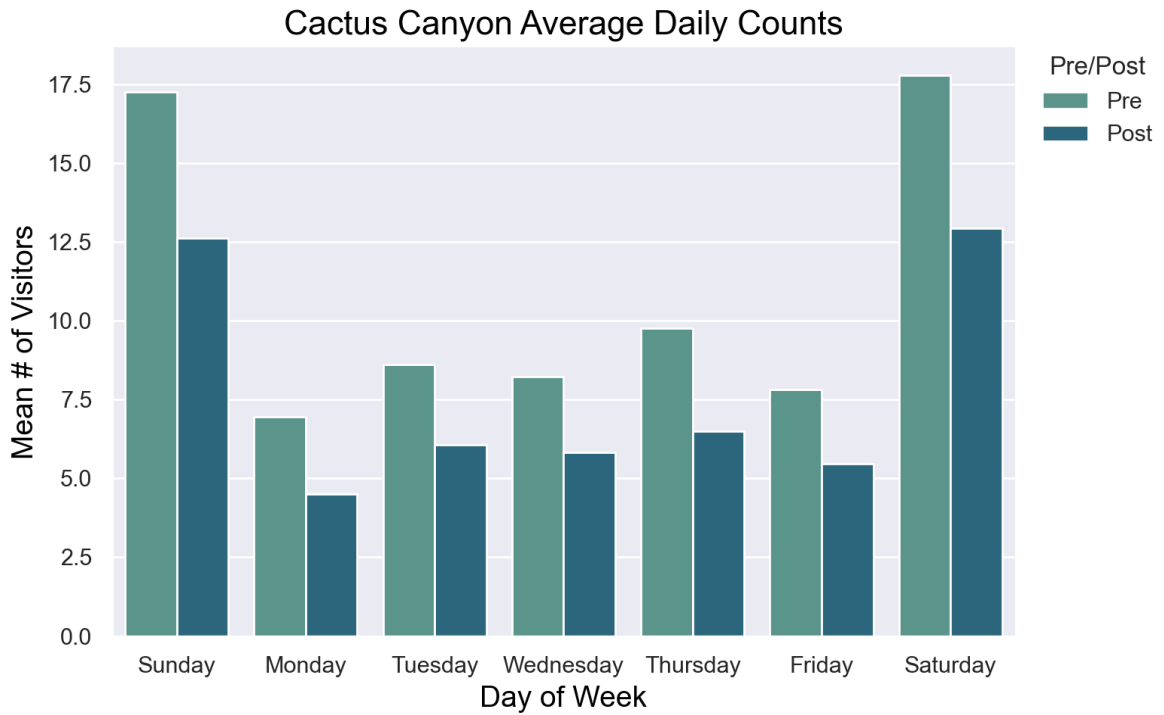


**Figure B.12:** Old Emerald visitor counts by Pre/Post pilot program hour of the day, weekday vs weekend.

# Appendix B.3. Santiago Oaks Regional Park

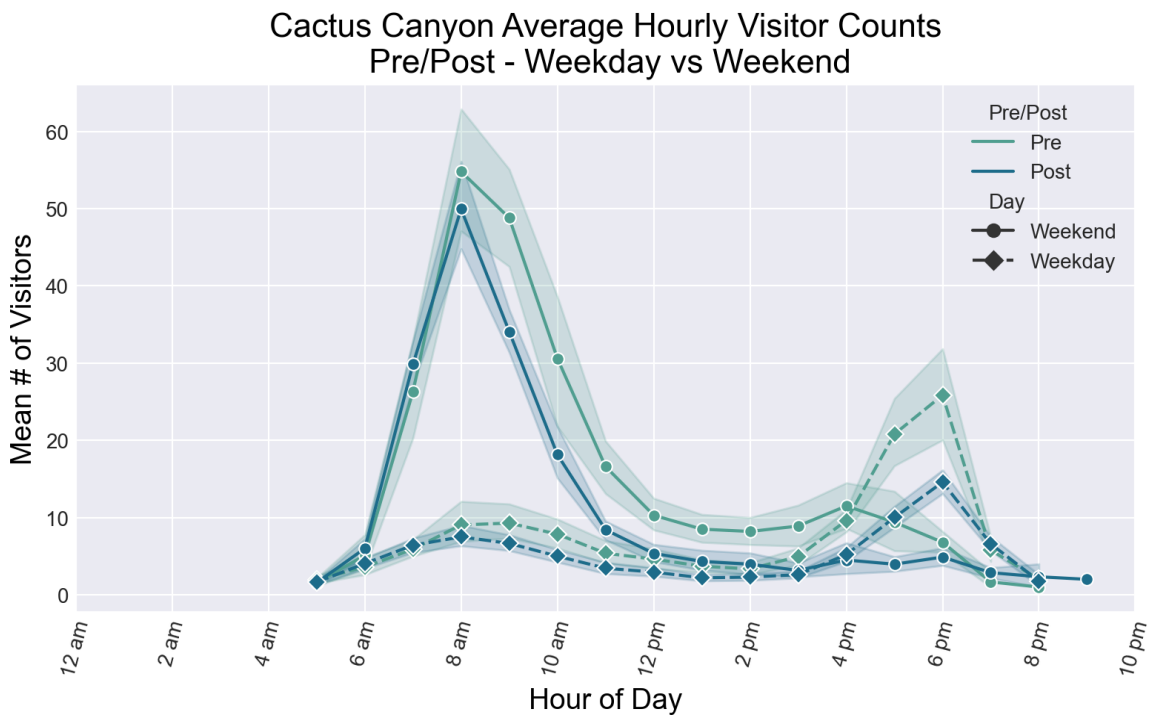
## TRAFx Data

### B.3.1 Cactus Canyon



Note : Cactus Canyon corrected data from 05/01/21 to 08/31/21(123 days) omitting zero count hours.

**Figure B.13:** Cactus Canyon visitor counts by day of the week.



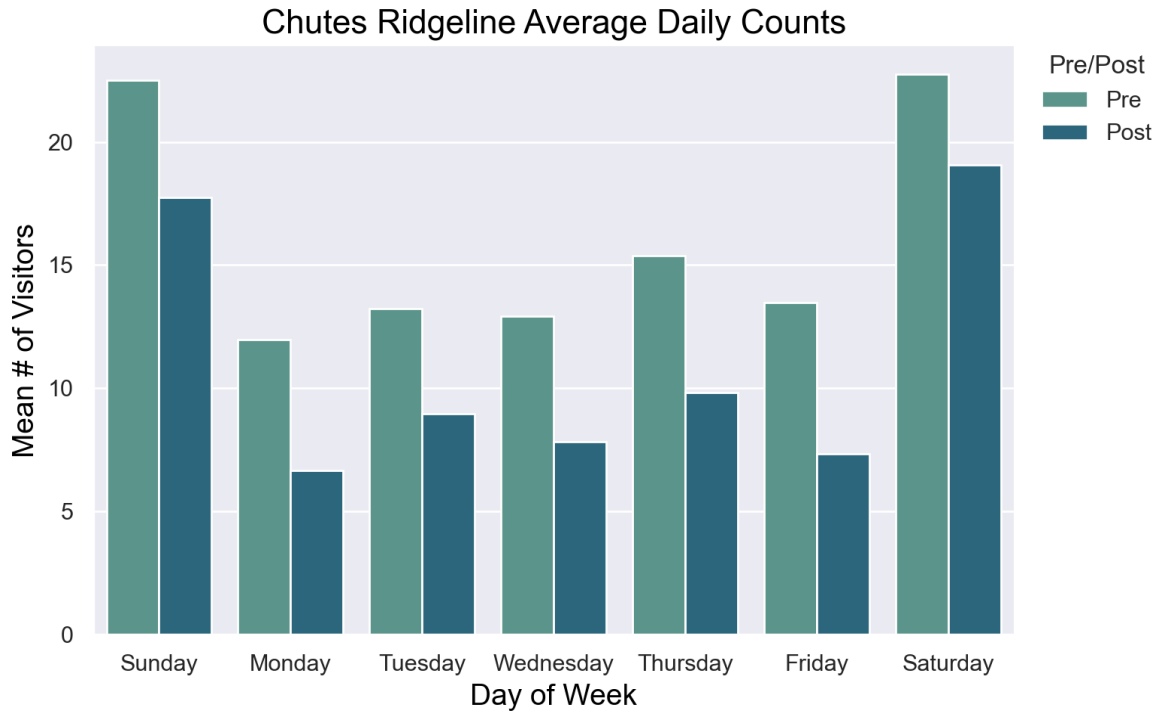
Note : Cactus Canyon corrected data from 05/01/21 to 08/31/21(123 days) omitting zero count hours.

**Figure B.14:** Cactus Canyon visitor counts by Pre/Post pilot program hour of the day, weekday vs weekend.

# Appendix B.3. Santiago Oaks Regional Park

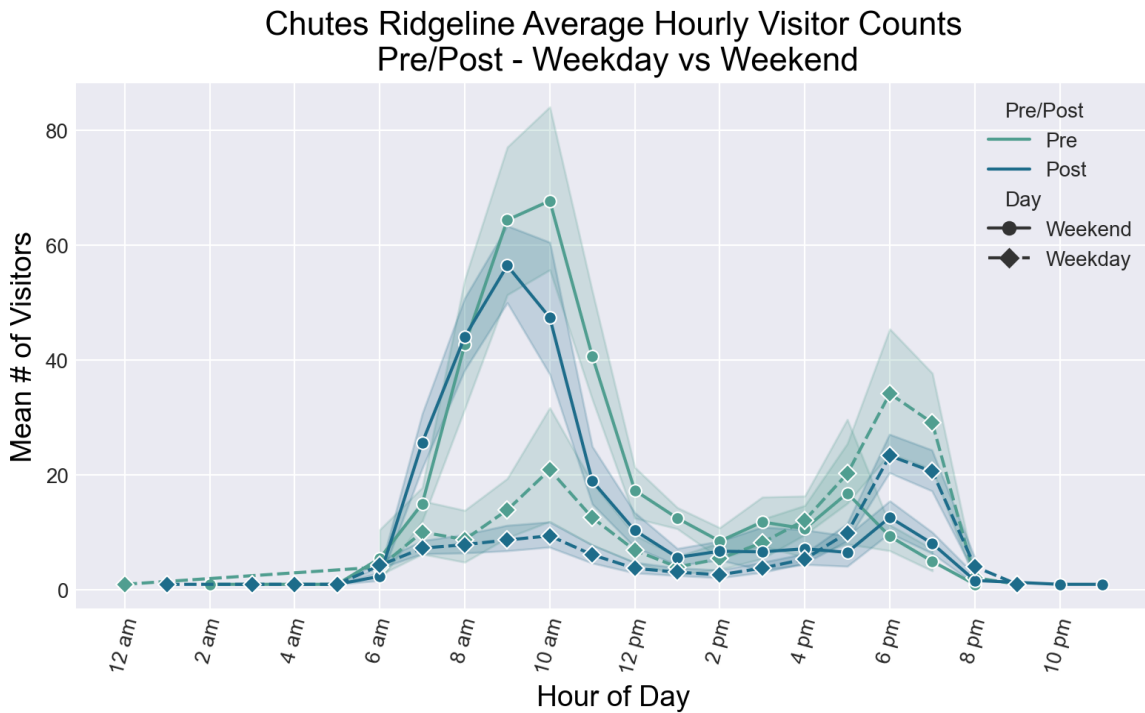
TRAFx Data

## B.3.2 Chutes Ridgeline



Note : Chutes Ridgeline corrected data from 05/01/21 to 08/31/21(100 days) omitting zero count hours.

**Figure B.15:** Chutes Ridgeline visitor counts by day of the week.

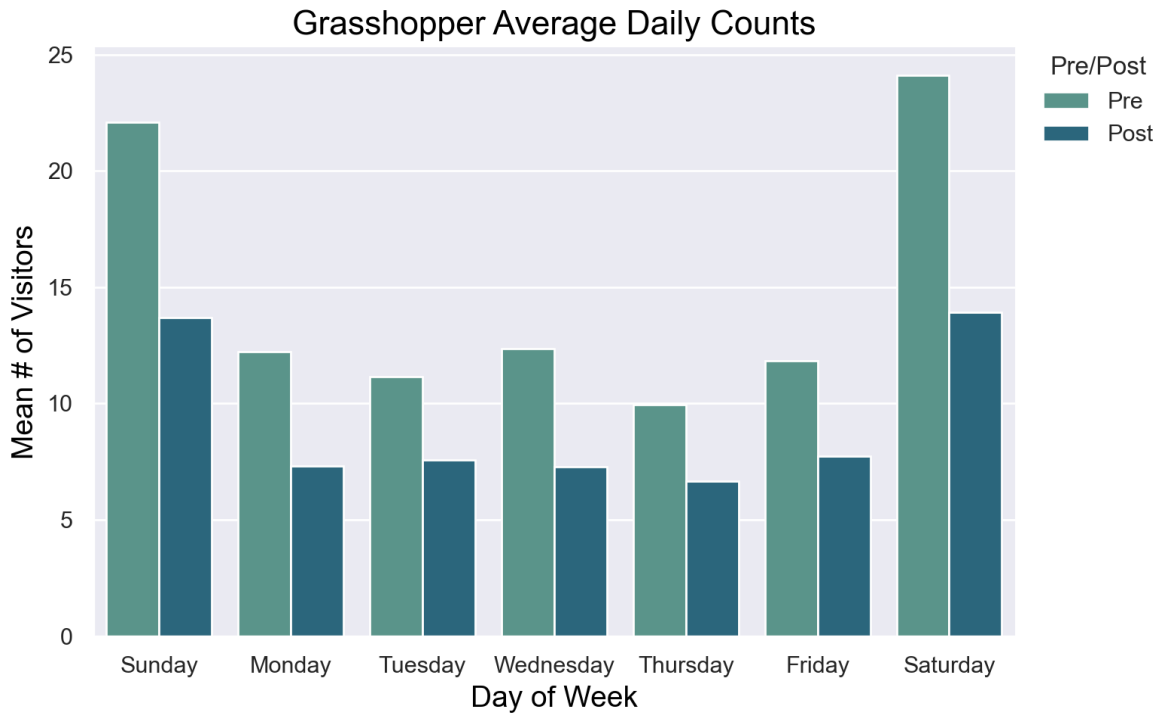


**Figure B.16:** Chutes Ridgeline visitor counts by Pre/Post pilot program hour of the day, weekday vs weekend

# Appendix B.3. Santiago Oaks Regional Park

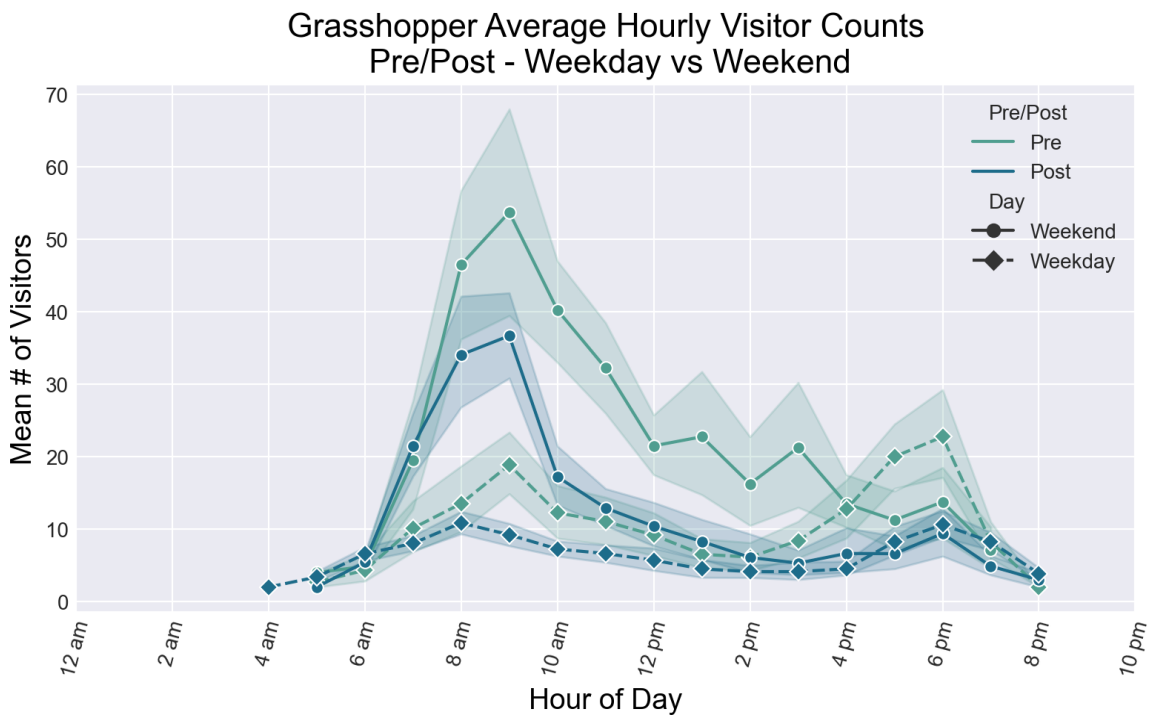
TRAFx Data

## B.3.3 Grasshopper



Note : Grasshopper corrected data from 05/01/21 to 08/31/21(117 days) omitting zero count hours.

**Figure B.17:** Grasshopper visitor counts by day of the week.



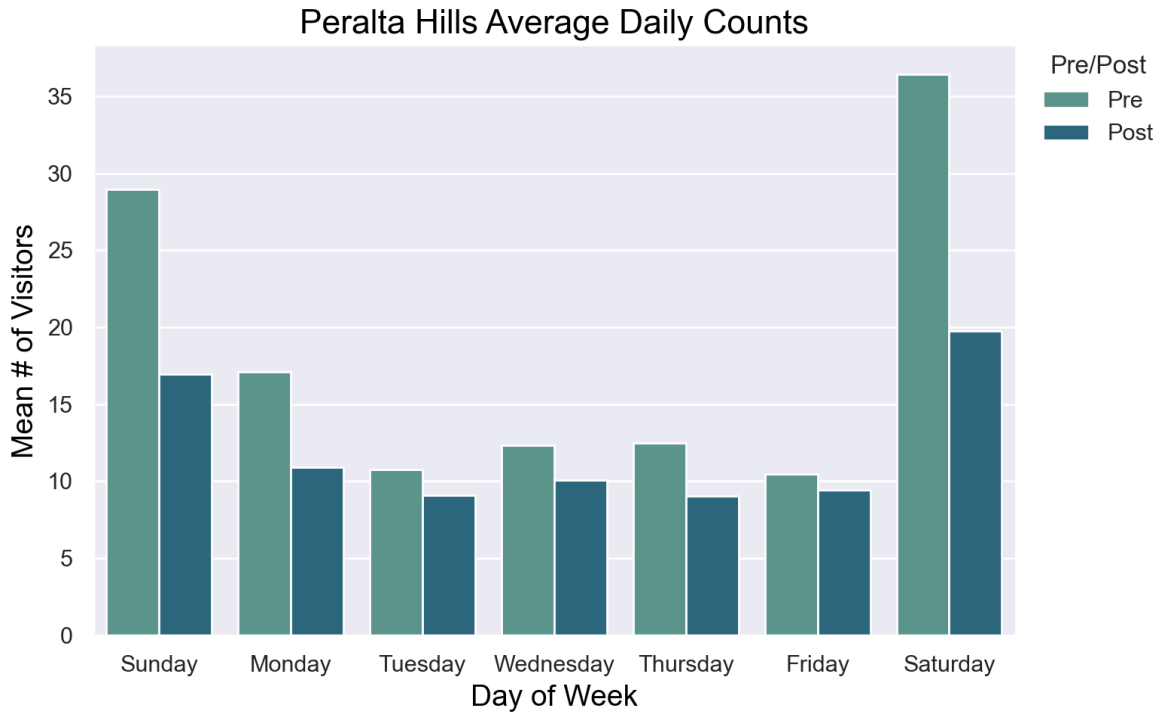
Note : Grasshopper corrected data from 05/01/21 to 08/31/21(117 days) omitting zero count hours.

**Figure B.18:** Grasshopper visitor counts by Pre/Post pilot program hour of the day, weekday vs weekend.

# Appendix B.3. Santiago Oaks Regional Park

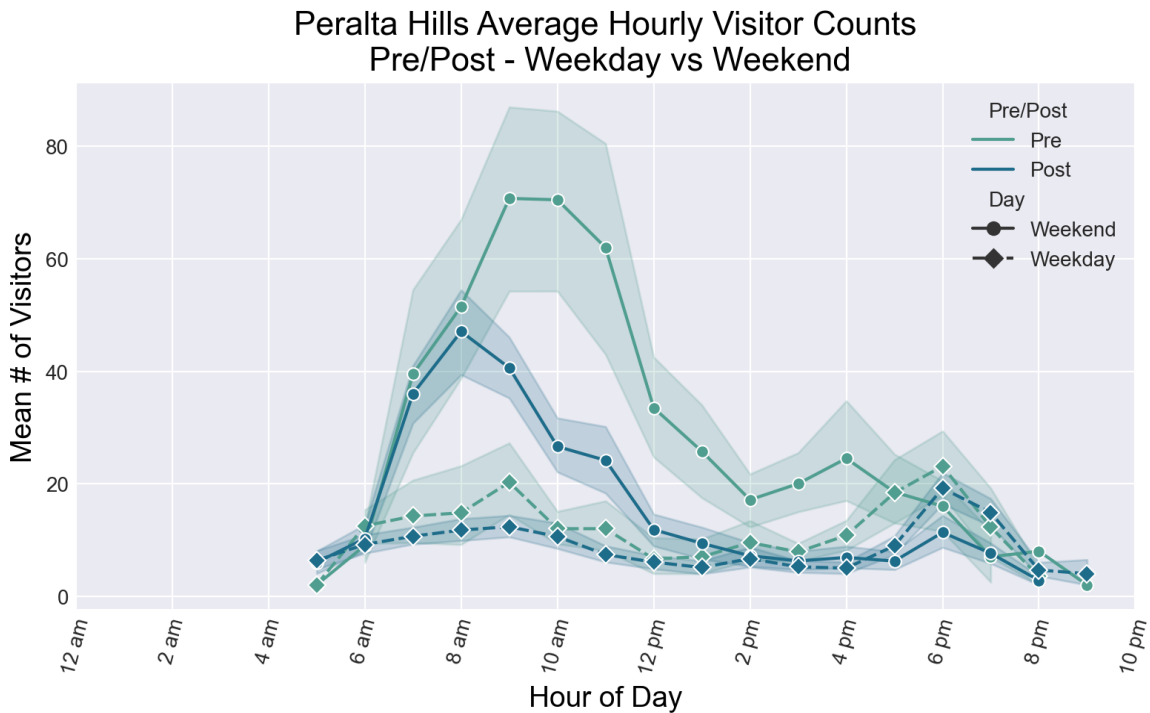
TRAFx Data

## B.3.4 Peralta Hills



Note : Peralta Hills corrected data from 05/01/21 to 08/31/21(117 days) omitting zero count hours.

**Figure B.19:** Peralta Hills visitor counts by day of the week.

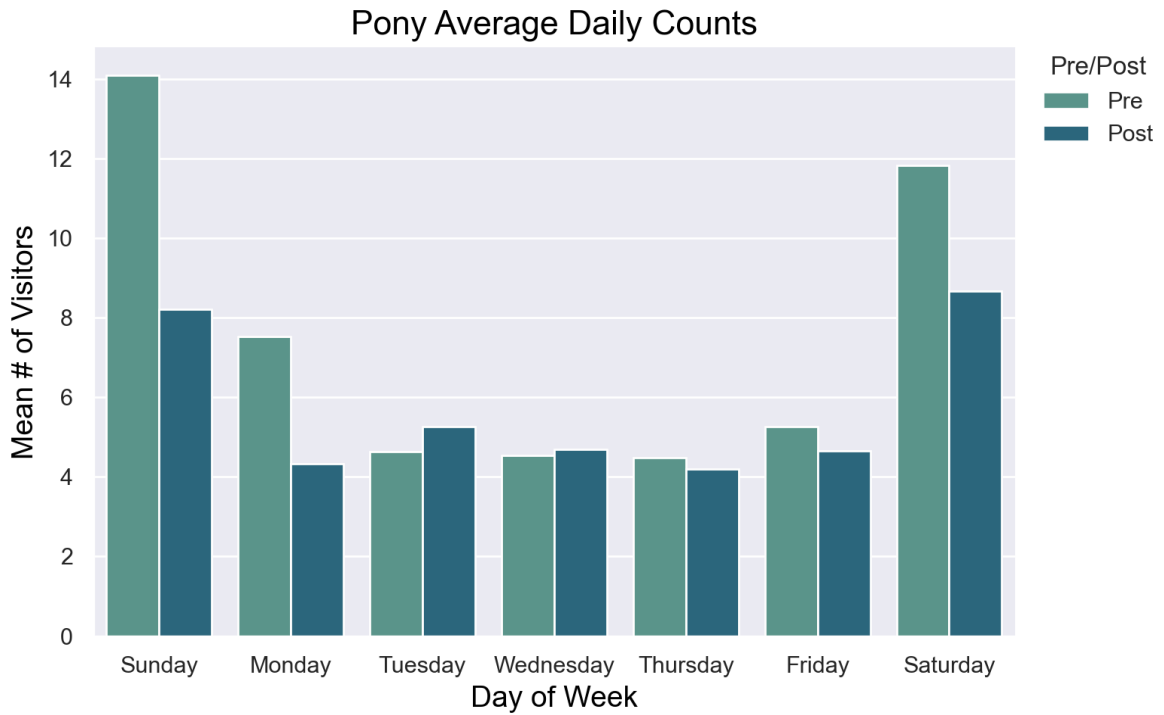


**Figure B.20:** Peralta Hills visitor counts by Pre/Post pilot program hour of the day, weekday vs weekend.

# Appendix B.3. Santiago Oaks Regional Park

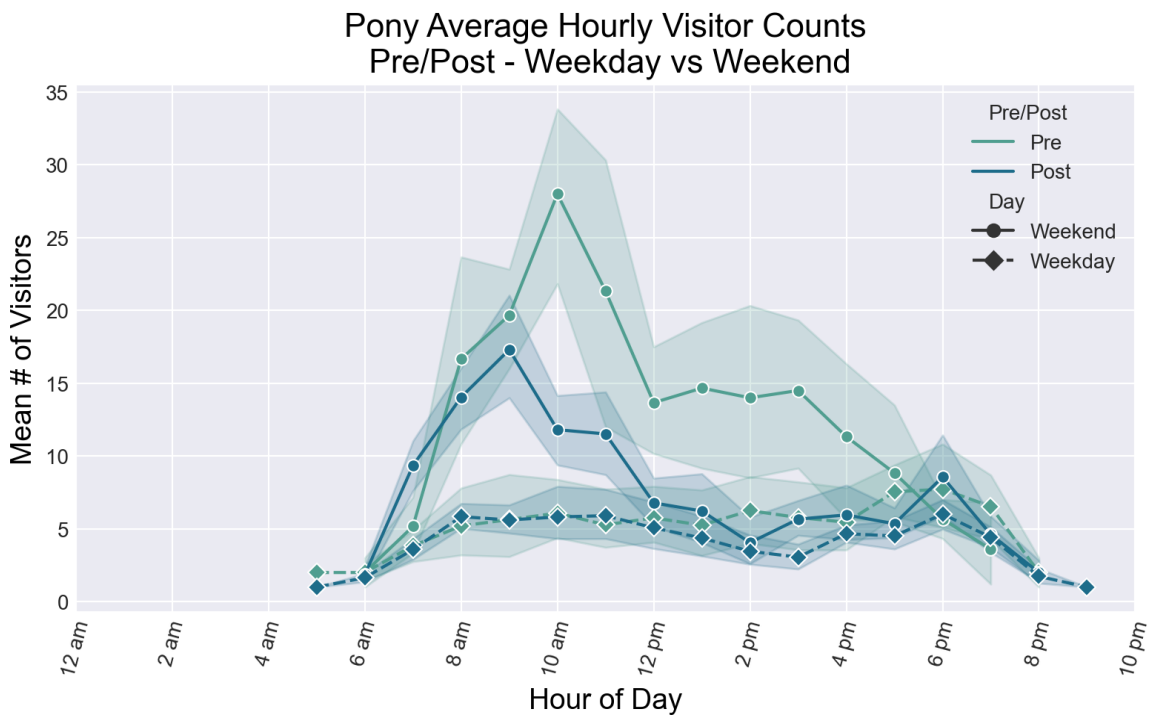
TRAFx Data

## B.3.5 Pony



Note : Pony corrected data from 05/01/21 to 08/31/21(112 days) omitting zero count hours.

**Figure B.21:** Pony visitor counts by day of the week.



Note : Pony corrected data from 05/01/21 to 08/31/21(112 days) omitting zero count hours.

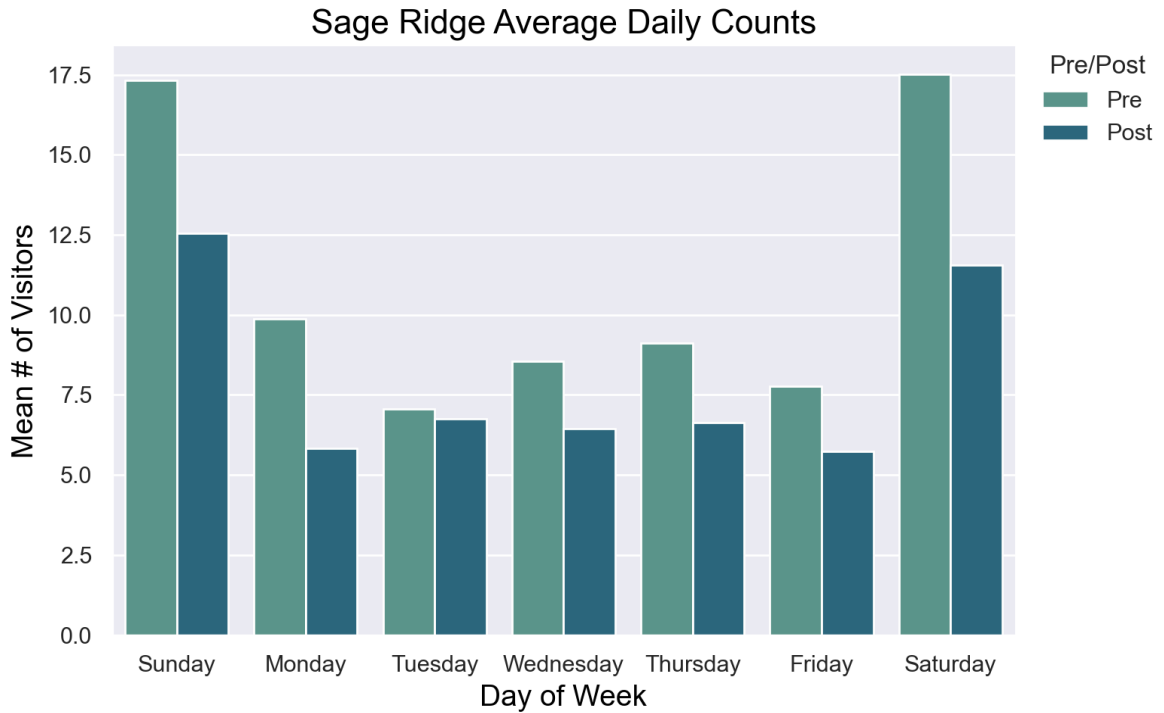
**Figure B.22:** Pony visitor counts by Pre/Post pilot program hour of the day, weekday vs weekend.



# Appendix B.3. Santiago Oaks Regional Park

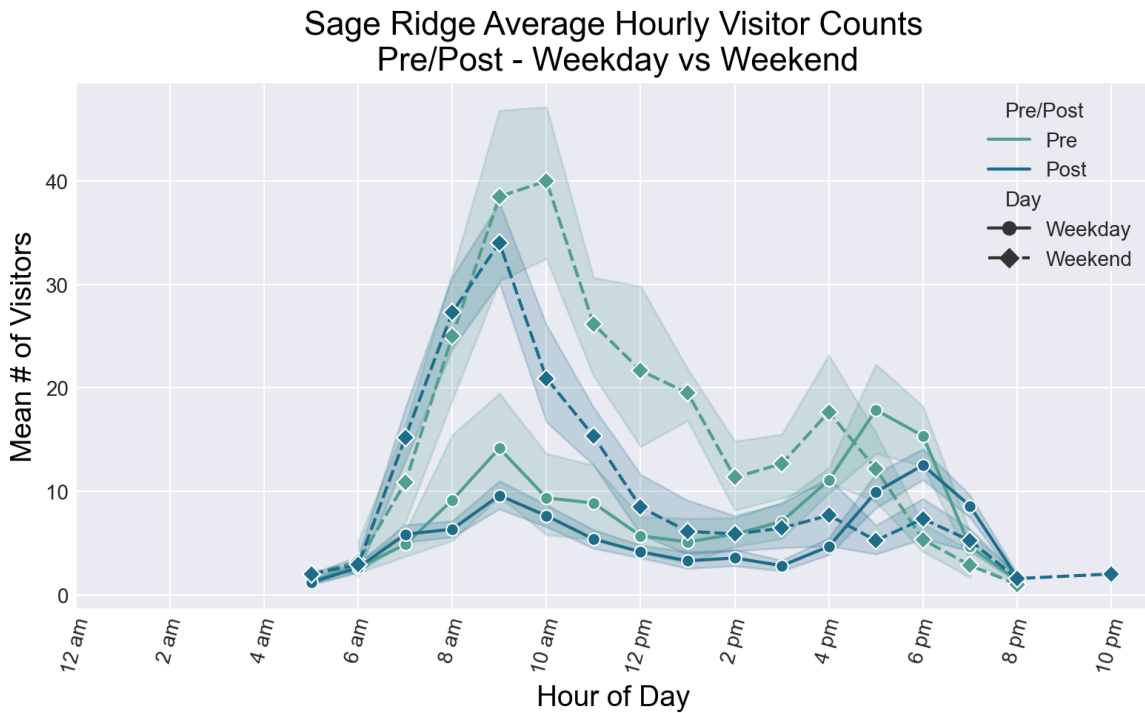
TRAFx Data

## B.3.6 Sage Ridge



Note : Sage Ridge corrected data from 05/12/21 to 08/31/21(112 days) omitting zero count hours.

**Figure B.23:** Sage Ridge visitor counts by day of the week.

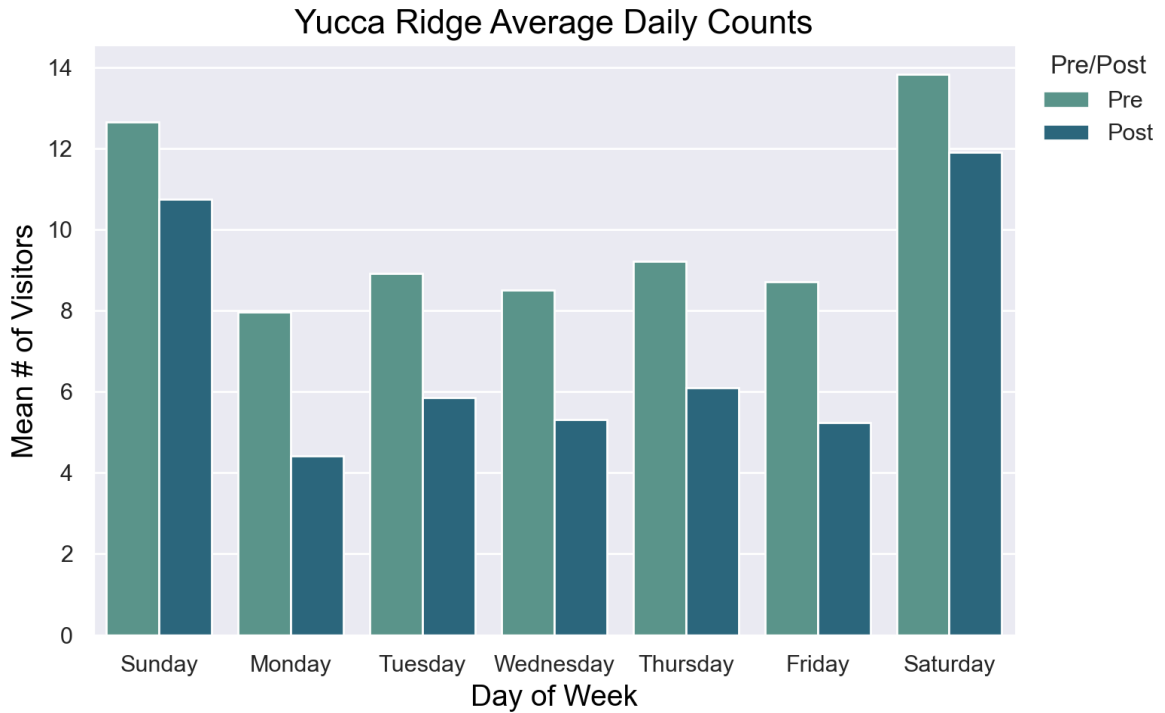


**Figure B.24:** Sage Ridge visitor counts by Pre/Post pilot program hour of the day, weekday vs weekend.

# Appendix B.3. Santiago Oaks Regional Park

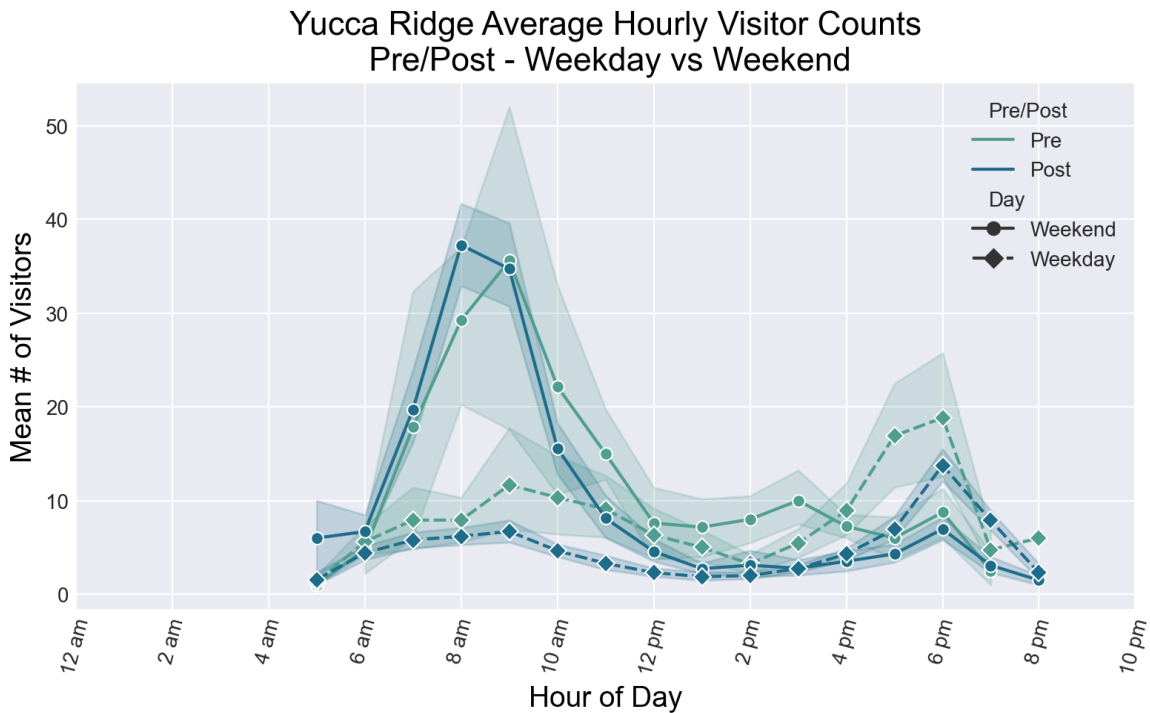
TRAFx Data

## B.3.7 Yucca Ridge



Note : Yucca Ridge corrected data from 05/01/21 to 08/31/21(111 days) omitting zero count hours.

**Figure B.25:** Yucca Ridge visitor counts by day of the week.

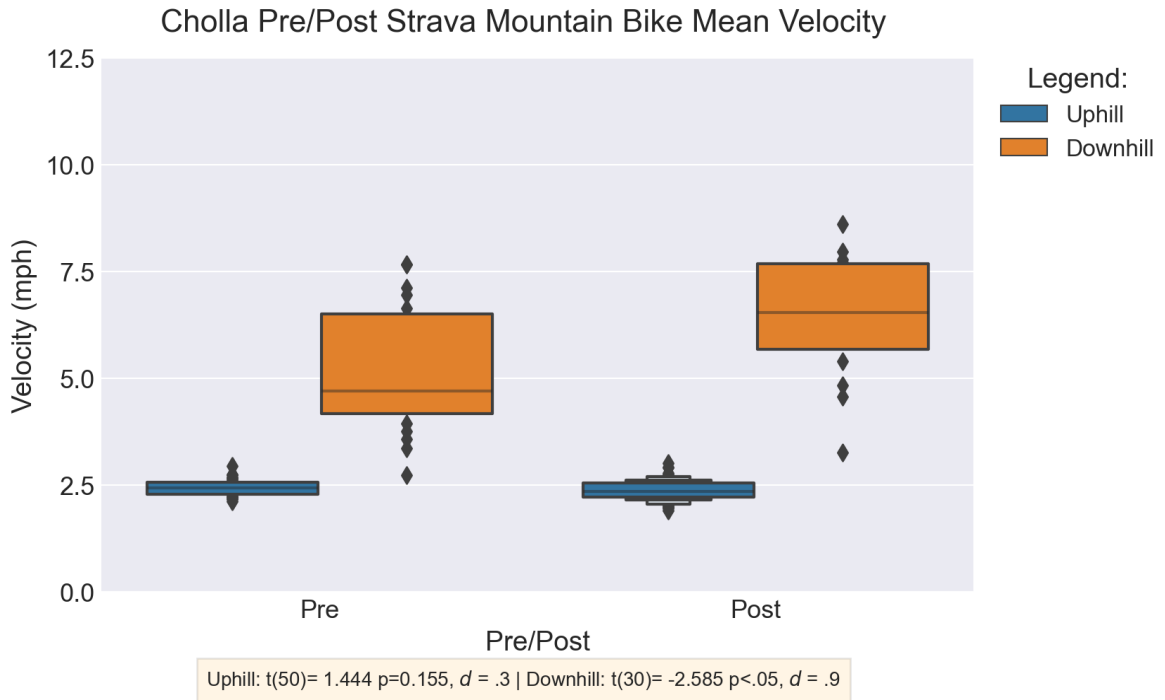


**Figure B.26:** Yucca Ridge visitor counts by Pre/Post pilot program hour of the day, weekday vs weekend.

## Appendix C: Strava Metro

### C.1. Aliso and Wood Canyons Wilderness Park

#### C.1.1 Cholla

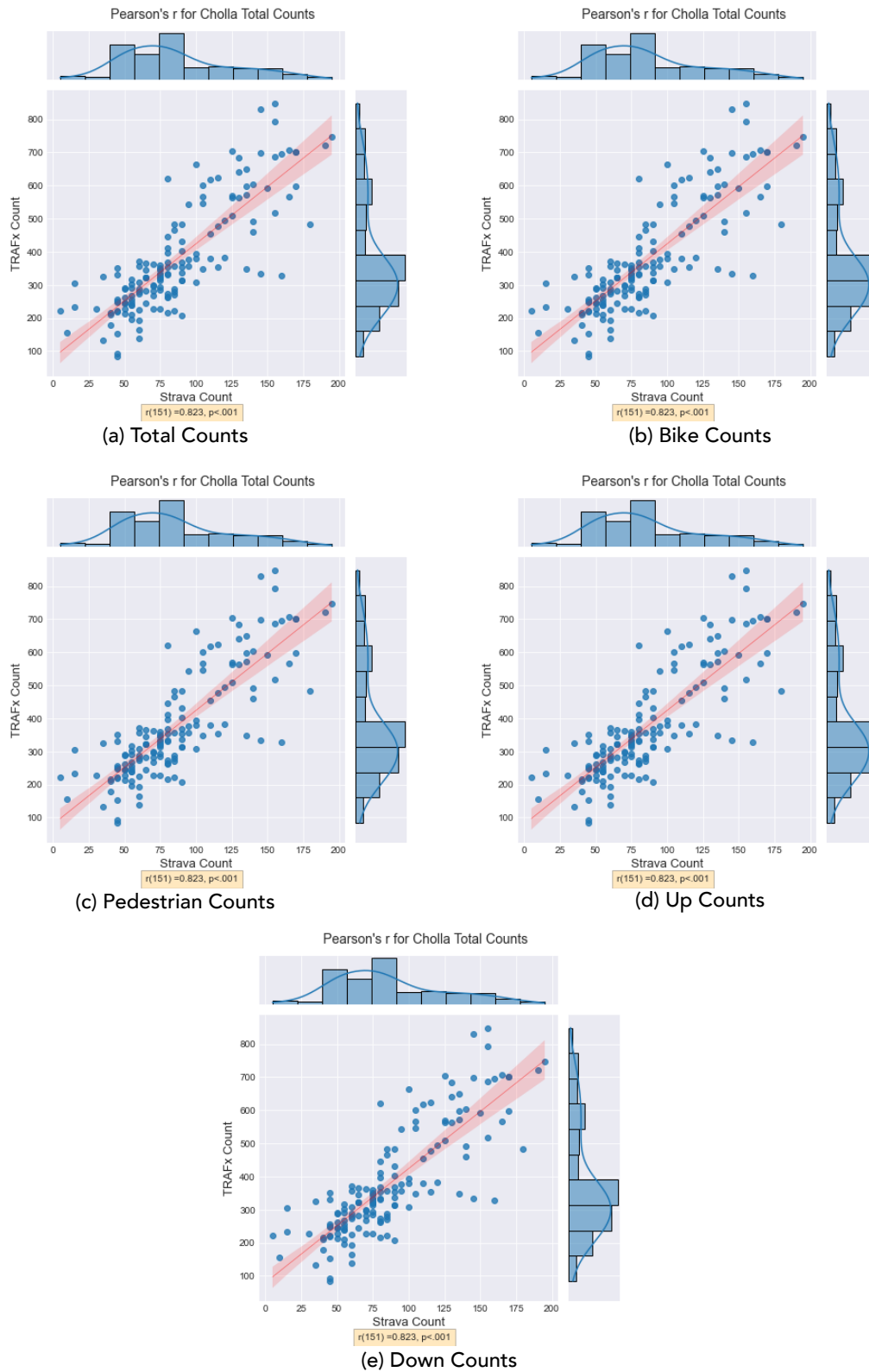


**Figure C.1:** Results of paired t-test comparing mountain bike uphill and downhill velocities on the Cholla Trail.

# Appendix C.1. Aliso Wood Canyon Wilderness Park

## Strava Metro Data

### C.1.1. Cholla

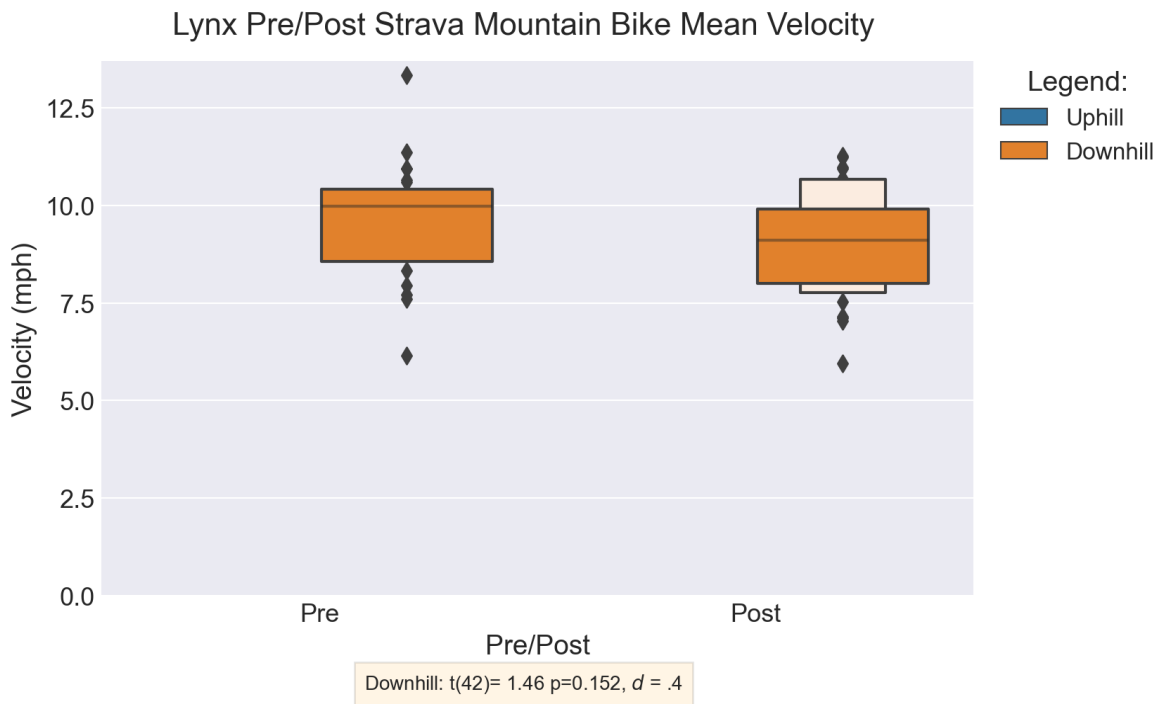


**Figure C.2:** Pearson's r correlation plots summarizing relationship between Strava Metro and TRAFx total, bike, pedestrian, up, and down counts for the Cholla trail.

# Appendix C.1. Aliso Wood Canyon Wilderness Park

## Strava Metro Data

### C.1.2. Lynx

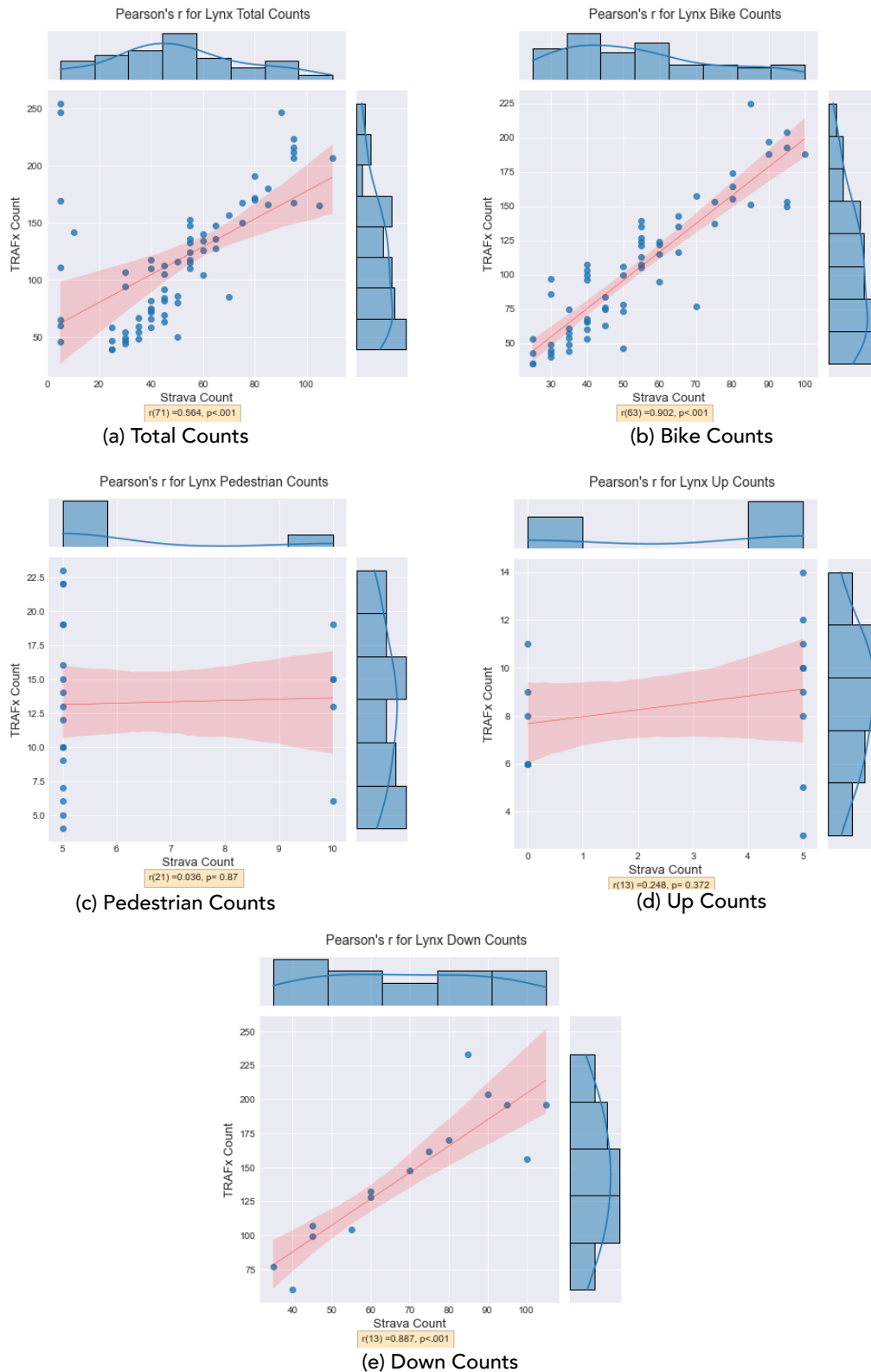


**Figure C.3:** Results of paired t-test comparing mountain bike uphill and downhill velocities on the Lynx Trail.

# Appendix C.1. Aliso Wood Canyon Wilderness Park

## Strava Metro Data

### C.1.2. Lynx

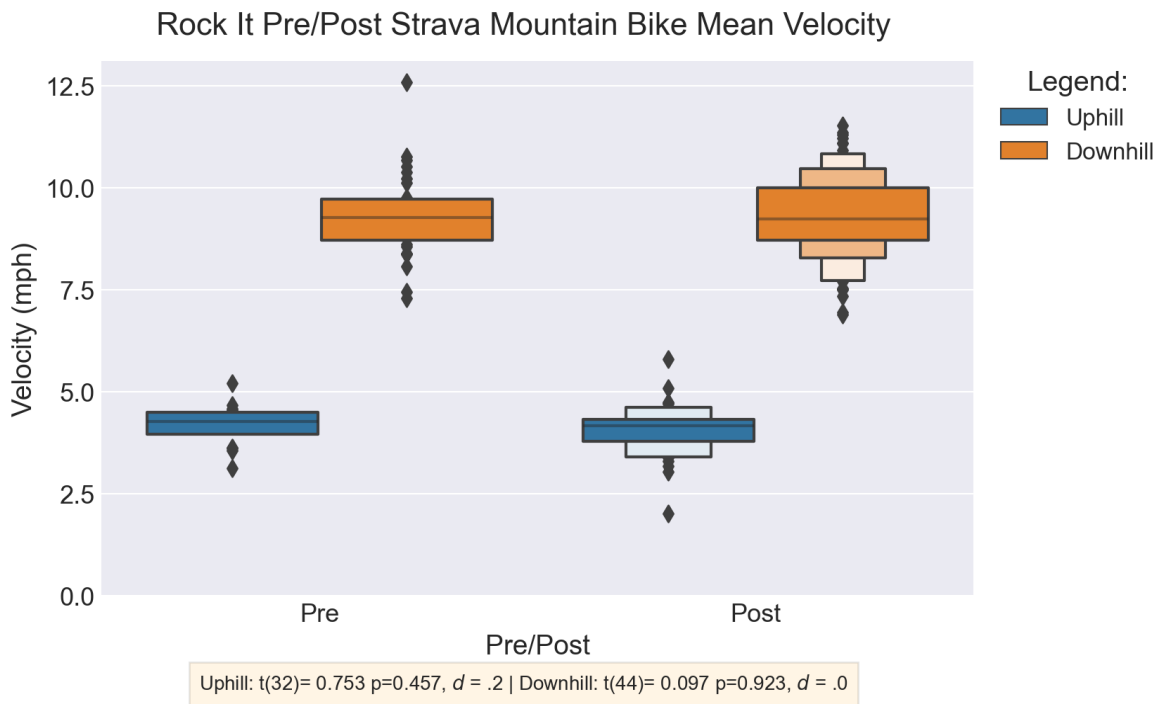


**Figure C.4:** Pearson's r correlation plots summarizing relationship between Strava Metro and TRAFx total, bike, pedestrian, up, and down counts for the Lynx trail.

# Appendix C.1. Aliso Wood Canyon Wilderness Park

## Strava Metro Data

### C.1.3. Rock-It



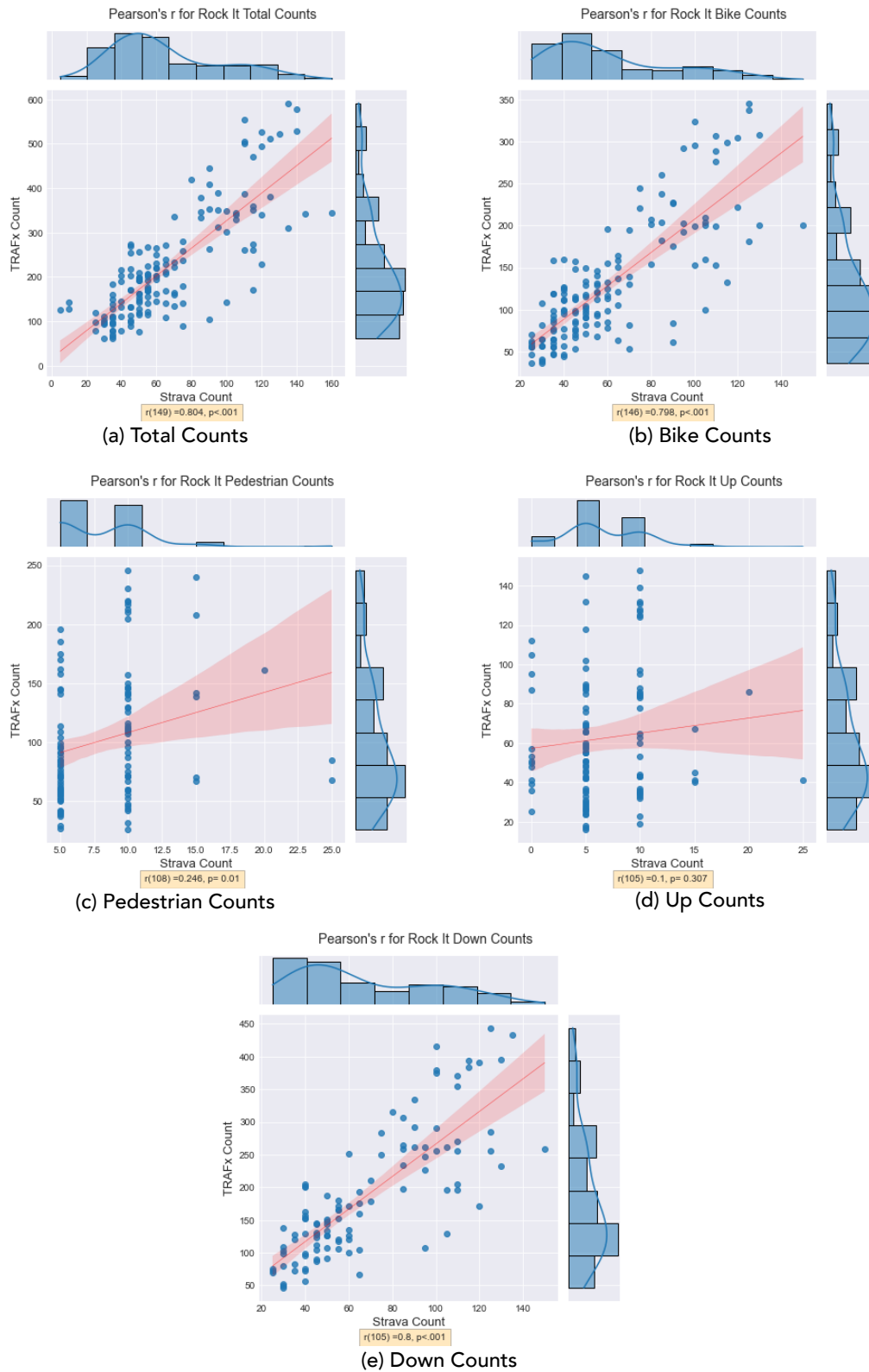
**Figure C.5:** Results of paired t-test comparing mountain bike uphill and downhill velocities on the Rock-It Trail.



# Appendix C.1. Aliso Wood Canyon Wilderness Park

## Strava Metro Data

### C.1.3. Rock-It

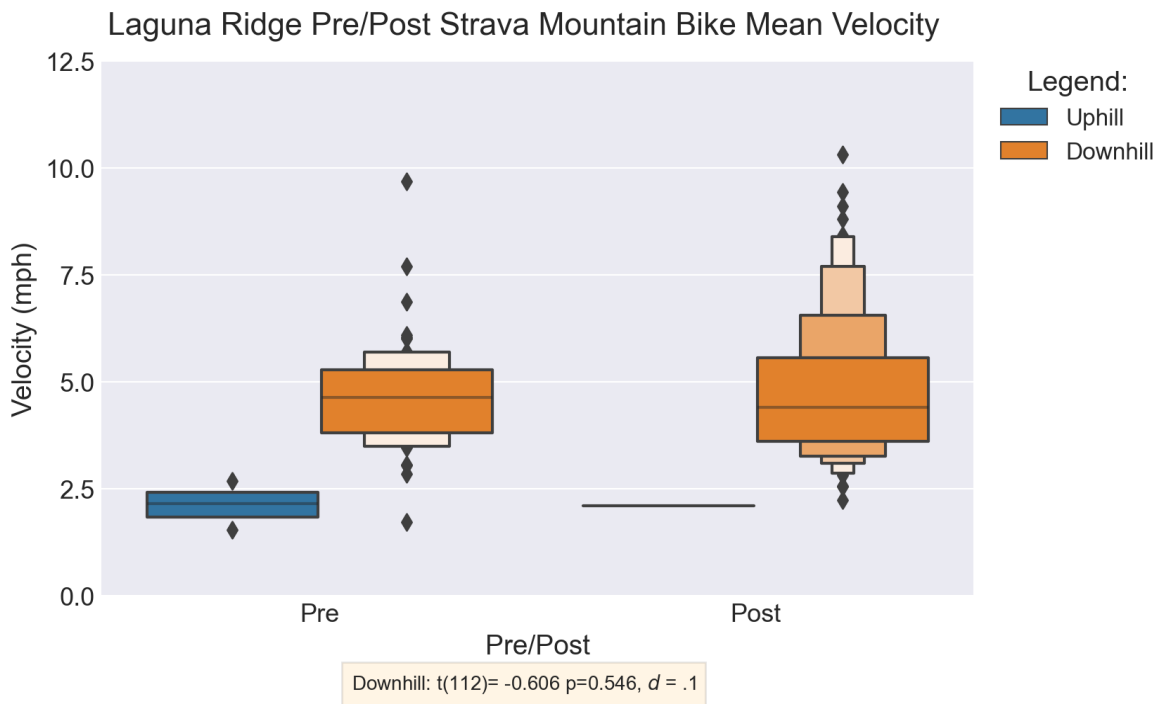


**Figure C.6:** Pearson's r correlation plots summarizing relationship between Strava Metro and TRAFx total, bike, pedestrian, up, and down counts for the Rock It trail.

# Appendix C.2. Laguna Coast Wilderness

## Strava Metro Data

### C.2.1. Laguna Ridge

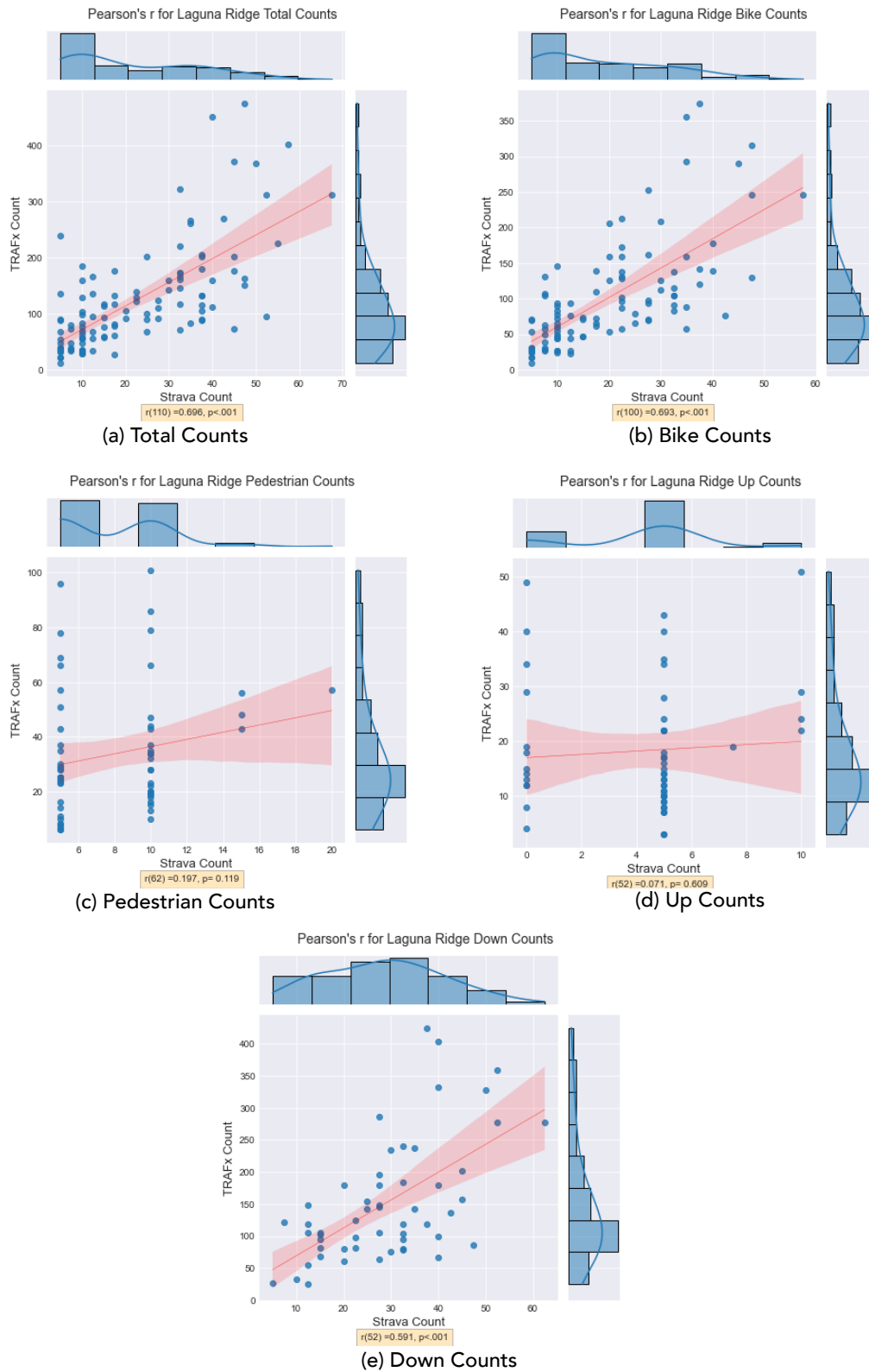


**Figure C.7:** Results of paired t-test comparing mountain bike uphill and downhill velocities on the Laguna Ridge Trail.

# Appendix C.2. Laguna Coast Wilderness

## Strava Metro Data

### C.2.1. Laguna Ridge

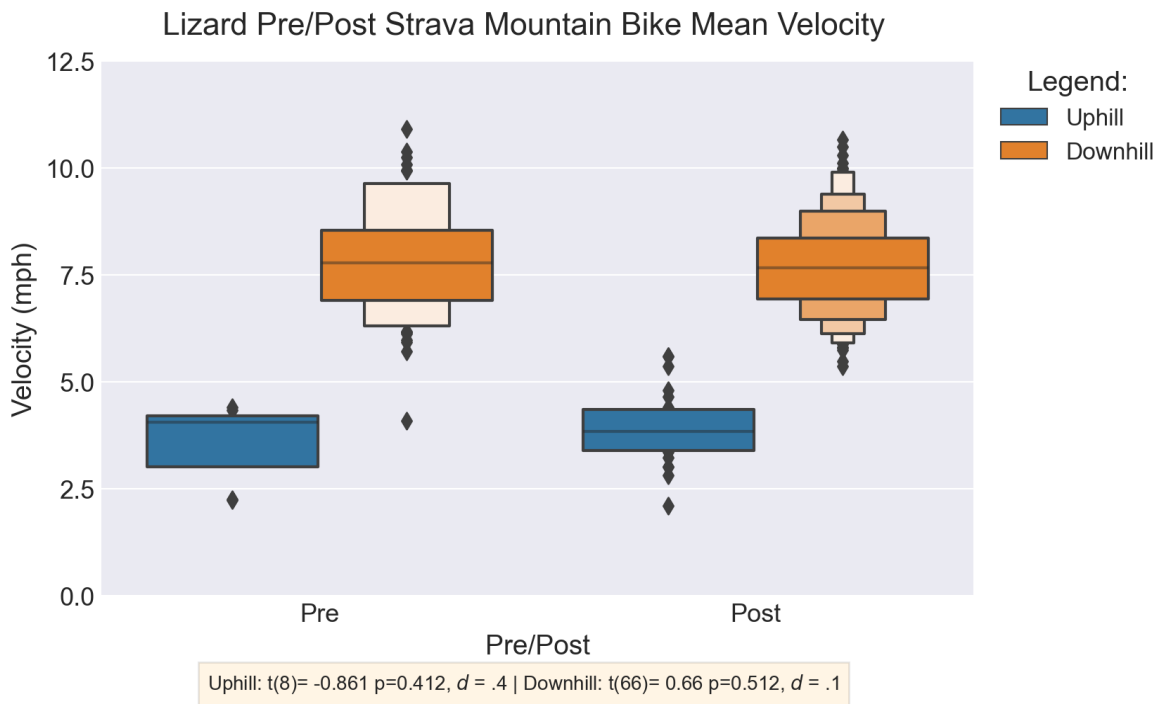


**Figure C.8:** Pearson's r correlation plots summarizing relationship between Strava Metro and TRAFx total, bike, pedestrian, up, and down counts for the Laguna Ridge trail.

# Appendix C.2. Laguna Coast Wilderness

## Strava Metro Data

### C.2.2. Lizard

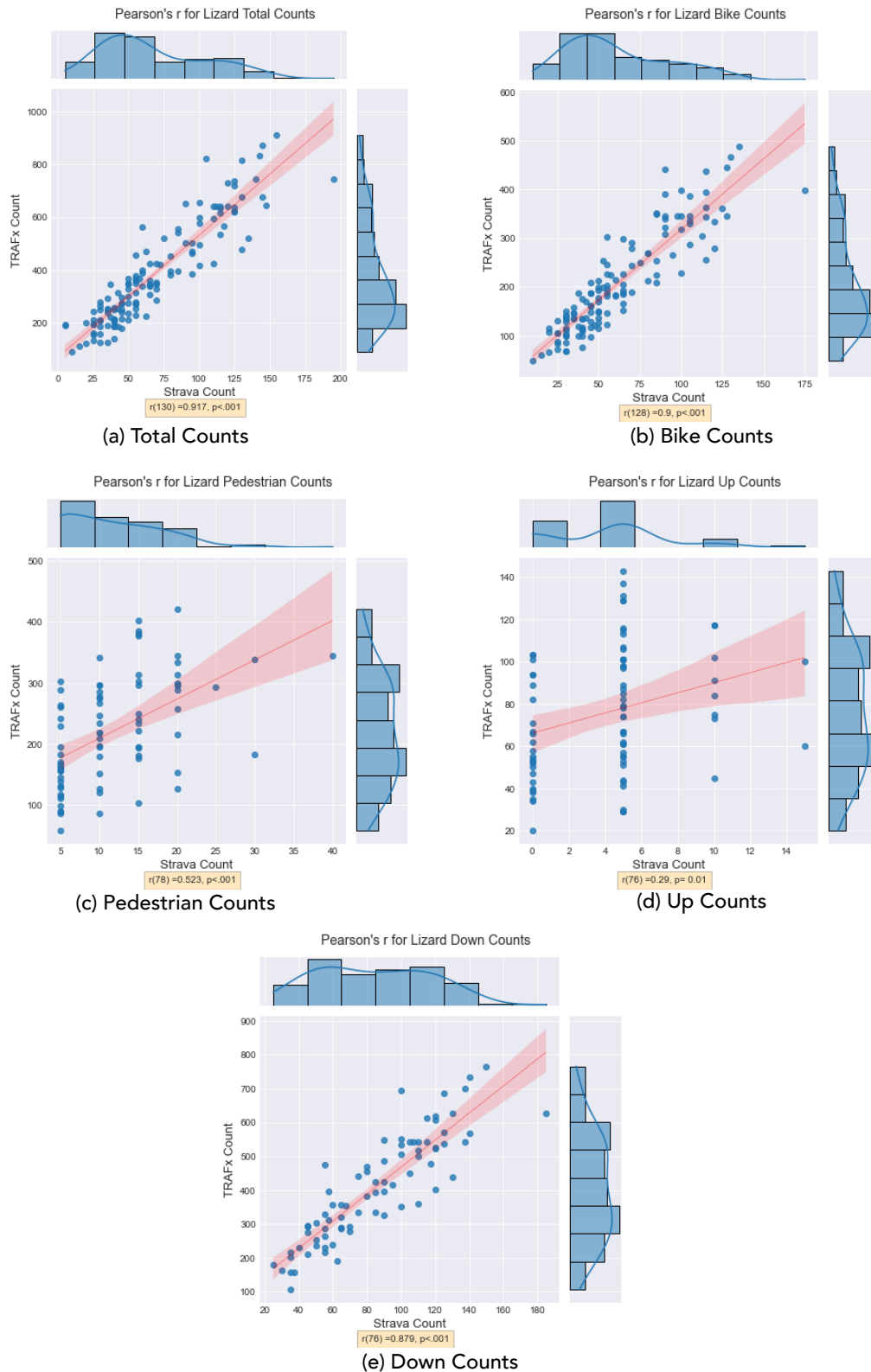


**Figure C.9:** Results of paired t-test comparing mountain bike uphill and downhill velocities on the Lizard Trail.

# Appendix C.2. Laguna Coast Wilderness

## Strava Metro Data

### C.2.2. Lizard

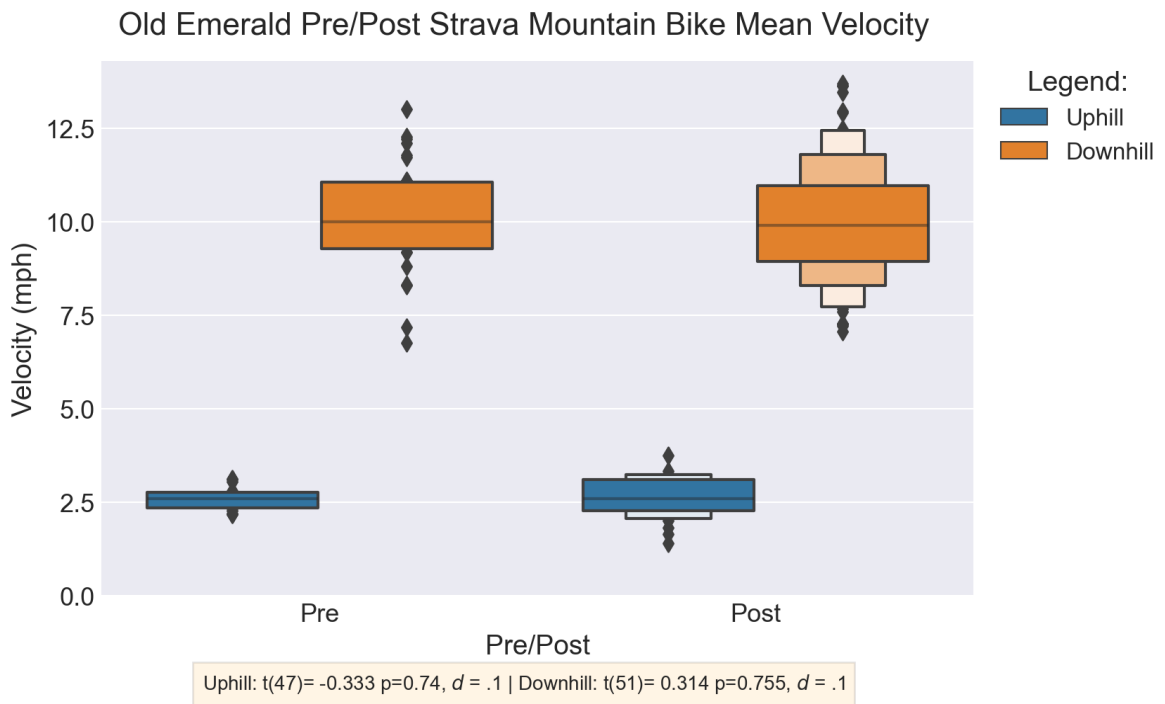


**Figure C.10:** Pearson's r correlation plots summarizing relationship between Strava Metro and TRAFx total, bike, pedestrian, up, and down counts for the Lizard trail.

# Appendix C.2. Laguna Coast Wilderness

Strava Metro Data

## C.2.3. Old Emerald

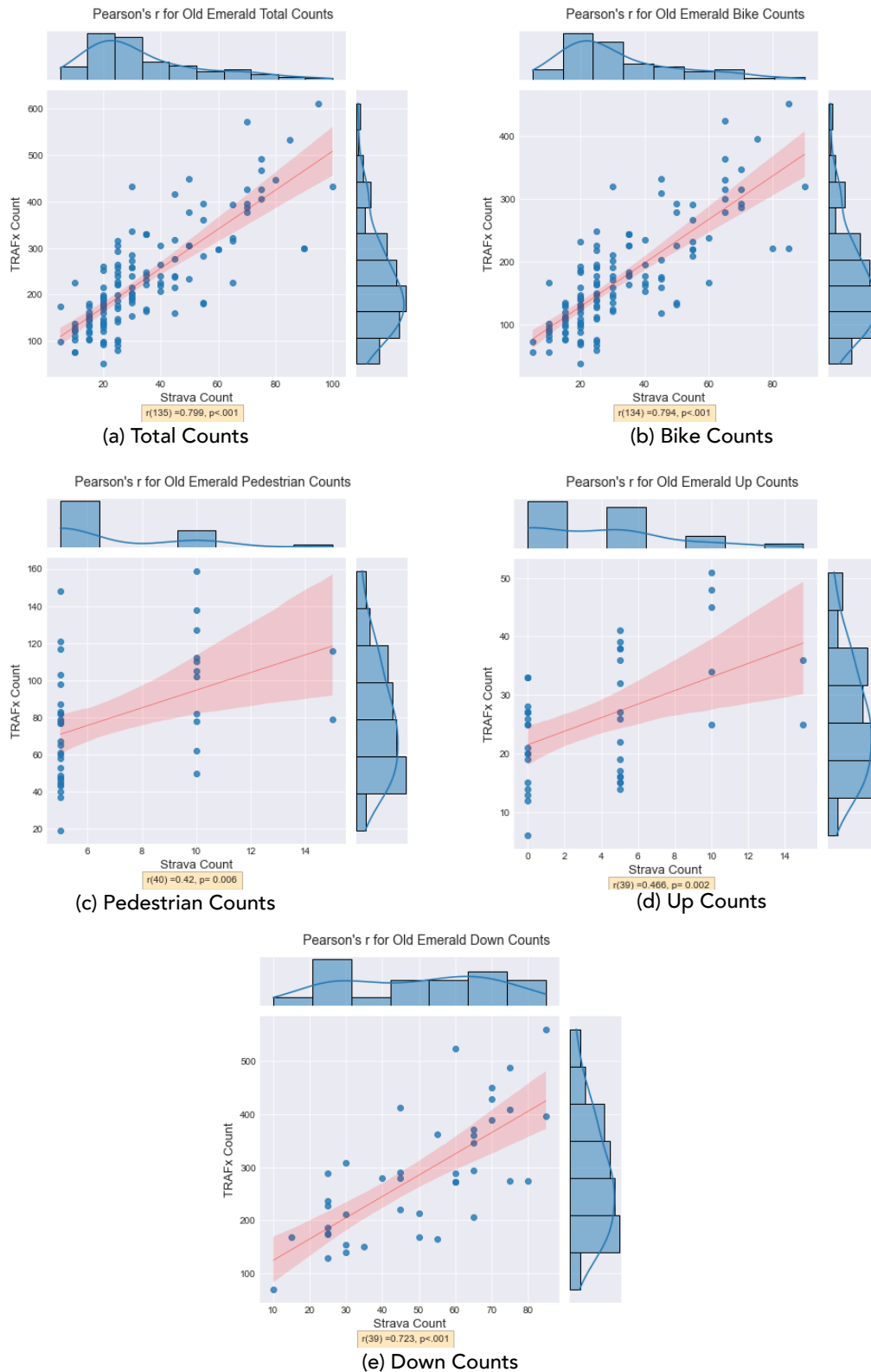


**Figure C.11:** Results of paired t-test comparing mountain bike uphill and downhill velocities on the Old Emerald Trail.

# Appendix C.2. Laguna Coast Wilderness

## Strava Metro Data

### C.2.3 Old Emerald



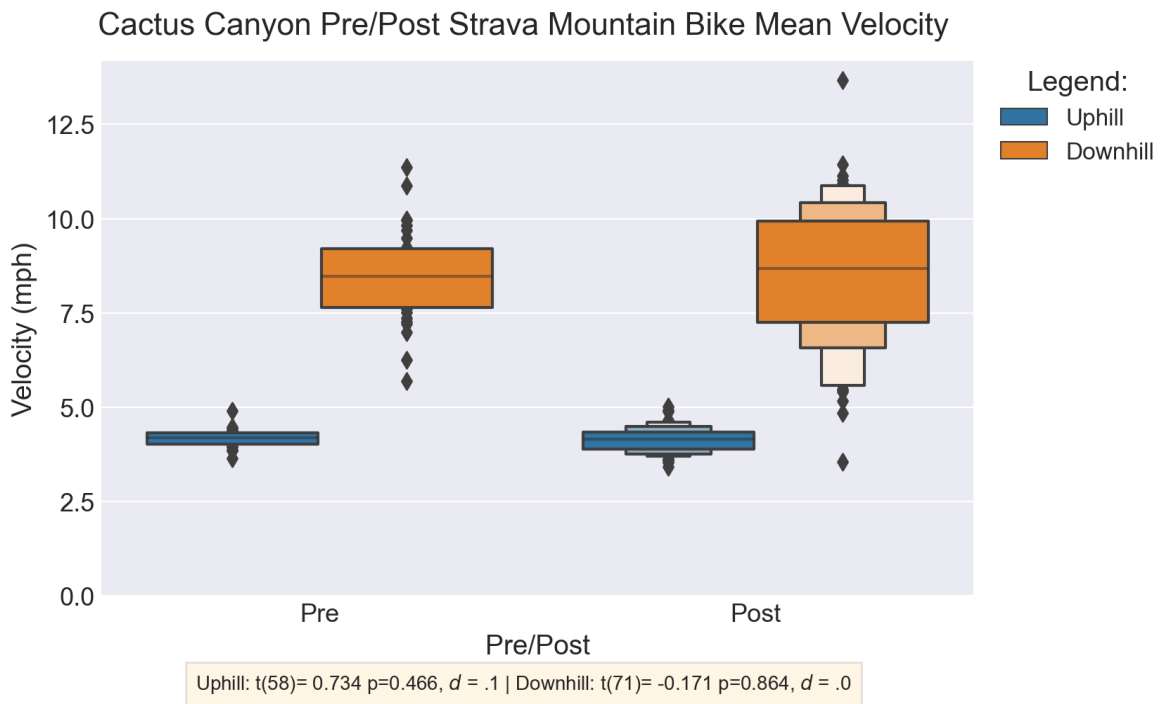
**Figure C.12:** Pearson's r correlation plots summarizing relationship between Strava Metro and TRAFx total, bike, pedestrian, up, and down counts for the Lizard trail.



# Appendix C.3. Santiago Oaks Regional Park

## Strava Metro Data

### C.3.1 Cactus Canyon

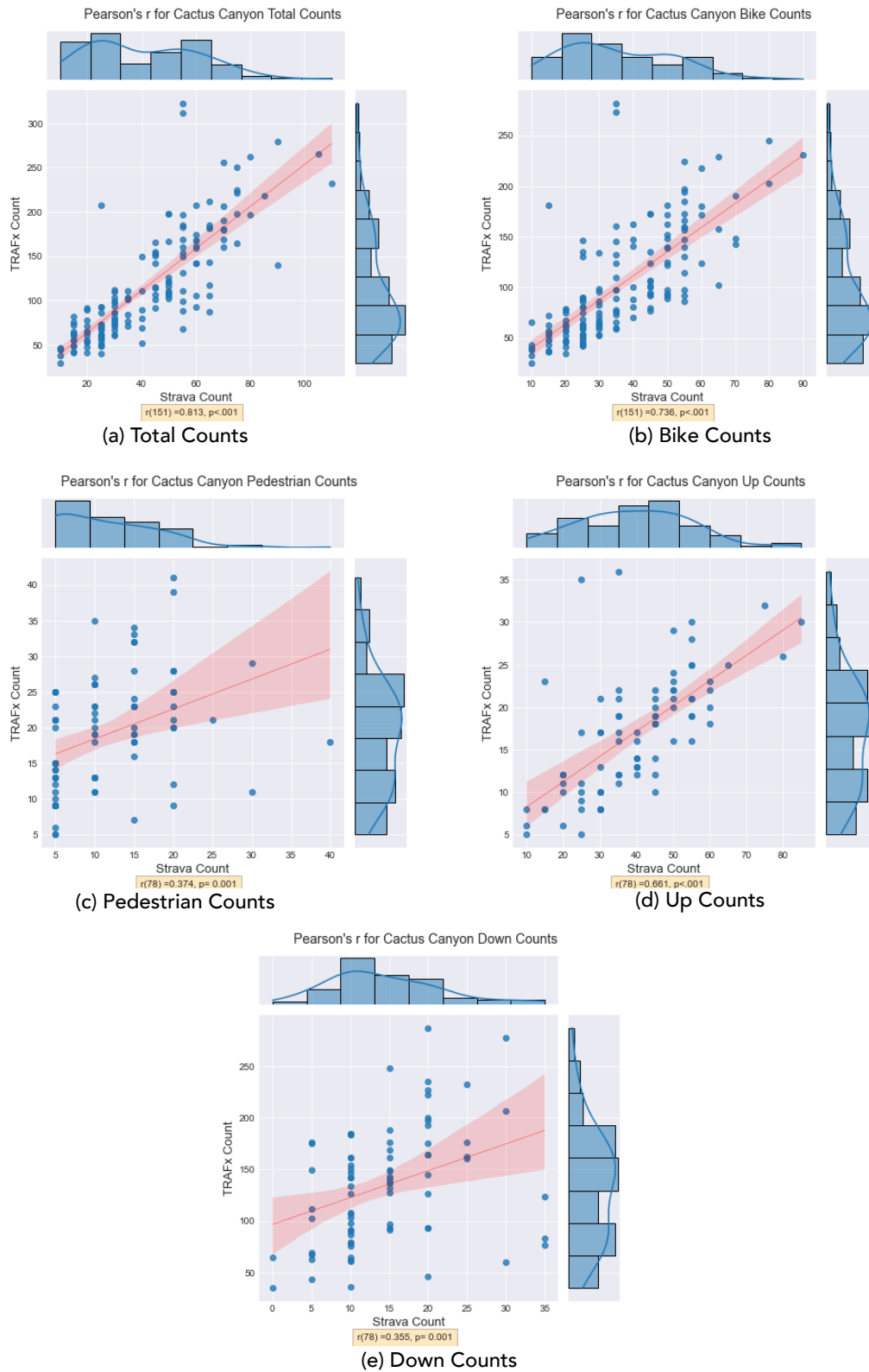


**Figure C.13:** Results of paired t-test comparing mountain bike uphill and downhill velocities on the Cactus Canyon Trail.

# Appendix C.3. Santiago Oaks Regional Park

## Strava Metro Data

### C.3.1 Cactus Canyon

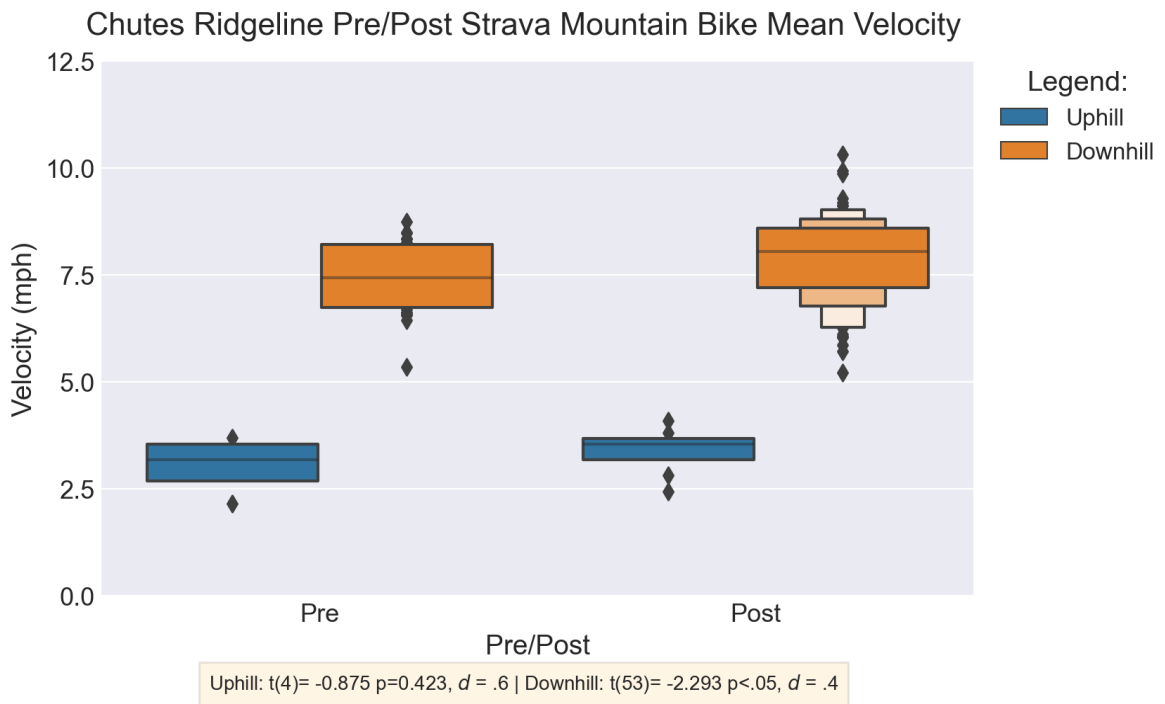


**Figure C.14:** Pearson's r correlation plots summarizing relationship between Strava Metro and TRAFx total, bike, pedestrian, up, and down counts for the Cactus Canyon trail.

# Appendix C.3. Santiago Oaks Regional Park

Strava Metro Data

## C.3.2 Chutes Ridgeline

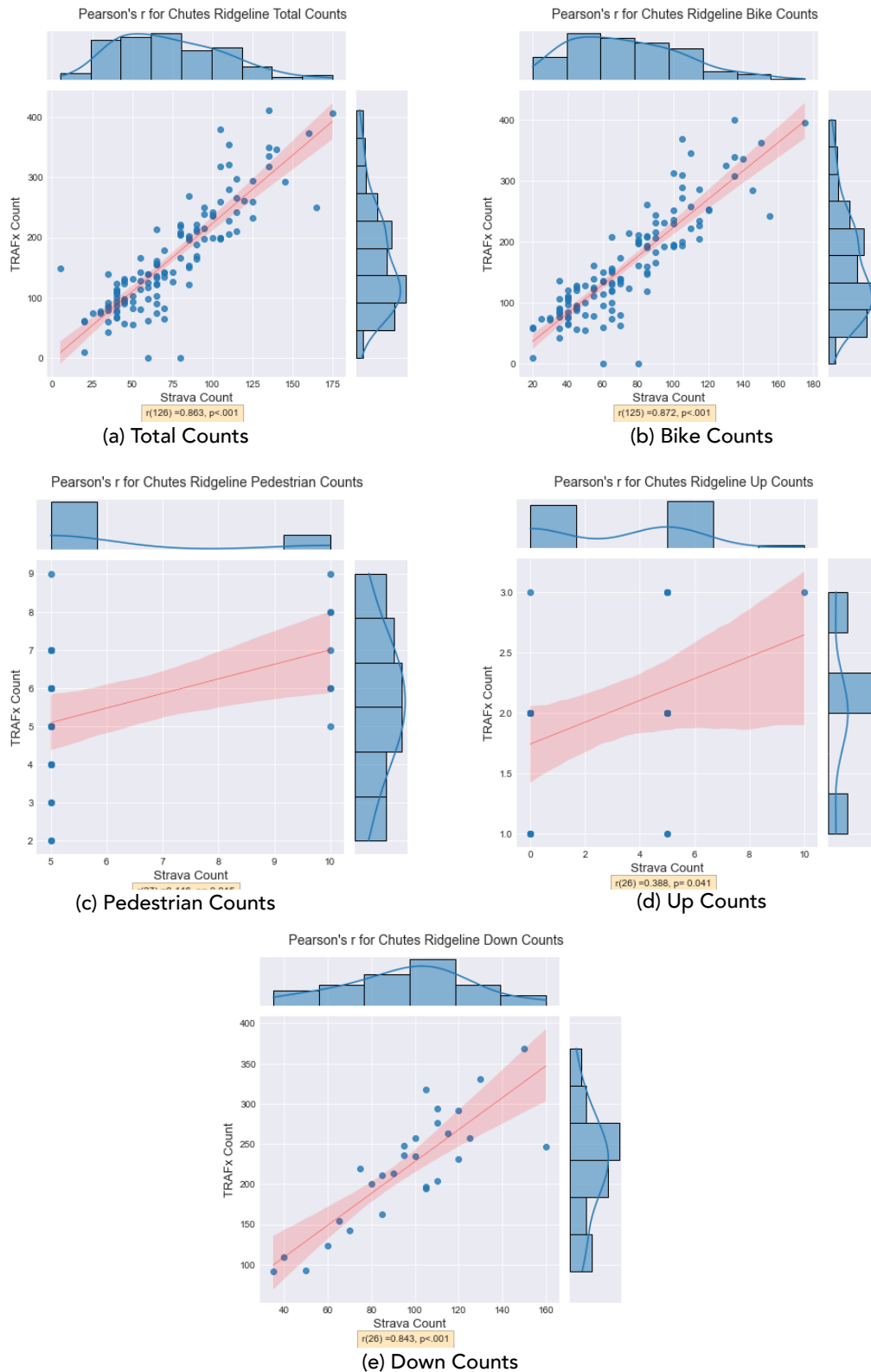


**Figure C.15:** Results of paired t-test comparing mountain bike uphill and downhill velocities on the Chutes Ridgeline Trail.

# Appendix C.3. Santiago Oaks Regional Park

## Strava Metro Data

### C.3.2 Chutes Ridgeline

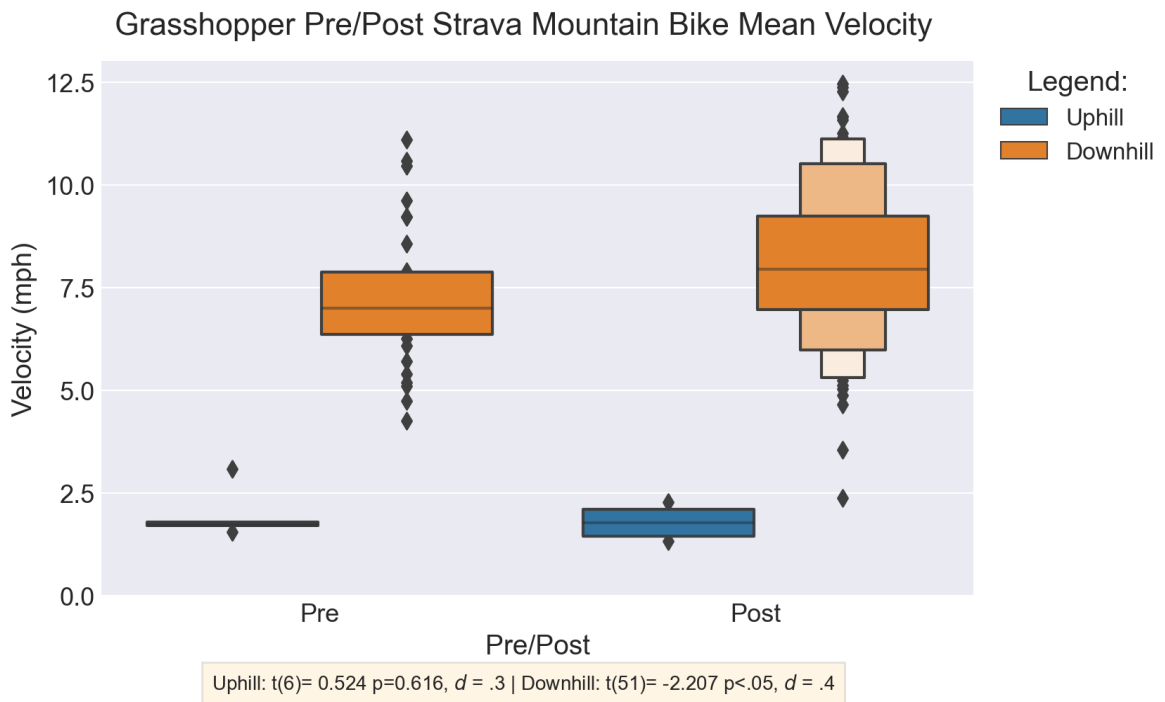


**Figure C.16:** Pearson's r correlation plots summarizing relationship between Strava Metro and TRAFx total, bike, pedestrian, up, and down counts for the Chutes Ridgeline trail.

# Appendix C.3. Santiago Oaks Regional Park

Strava Metro Data

## C.3.3. Grasshopper

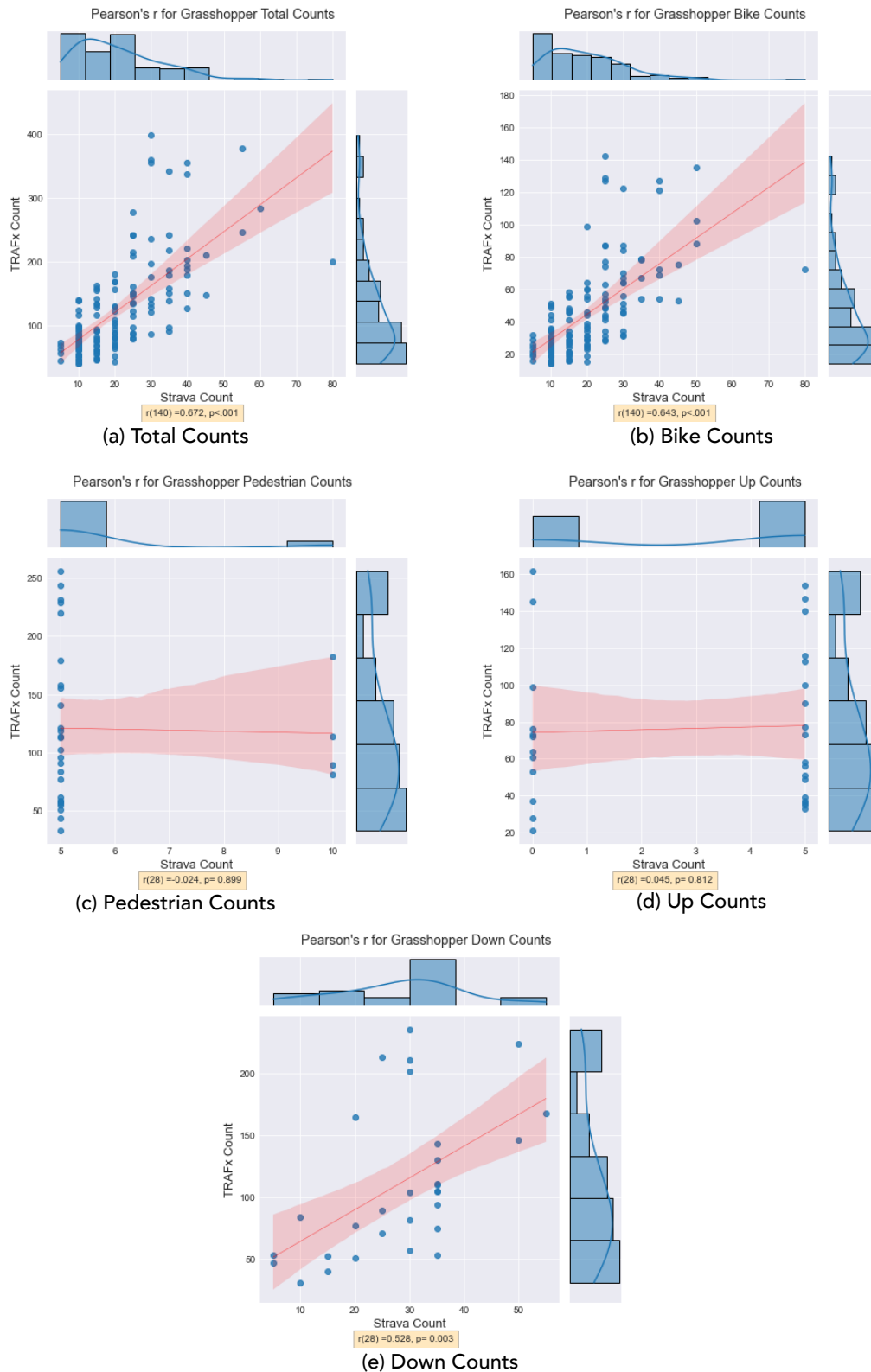


**Figure C.17:** Results of paired t-test comparing mountain bike uphill and downhill velocities on the Grasshopper Trail.

# Appendix C.3. Santiago Oaks Regional Park

## Strava Metro Data

### C.3.3. Grasshopper

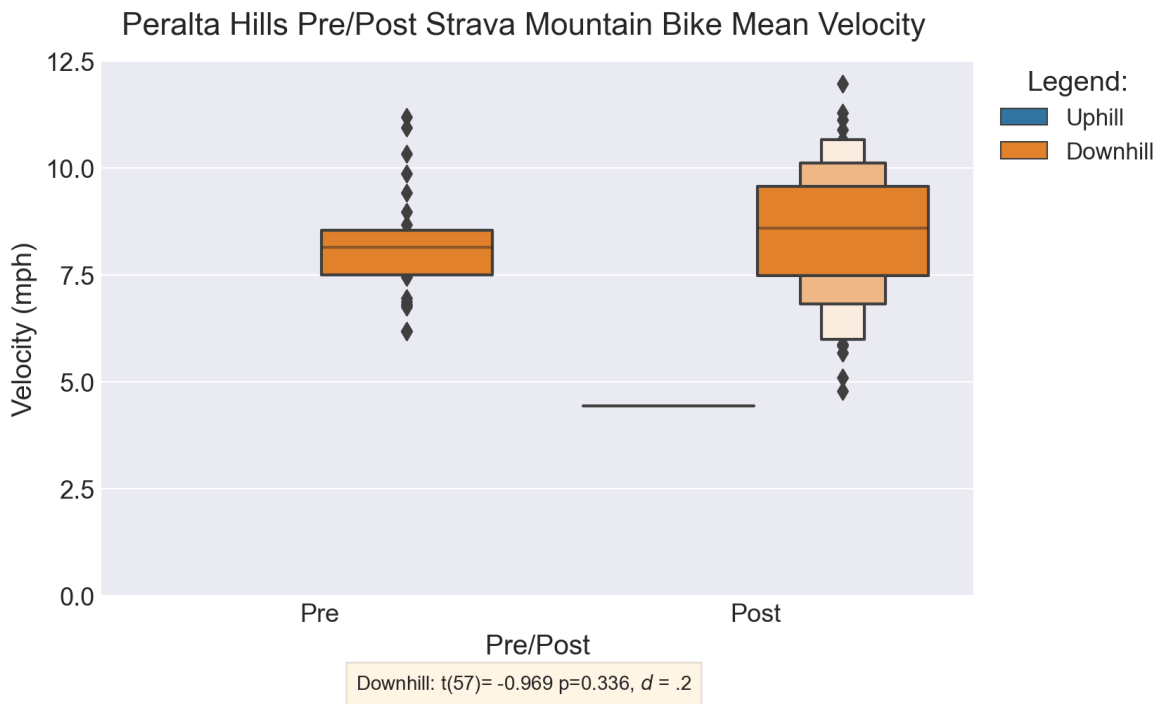


**Figure C.18:** Pearson's r correlation plots summarizing relationship between Strava Metro and TRAFx total, bike, pedestrian, up, and down counts for the Grasshopper trail.

# Appendix C.3. Santiago Oaks Regional Park

## Strava Metro Data

### C.3.4 Peralta Hills

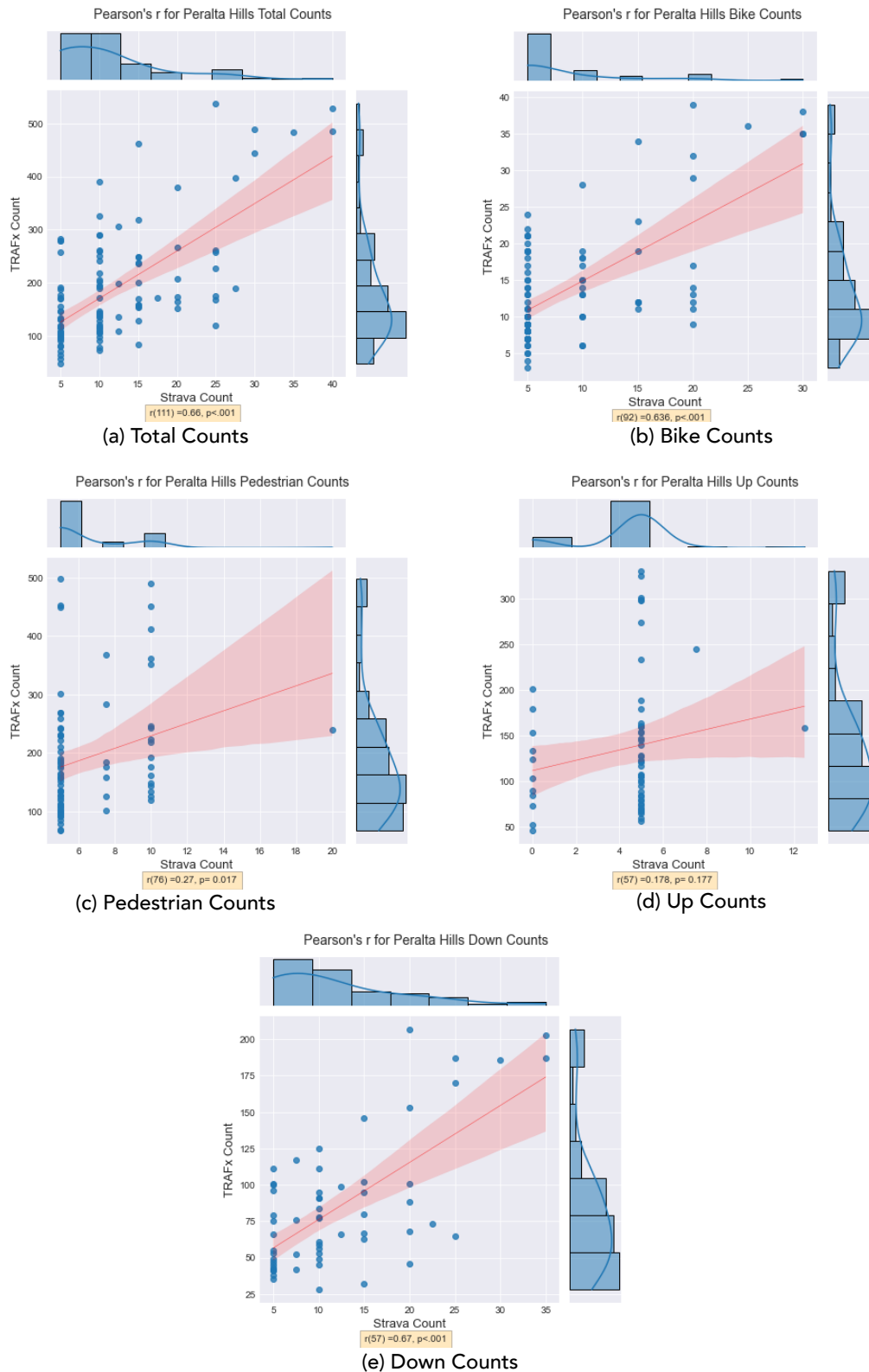


**Figure C.19:** Results of paired t-test comparing mountain bike uphill and downhill velocities on the Peralta Hills Trail.

# Appendix C.3. Santiago Oaks Regional Park

## Strava Metro Data

### C.3.4 Peralta Hills



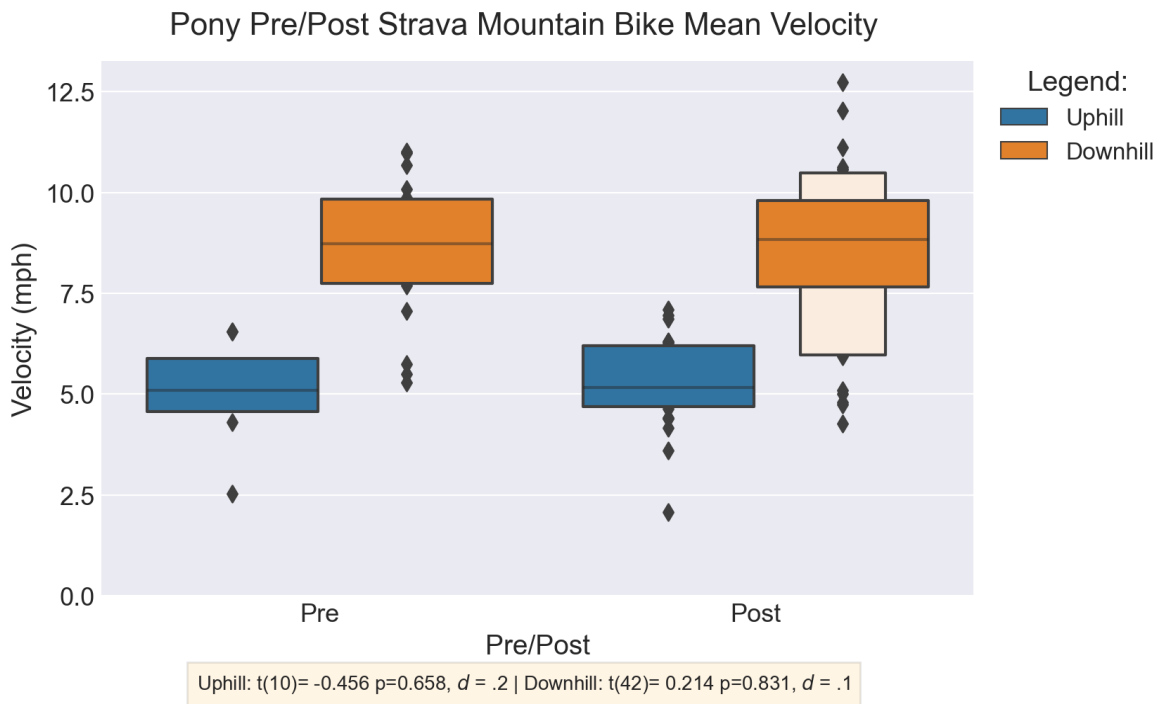
**Figure C.20:** Pearson's r correlation plots summarizing relationship between Strava Metro and TRAFx total, bike, pedestrian, up, and down counts for the Peralta Hills trail.



# Appendix C.3. Santiago Oaks Regional Park

## Strava Metro Data

### C.3.5 Pony

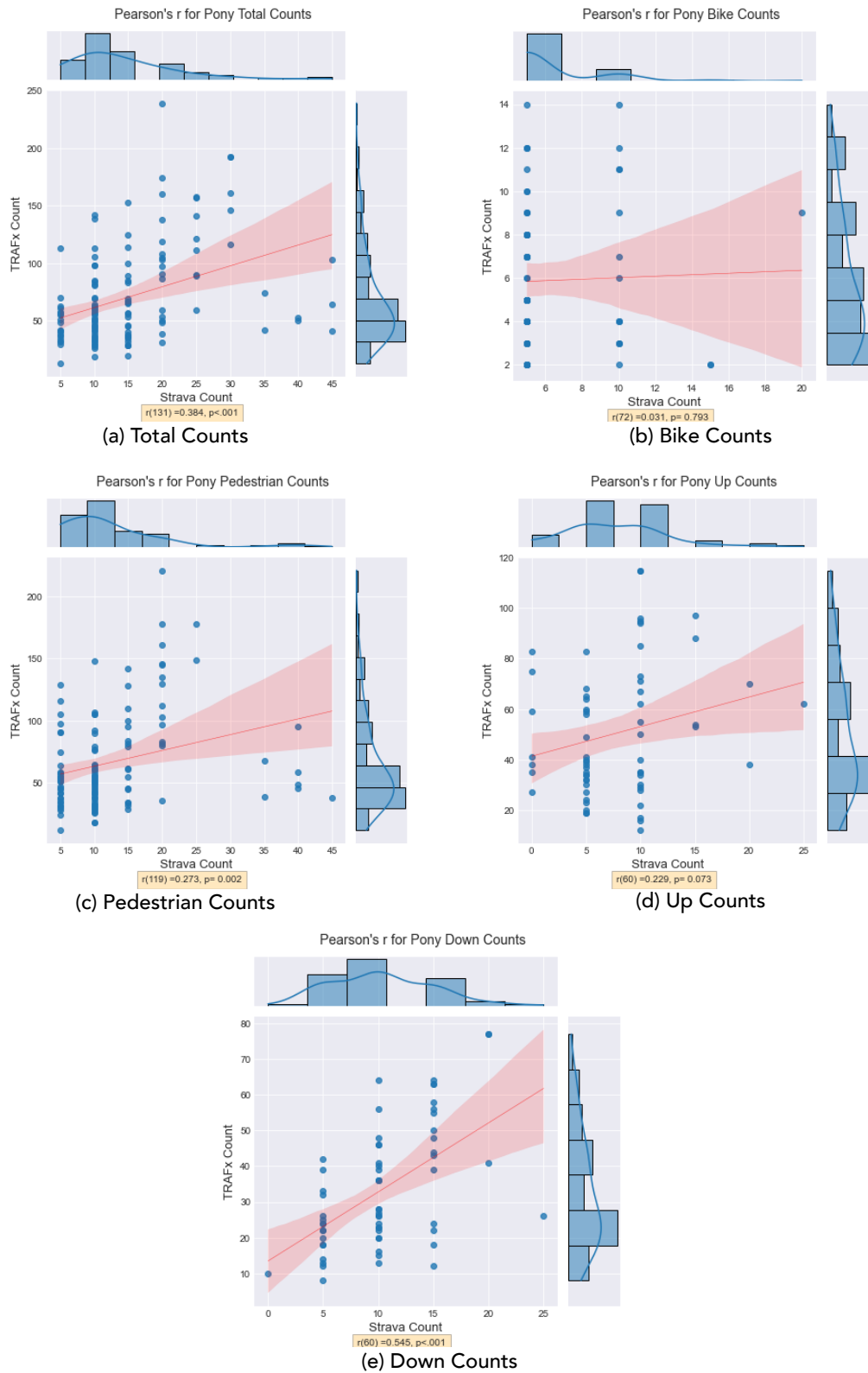


**Figure C.21:** Results of paired t-test comparing mountain bike uphill and downhill velocities on the Pony Trail.

# Appendix C.3. Santiago Oaks Regional Park

## Strava Metro Data

### C.3.5 Pony

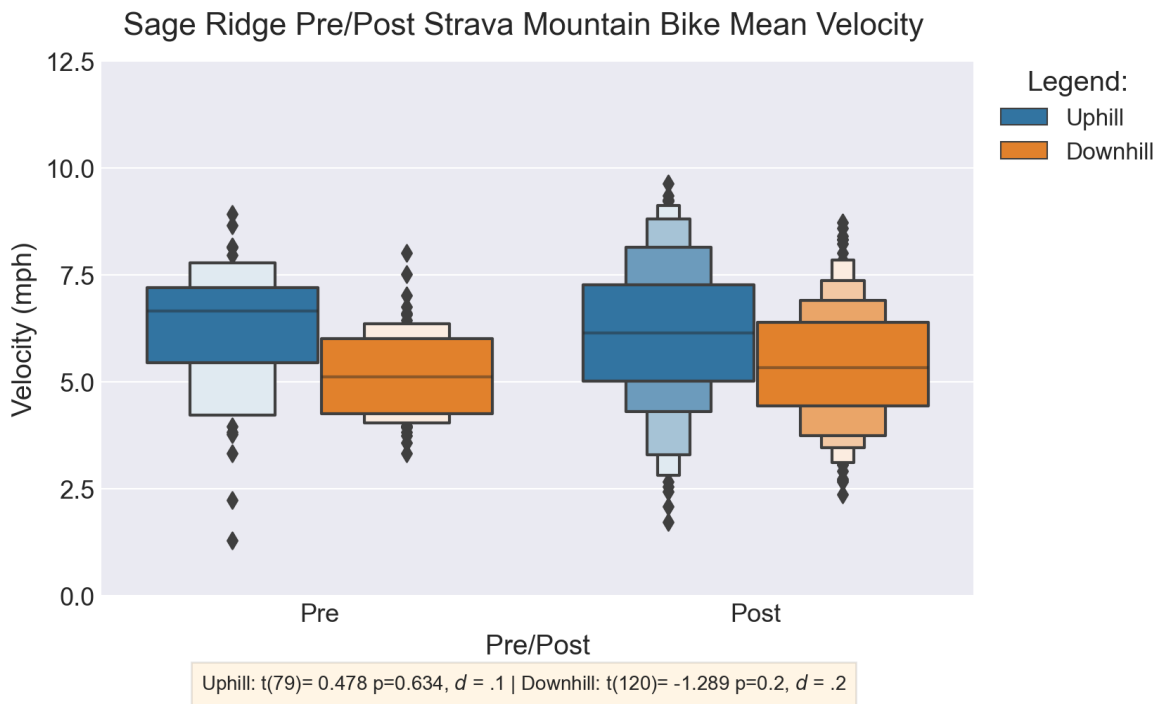


**Figure C.22:** Pearson's r correlation plots summarizing relationship between Strava Metro and TRAFx total, bike, pedestrian, up, and down counts for the Pony trail.

# Appendix C.3. Santiago Oaks Regional Park

## Strava Metro Data

### C.3.6 Sage Ridge

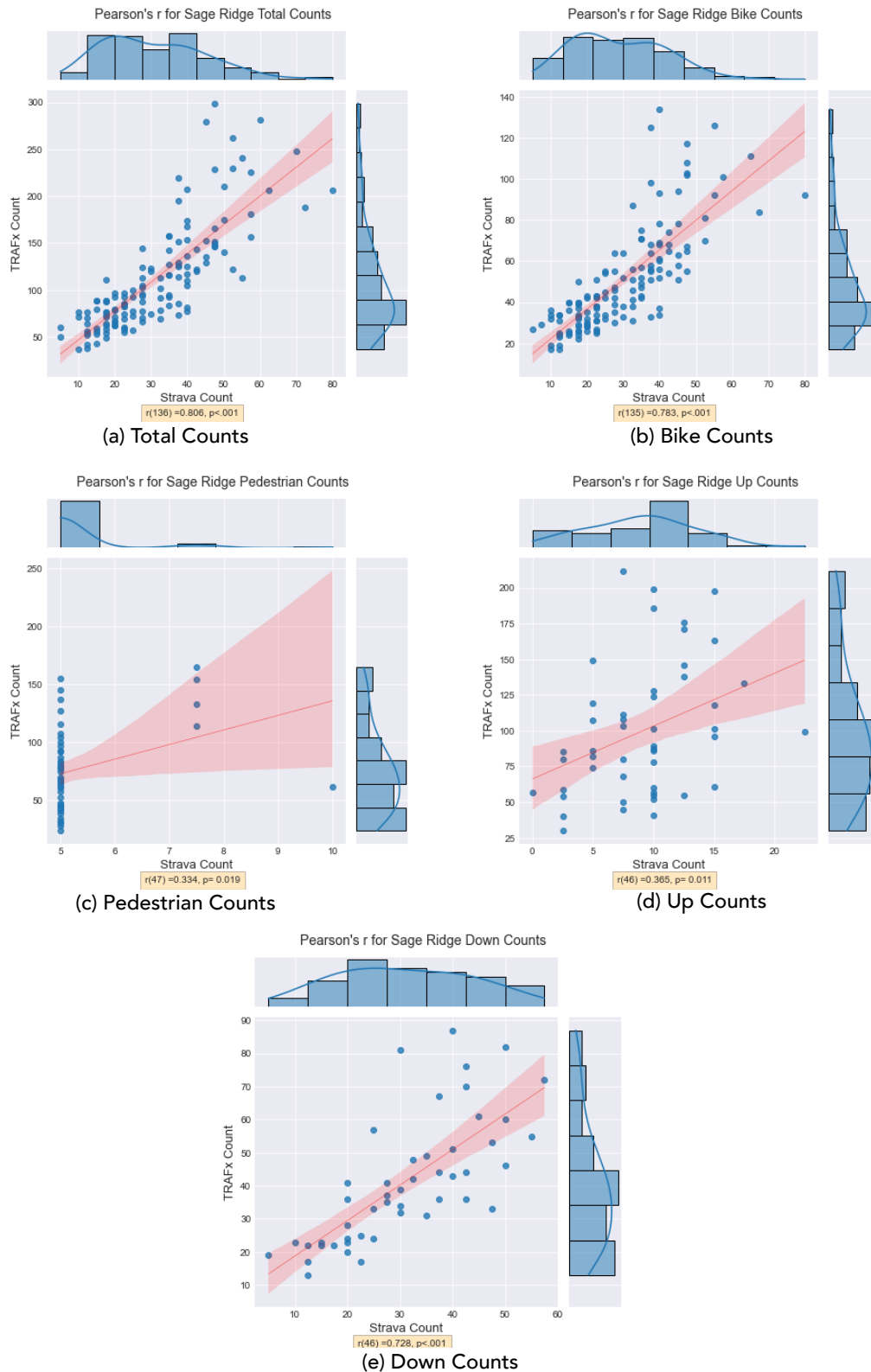


**Figure C.23:** Results of paired t-test comparing mountain bike uphill and downhill velocities on the Sage Ridge Trail.

# Appendix C.3. Santiago Oaks Regional Park

## Strava Metro Data

### C.3.6 Sage Ridge

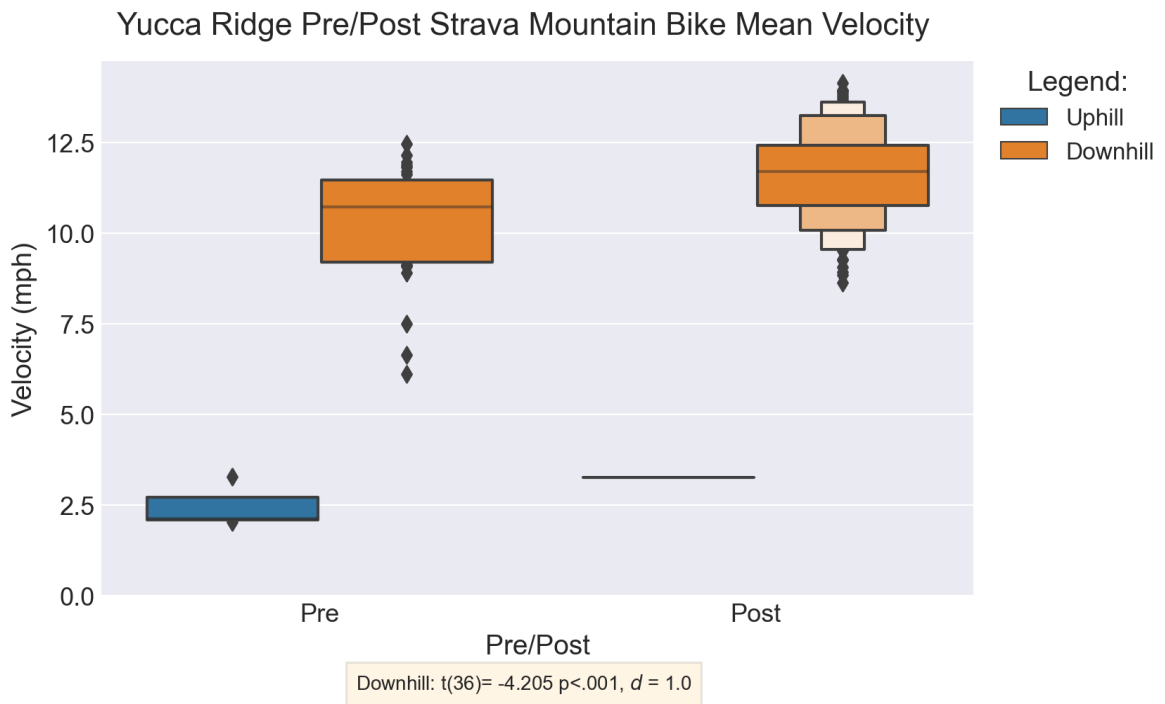


**Figure C.24:** Pearson's r correlation plots summarizing relationship between Strava Metro and TRAFx total, bike, pedestrian, up, and down counts for the Sage Ridge trail.

# Appendix C.3. Santiago Oaks Regional Park

Strava Metro Data

## C.3.7 Yucca Ridge

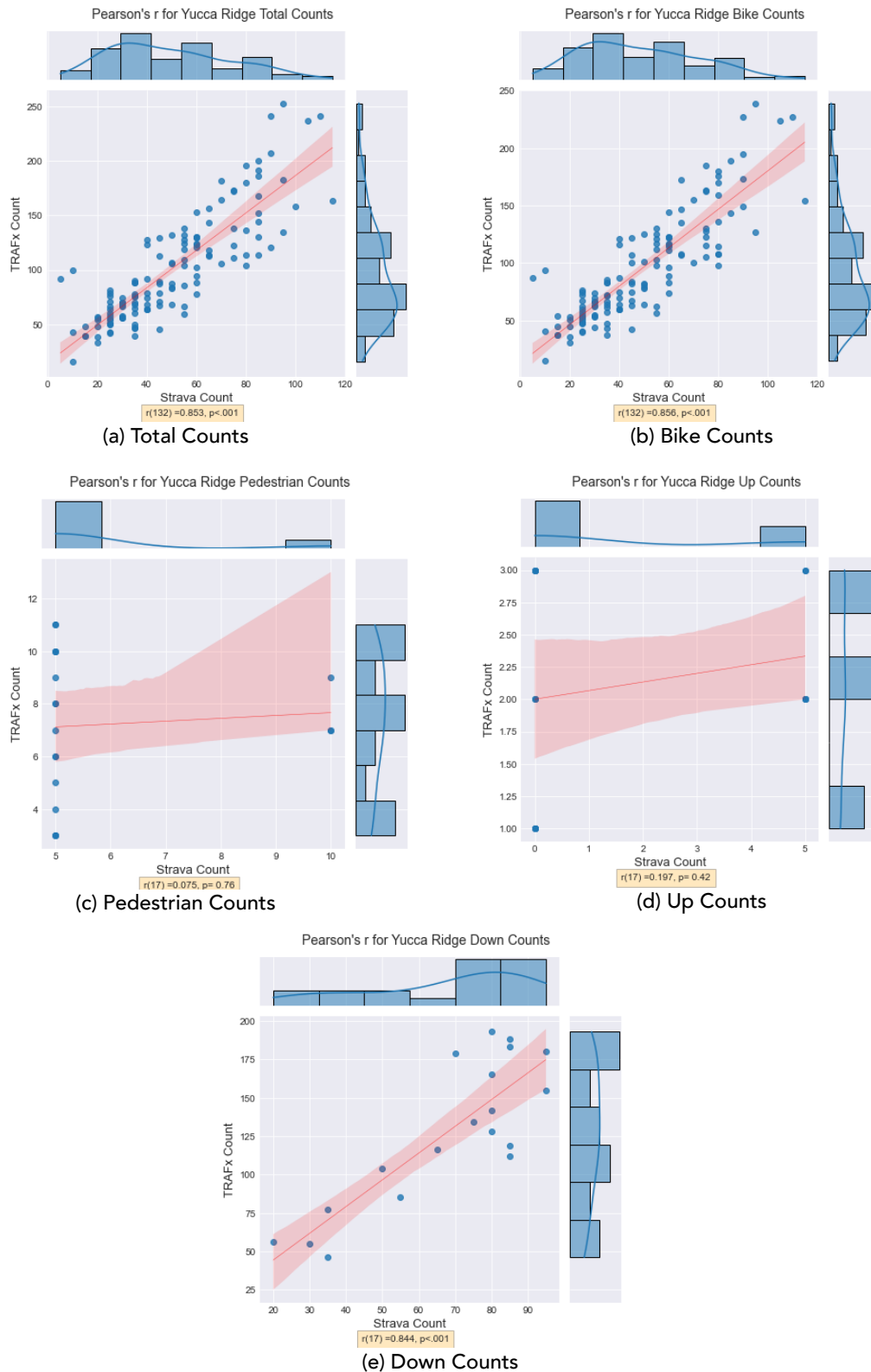


**Figure C.25:** Results of paired t-test comparing mountain bike uphill and downhill velocities on the Yucca Ridge Trail.

# Appendix C.3. Santiago Oaks Regional Park

## Strava Metro Data

### C.3.7 Yucca Ridge



**Figure C.26:** Pearson's r correlation plots summarizing relationship between Strava Metro and TRAFx total, bike, pedestrian, up, and down counts for the Yucca Ridge trail.

# Appendix D: Survey Instrument

## Strava Metro Data

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# OC Parks Trail Management & Regulations: Visitor Evaluative Survey

---

## Start of Block: Survey Intro

### Q1.1 Purpose:

OC Parks is piloting changes to the management and regulations of trail use in Aliso-Wood Canyon Wilderness Park, Laguna Coast Wilderness, and Santiago Oaks Regional Park and is gathering feedback from the public about these changes and their effect on visitors' recreation experiences.

**Participation in this Study:** 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.

**Would you like to participate in this survey?**

Yes

No

---

End of Block: Survey Intro

---

Start of Block: Non-Response + Visitor Characteristics

*Display This Question:*

*If Q1.1 = No*



---

Q2.1 What is your primary constraint or reason for not participating in this study?

- Language Barrier
  - Not enough time
  - Not interested
  - Safety Concerns due to COVID-19
  - Other: (Please explain) \_\_\_\_\_
- 

Q2.2 What park are you visiting today?

- Aliso-Wood Canyon Wilderness Park
  - Laguna Coast Wilderness Park
  - Santiago Oaks Regional Park
- 

Q2.3 What is the primary activity you planned to participate in on your visit to the park today?

- Walking/Hiking
  - Running
  - Biking
  - Dog Walking
  - Horseback Riding
-

Display This Question:

If Q2.3 = Biking

Q2.4 What type of bike are you riding?

- Mountain Bike (Cross-country or Enduro)
- E-Bike
- Gravel Bike
- Hybrid Bike
- Road Bike
- Other \_\_\_\_\_

End of Block: Non-Response + Visitor Characteristics

---

Start of Block: Pre-Evaluations

Q3.1 On average, how many days per year do you participate in [\\${Q2.3/ChoiceGroup/SelectedChoices}](#)?

- 0-10 days
  - 11-25 days
  - 26-50 days
  - 51 or more days
-

Q3.2 Please rate your current experience level in  $\{Q2.3/ChoiceGroup/SelectedChoices\}$ .

- Beginner
- Novice
- Intermediate
- Advanced
- Expert

Q3.3 Have you experienced some form of conflict with any of the following user groups? (Select all that apply)

- Walkers/Hikers
  - Runners
  - Bikers
  - Dog Walkers
  - Horseback Riders
  - Others \_\_\_\_\_
-

*Carry Forward Selected Choices from "Q3.3"*

Q3.4 On average, what is the likelihood or chance you to experience some form of conflict with the groups you selected?

	Extremely unlikely	Somewhat unlikely	Neither likely nor unlikely	Somewhat likely	Extremely likely
Walkers/Hikers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Runners	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bikers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dog Walkers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Horseback Riders	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

*Display This Question:*

*If Q3.3 = Bikers*

Q3.5 You indicated you have experienced conflict with **Bikers**. Please identify the specific behaviors you believe are the source of the conflict (select all that apply):

- Failure to yield/follow trail right of way
- Lack of communication
- Discourteous behavior
- Speeding
- Failure to comply with regulations
- Crowding

---

*Display This Question:*

*If Q3.3 = Walkers/Hikers*

Q3.6 You indicated you have experienced conflict with **Hikers**. Please identify the specific behaviors you believe are the source of the conflict (select all that apply):

- Failure to yield/follow trail right of way
  - Lack of communication
  - Discourteous behavior
  - Failure to comply with regulations
  - Crowding
-

---

*Display This Question:*

*If Q3.3 = Runners*

Q3.7 You indicated you have experienced conflict with **Runners**. Please identify the specific behaviors you believe are the source of the conflict (select all that apply):

- Failure to yield/follow trail right of way
  - Lack of communication
  - Discourteous behavior
  - Failure to comply with regulations
  - Crowding
- 

*Display This Question:*

*If Q3.3 = Dog Walkers*

Q3.8 You indicated you have experienced conflict with **Dog Walkers**. Please identify the specific behaviors you believe are the source of the conflict (select all that apply):

- Failure to yield/follow trail right of way
- Lack of communication
- Discourteous behavior
- Crowding
- Dogs off-leash, not under control
- Feces

---

*Display This Question:*

*If Q3.3 = Horseback Riders*

Q3.9 You indicated you have experienced conflict with **Horseback Riders**. Please identify the specific behaviors you believe are the source of the conflict (select all that apply):

- Failure to yield/follow trail right of way
  - Lack of communication
  - Discourteous behavior
  - Crowding
  - Feces
-

Q3.10 We would like to know how effective you think the current signage communicates the following park regulations and expectations for visitor behavior:

	Not effective at all	Slightly effective	Moderately effective	Very effective	Extremely effective
Trail speed limit of 10 mph	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Multi-use trail etiquette and behavior	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Trail closures for the preservation and protection of natural or cultural resources	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
OC Parks regulations about e-bikes (electric bicycles)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Drawing connections between recreation management and habitat conservation goals in parks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

---





---

Q3.12 In your opinion, is enough management presence (i.e., rangers, staff) on trails to educate visitors and enforce trail regulations?

- Far too little
  - Slightly too little
  - The right amount
  - Slightly too much
  - Far too much
- 

Q3.13 Do you agree or disagree that the current trail regulations contribute to OC Park's habitat conservation goals for [\\${Q2.2/ChoiceGroup/SelectedChoices}](#)?

- Strongly disagree
  - Somewhat disagree
  - Indifferent/ Neutral
  - Somewhat agree
  - Strongly agree
  - Don't Know/Unsure
-

---

Q3.14 What is your age?

- 18-19
  - 20-34
  - 35-54
  - 55-64
  - 65+
- 

Q3.15 Which gender do you most identify with?

- Male
  - Female
  - Non-binary
  - Genderqueer and or gender non-conforming
  - Prefer not to answer
  - Identity not listed above
- 

Q3.16 On average, how many days per year do you participate in [\\${Q2.3/ChoiceGroup/SelectedChoices}](#)?

- 0-10 days
- 11-25 days
- 26-50 days
- 51 or more days

---

**End of Block: Pre-Evaluations**

---

**Start of Block: Post-Evaluations**

Q4.1 Please rate your current experience level in [\\${Q2.3/ChoiceGroup/SelectedChoices}](#).

- Beginner
  - Novice
  - Intermediate
  - Advanced
  - Expert
- 

Q4.2 Have you experienced some form of conflict with any of the following user groups? (Select all that apply)

- Walkers/Hikers
  - Runners
  - Bikers
  - Dog Walkers
  - Horseback Riders
  - Others \_\_\_\_\_
- 

Page Break \_\_\_\_\_

*Carry Forward Selected Choices from "Q4.2"*

Q4.3 On average, what is the likelihood or chance you to experience some form of conflict with the groups you selected?

	Extremely unlikely	Somewhat unlikely	Neither likely nor unlikely	Somewhat likely	Extremely likely
Walkers/Hikers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Runners	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bikers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dog Walkers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Horseback Riders	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

*Display This Question:*

*If Q4.2 = Bikers*

Q4.4 You indicated you have experienced conflict with **Bikers**. Please identify the specific behaviors you believe are the source of the conflict (select all that apply):

- Failure to yield/follow trail right of way
- Lack of communication
- Discourteous behavior
- Speeding
- Failure to comply with regulations
- Crowding

---

*Display This Question:*

*If Q4.2 = Walkers/Hikers*

Q4.5 You indicated you have experienced conflict with **Hikers**. Please identify the specific behaviors you believe are the source of the conflict (select all that apply):

- Failure to yield/follow trail right of way
  - Lack of communication
  - Discourteous behavior
  - Failure to comply with regulations
  - Crowding
-

---

*Display This Question:*

*If Q4.2 = Runners*

Q4.6 You indicated you have experienced conflict with **Runners**. Please identify the specific behaviors you believe are the source of the conflict (select all that apply):

- Failure to yield/follow trail right of way
  - Lack of communication
  - Discourteous behavior
  - Failure to comply with regulations
  - Crowding
- 

*Display This Question:*

*If Q4.2 = Dog Walkers*

Q4.7 You indicated you have experienced conflict with **Dog Walkers**. Please identify the specific behaviors you believe are the source of the conflict (select all that apply):

- Failure to yield/follow trail right of way
- Lack of communication
- Discourteous behavior
- Crowding
- Dogs off-leash, not under control
- Feces

---

*Display This Question:*

*If Q4.2 = Horseback Riders*

Q4.8 You indicated you have experienced conflict with **Horseback Riders**. Please identify the specific behaviors you believe are the source of the conflict (select all that apply):

- Failure to yield/follow trail right of way
- Lack of communication
- Discourteous behavior
- Crowding
- Feces

---

Page Break







---

Q4.11 In your opinion, is enough management presence on trails to educate visitors and enforce the new trail regulations?

- Far too little
  - Slightly too little
  - The right amount
  - Slightly too much
  - Far too much
- 

Q4.12 Do you agree or disagree that the new trail regulations contribute to OC Park's habitat conservation goals for [\\${Q2.2/ChoiceGroup/SelectedChoices}](#)?

- Strongly disagree
  - Somewhat disagree
  - Indifferent/ Neutral
  - Somewhat agree
  - Strongly agree
  - Don't Know/Unsure
-

Q4.13 What is your age?

- 18-19
  - 20-34
  - 35-54
  - 55-64
  - 65+
- 

Q4.14 Which gender do you most identify with?

- Male
- Female
- Non-binary
- Genderqueer and or gender non-conforming
- Prefer not to answer
- Identity not listed above

**End of Block: Post-Evaluations**

---