CITY OF COLUMBUS TRAIL COUNT REPORT

Prepared for the City of Columbus by The Mid-Ohio Regional Planning Commission

December 2012

COLUMBUS RECREATION AND PARKS

CENTRAL OHIO GREENWAYS

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EXECUTIVE SUMMARY

In order to better understand trail use on Columbus trails, the City of Columbus tasked the Mid-Ohio Regional Planning Commission (MORPC) and the Rails-to-Trails Conservancy (RTC) with collecting and analyzing data at ten locations on the city's trail system. Three of the ten locations included two full years of 24-hr count data, while the other seven included over two months of data.

The full version of the Columbus Trail Count Report provides a detailed analysis of trail use during the study period. Factors such as the time of year, day of week, and time of day are analyzed, along with the impact of temperature, precipitation, and special events on trail use. The report is available on MORPC's website at http://www.morpc.org/transportation/bicycle_pedestrian/counts.asp. Some highlights of the study are listed below.

Study Highlights

Trail use is on the rise

- From 2010 to 2012, trail use increased by 25% at North Bank Park and by 8% at Antrim Park. The dramatic increase at North Bank Park is likely due in part to the completion of the Scioto Mile, just south of the count location. Additional data are needed to determine whether the trends are similar at other sites.

Columbus trails serve a variety of user groups and purposes

- Trail use at Antrim Park shows a clear commuting pattern, combined with steady use throughout the day. The OSU Wetlands Park shows a similar, but less distinct pattern, likely due to the large number of students whose schedules do not follow the typical work-day pattern.
- Around 30% of trail volume at North Bank Park falls between the hours of 12pm and 3pm. This suggests that urban trails provide downtown workers with an important exercise and recreation opportunity.
- More dense urban areas appear to have relatively higher weekday volumes, which suggests they are used more for utilitarian purposes. For example, weekdays account for 69% of total volume at North Bank Park and 68% at the Scioto Trail count location, compared to only 60% at Antrim Park, and 62% at the northern end of the Olentangy Trail near Worthington Hills Market.
- Trail use shows greater sensitivity to weather at Antrim Park than at OSU Wetlands Park. This suggests that trail users passing through the OSU Wetlands are more likely to be reliant on biking or walking, as compared to those at Antrim Park. Similarly, trail use at North Bank Park appears to be heavily affected by weather, reinforcing the idea that a greater portion of trips at this site is discretionary.

Many trail users rely on the trails during inclement weather

- Even on the coldest days of the year (high temperature less than 20 deg. F), about 275 trail users could be expected at OSU Wetlands Park and close to 200 at Antrim Park.
- Overall trail volume remains above 60% of typical daily use on days with more than 1/2 inch of precipitation, which translates to over 500 users at Antrim Park and OSU Wetlands Park, and around 450 users at North Bank Park.

Trails play an important function during special events.

- Trail use increased significantly during several festivals, most notably Red, White, and Boom; Columbus Arts Festival; and Comfest. Over 10,000 users were counted at North Bank Park during Red, White, and Boom.

Other Key Facts

- Antrim Park had the highest overall volume among the locations studied, with an average of 920 trail users per day. Other locations along the Olentangy Trail rounded out the top four.
- North Bank Park had the highest single-day total of 10,400 trail users, as well as the highest hourly total of 1,630 users.
- Trail use at the OSU Wetlands Park was typically the highest of the three sites prior to the beginning of the Dodridge Bridge construction project, which began in July 2011.
- July is the busiest month for all sites combined.
- December is the least busy month for all sites. However, even in December, there were over 500 trail users per day at Antrim Park in 2011, and close to 400 at the OSU Wetlands Park.
- Trail use is generally higher on the weekends than during the week. This is most pronounced at Antrim Park and the Worthington Hills Market count location.
- Overall, the trails are busiest on Saturday, which accounts for 18% of the total weekly volume.
- The highest average hourly volume is 87 trail users at North Bank Park from 12pm to 1pm.

Recommendations

Widening of some trail sections should be considered

- Peak-hour demand may exceed current capacity in some locations near the OSU Wetlands and Antrim Park. A level-of-service analysis should be conducted to determine whether existing capacity is adequate.
- Some segments might not meet current trail design standards. Due to the popularity of the Olentangy Trail, consideration should be given to bringing non-compliant segments into compliance.

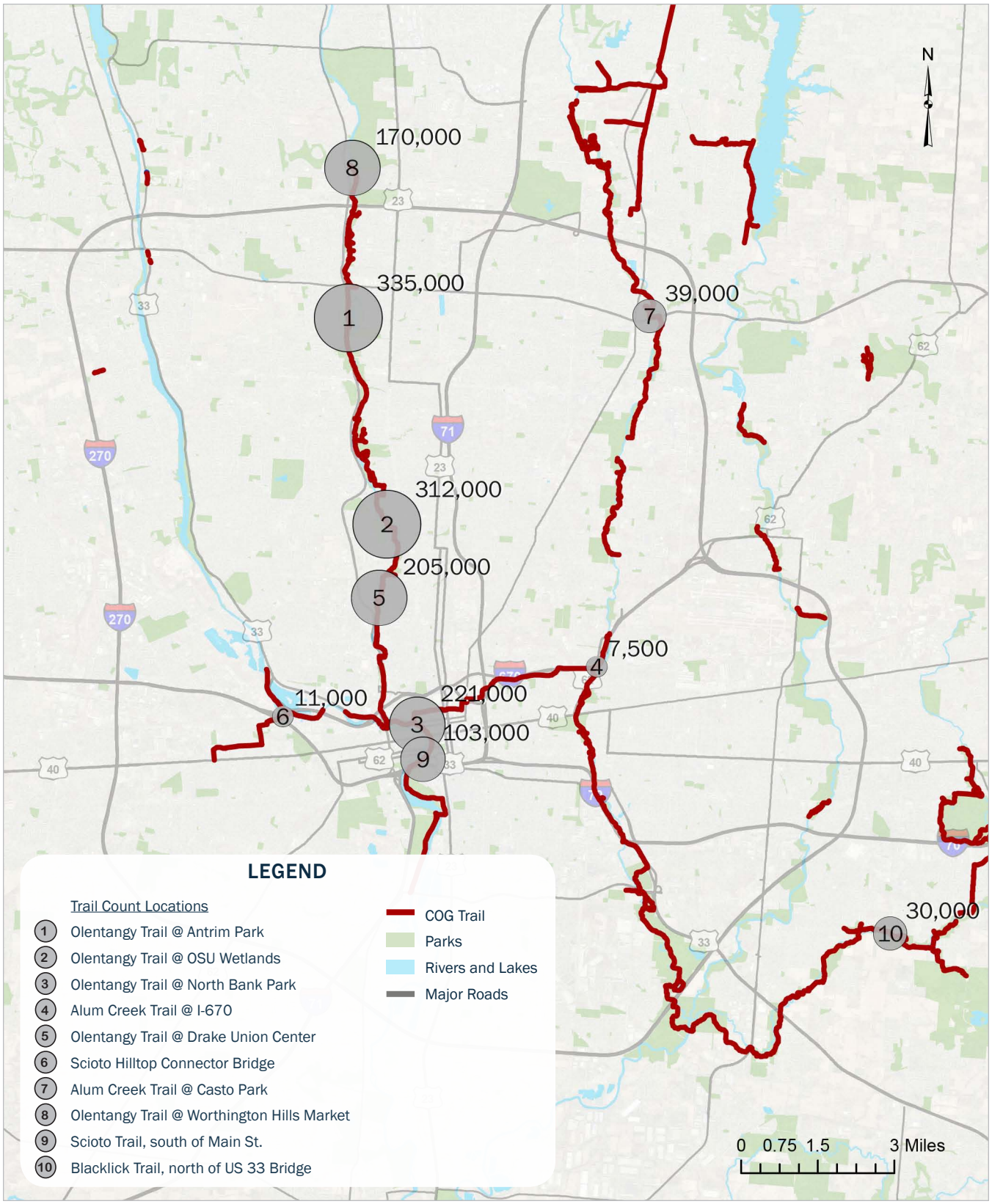
The impacts of construction projects on trail users should be minimzed

- Convenient and safe detours should be established whenever trail use is affected by construction, as many users rely on the trails for transportation purposes.
- Trail use at the OSU Wetlands Park declined by 19% during construction, compared to the prior similar period before construction began. Taking into account the increase at Antrim Park and North Bank Park, trail use was 39% lower at the OSU Wetlands location during construction compared to what it would have been if the same trend had applied there.

Additional permanent count data are needed

- More data are needed to determine how trail use is affected by land use, demographics, and other factors.
- A better understanding of trail access modes and routes could lead to more strategic investments in on-road facilities or short connector paths.

Estimated Annual Trail Volume by Location, 2011



1. INTRODUCTION

It's an exciting time for trail users in central Ohio! The network has been growing steadily for the past several years and new segments are continually being constructed. As of 2012, close to half of the Franklin County population lives within one mile of a regionally significant trail (those included on the Central Ohio Greenways website, www.centralohiogreenways.com), while nearly all Franklin County residents live within three miles. Over the next decade, additional segments will be built, providing even greater access. These efforts are significant for the roughly 16,000 Franklin County residents who walk or bike to work or school, and for those who use the trail for recreation.

The progress in building the trail network is due to the efforts of many individuals and organizations, including greenway planners and engineers, parks departments, and local trail groups. These various partners and the trails under their purview are organized under the umbrella of the Central Ohio Greenways group (COG), which is coordinated by the Mid-Ohio Regional Planning Commission (MORPC). The COG members represent a diverse group of agencies and interests who have come together for a common cause and passion: TRAILS!

While the trail network in central Ohio has developed steadily over the years, our understanding and documentation of its use has lagged behind. This report represents an important step toward filling that gap. Separate reports developed by the Rails-to-Trails Conservancy (RTC) and MORPC are also addressing this shortcoming.

1.1 Study Background

The 2012 Columbus Trail Counts Report stems from the same sense of collaboration and common interest as the COG group itself. In October 2011, the City of Columbus, MORPC, and RTC entered into a contract whereby data from ten locations on the City of Columbus trail system would be collected and analyzed. Map 1 on page 2 depicts the study locations.

The primary objectives of the study are to document overall use of the trail system, provide a benchmark for future comparisons, analyze trends over the study period, and to gain a better understanding of trail use patterns. It was funded by the City of Columbus, and the work was conducted by MORPC and RTC. MORPC collected data from three permanent counters (locations 1-3), while RTC was responsible for setting up and collecting data at seven temporary locations (4-10). Table 1 on page 3 provides an overview of the count period for each site. All data analysis and organizational tasks were handled by MORPC.

1.2 Methodology

The study relied on TRAFx Infrared Trail Counters for all locations. Among the ten locations, permanent counters are installed at three spots, and temporary counters were installed by RTC at the other seven spots during fall 2011 and spring 2012, each for a duration of approximately two months.

The TRAFx counters use passive infrared technology to detect trail users as they cross an infrared beam. Although there is some error associated with the initial counts, they are generally reliable over a long period of time and provide 24-hr data, which cannot be realistically produced using manual counts. To account for the error in the counts, manual "calibration counts" were conducted, which allowed the counts to be adjusted to provide a more accurate estimate of actual use.

Map 1. COG Trails and Count Locations

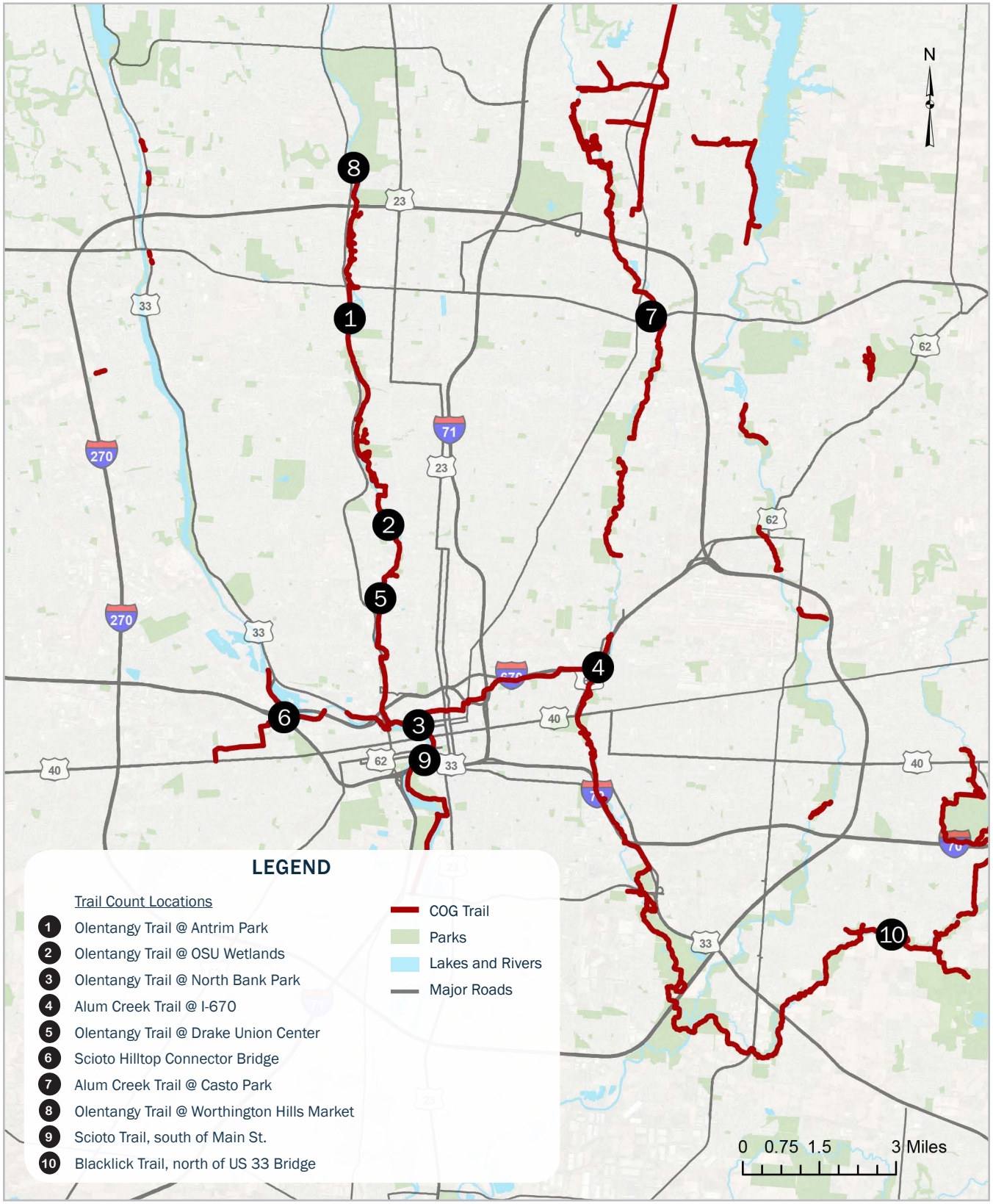


Table 1. Number of Full Days Counted by Month and Location

YEAR	MONTH	LOCATION									
		1: Antrim Park	2: OSU Wetlands Park	3: North Bank Park	4: Alum Creek @ I-670	5: Drake Union	6: Hilltop Connector Bridge	7: Casto Park	8: Hills Market	9: Scioto Trail	10: Blacklick Trail
2010	October	31	31	31							
	November	30	30	30							
	December	31	31	31							
2011	January	31	31	31							
	February	28	28	28							
	March	31	31	31							
	April	30	30	30							
	May	31	31	31							
	June	13	13	13							
	July	31	31	31							
	August	31	31	31							
	September	30	30	30	7	7	7				
	October	31	31	31	29	29	29				
	November	30	30	30	28	28	28				
	December	31	31	31							
2012	January	31	31	31							
	February	29	29	29							
	March	31	31	31							
	April	30	30	30				10	10	10	2
	May	31	31	31				31	31	31	28
	June	26	29	26				30	30	18	14
	July	31	31	31				4	4		
	August	31	31	31							
	September	29	30	14							

Note: Months with incomplete counts may be due to one of several circumstances, including: 1) the counters were installed or taken down during the middle of the month; 2) the counter was vandalized during the month, prohibiting the collection of data for a period of time; or 3) data were downloaded during the month, causing one day's worth of data to be incomplete.

Once the data were collected from the counters, it was imported into a database and processed to support the types of analysis contained in the report. Along with the calibration described above, some of the data needed to be corrected to account for daylight savings time.

After the data were adjusted, an initial analysis was conducted to determine the overall trend in trail use. In particular, monthly trail use was calculated from October 2010 through September 2012 so that estimates could be provided for the other locations over the entire study period. The counters at Antrim Park and North Bank Park were used for this purpose (the counts from the OSU Wetlands were not included since construction of the Dodridge Bridge during the study period affected trail use). Actual count results were always used when available, and estimates were used to fill in missing data. For a more detailed explanation of the methodology, please see Appendix 2. Detailed Methodology, p. 42.

2. DATA ANALYSIS

This section of the report contains a detailed analysis of trail use for the ten locations studied. The results for locations 1-3 are the most reliable since they are based on two full years of data. Additionally, some types of analysis only make sense or are most practical for these locations due to the number of observations required to obtain reliable results (e.g., influence of weather). It is important to keep in mind that all figures provided are estimates.

After a summary of results is given, trail use is first broken down by temporal factors: by year, by month, by day of week, and by hour. Following this, the influence of weather is examined, and the effect of special events is looked at. For each section, a table and/or chart is presented and a few key facts are highlighted.

2.1 Results Summary

Table 2. 2012 Trail Count Study Summary Statistics

	STATISTIC	LOCATION									
		1: ANTRIM PARK	2: OSU WETLANDS PARK	3: NORTH BANK PARK	4: ALUM CREEK @ I-670	5: DRAKE UNION	6: HILLTOP CONNECTOR BRIDGE	7: CASTO PARK	8: HILLS MARKET	9: SCIOTO TRAIL	10: BLACKLICK TRAIL
Monthly	n (Months)	24	24	24	3	3	3	4	4	3	3
	Mean	28,000	25,000	20,000	590	16,000	870	4,790	21,000	13,000	3,680
	Median	29,000	26,000	21,000	670	17,000	1,030	4,960	21,000	13,000	3,790
	Max	46,000	44,000	42,000	710	21,000	1,090	5,160	24,000	14,000	3,800
Daily	n (Days)	709	713	694	64	64	64	75	75	59	44
	Mean	920	810	650	18	310	27	160	690	410	120
	Median	780	740	570	16	460	9	150	660	400	120
	Max	2,850	2,510	10,000	86	1,320	100	290	1,440	730	300
Hourly	n (Hours)	11,344	11,408	11,104	1,024	1,024	1,024	1,200	1,200	944	704
	Mean	57	50	39	1	30	2	10	43	25	8
	Median	39	38	25	-	20	-	7	33	20	6
	Max	454	356	1,630	20	205	18	72	243	262	45

Notes: (1) Statistics shown here do not include any estimated values. As a result, averages may vary slightly from other values presented in the report. (2) Count values above10,000 rounded to nearest thousand; values between 100 and10,000 rounded to nearest ten. (3) Hourly summary based on period from 6am-9pm.

Key Facts

- Location 1 (Antrim Park) had the highest overall volume with an average of 920 trail users daily.
- Location 3 (North Bank Park) had the highest daily and hourly totals (10,000 and 1,630, respectively).

2.2 Time-Based Analysis

Since continuous counts for the entire period were only available for three of the ten locations, it was necessary to generate estimates for the other seven locations. Additionally, estimates for locations 1-3 were needed to round out years 2010 and 2012.

To better understand how these estimates were produced, please see "Table 3. Notes on Estimates" below. This table briefly outlines how the estimates were produced for each time group of the analysis. A more detailed explanation is offered in "Appendix 2. Detailed Methodology," on p. 42.

Table 3. Notes on Estimates

LOCATION	ANNUAL ESTIMATES	MONTHLY ESTIMATES	DAILY ESTIMATES	HOURLY ESTIMATES
1: Olentangy Trail @ Antrim Park	2010 - extrapolated from monthly counts (Oct-Dec); 2011 - complete count; 2012 - extrapolated from monthly counts (Jan - Sep)	Based on complete counts	Based on complete counts	Based on complete counts
2: Olentangy Trail @ OSU Wetlands				
3: Olentangy Trail @ North Bank Park				
4: Alum Creek Trail @ I-670	2010 - based on overall 2010-2011 trend; 2011 - extrapolated from monthly counts (Oct, Nov); 2012 - based on overall 2011-2012 trend	Based on monthly counts (Oct & Nov 2011); extrapolated for remainder of months	Based on 2011 counts	Based on 2011 counts
5: Olentangy Trail @ Drake Union Center				
6: Scioto Hilltop Connector Bridge				
7: Alum Creek Trail @ Casto Park	2010 - based on overall 2010-2011 trend; 2011 - extrapolated from monthly counts; 2012 - extrapolated from monthly counts (May, June)	Based on monthly counts (May & June 2012); extrapolated for remainder of months	Based on 2012 counts	Based on 2012 counts
8: Olentangy Trail @ Worthington Hills Market				
9: Scioto Trail, south of Main St.				
10: Blacklick Trail, north of US33 Bridge				

Notes: (1) All extrapolations and trends are based on data from locations1 and 3; monthly extrapolation is based on the 2011 monthly distribution, as shown in "Figure 2. Estimated Trail Usage by Month, Olentangy Trail," on p. 8. (2) Small sections of missing data filled in by averaging counts from neighboring periods.

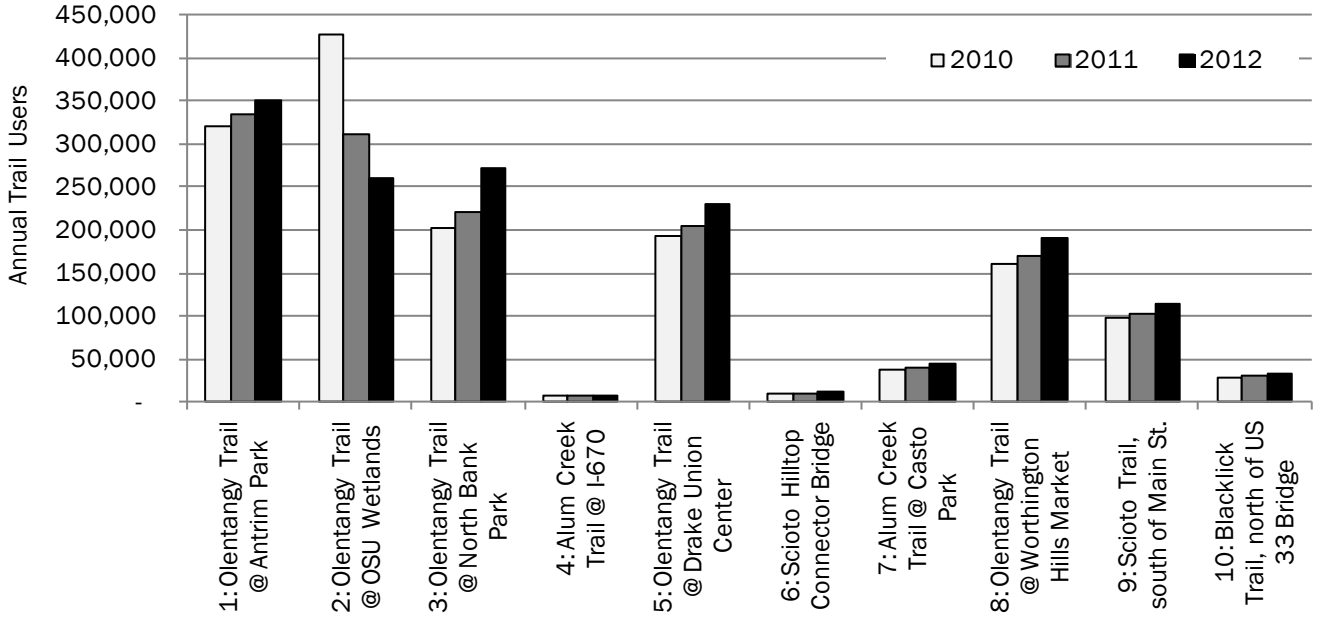
2.2.1 Annual Trail Usage

Table 4. Estimated Annual Trail Volume by Location, 2010-2012

LOCATION	2010	2011	2012
1: Olentangy Trail @ Antrim Park	321,000	335,000	350,000
2: Olentangy Trail @ OSU Wetlands	427,000	312,000	261,000
3: Olentangy Trail @ North Bank Park	202,000	221,000	271,000
4: Alum Creek Trail @ I-670	*7,100*	7,500	*8,400*
5: Olentangy Trail @ Drake Union Center	*193,000*	205,000	*229,000*
6: Scioto Hilltop Connector Bridge	*10,000*	11,000	*12,000*
7: Alum Creek Trail @ Casto Park	*37,000*	*39,000*	44,000
8: Olentangy Trail @ Worthington Hills Market	*160,000*	*170,000*	190,000
9: Scioto Trail, south of Main St.	*97,000*	*103,000*	115,000
10: Blacklick Trail, north of US33 Bridge	*28,000*	*30,000*	33,000

Notes: (1) Count values below10,000 rounded to nearest hundred; values above 10,000 rounded to nearest thousand. (2) Values shown in *light blue italics* indicate that annual estimates for those locations and years are based on the trend from locations 1 and 3, as no actual counts were taken in those years.

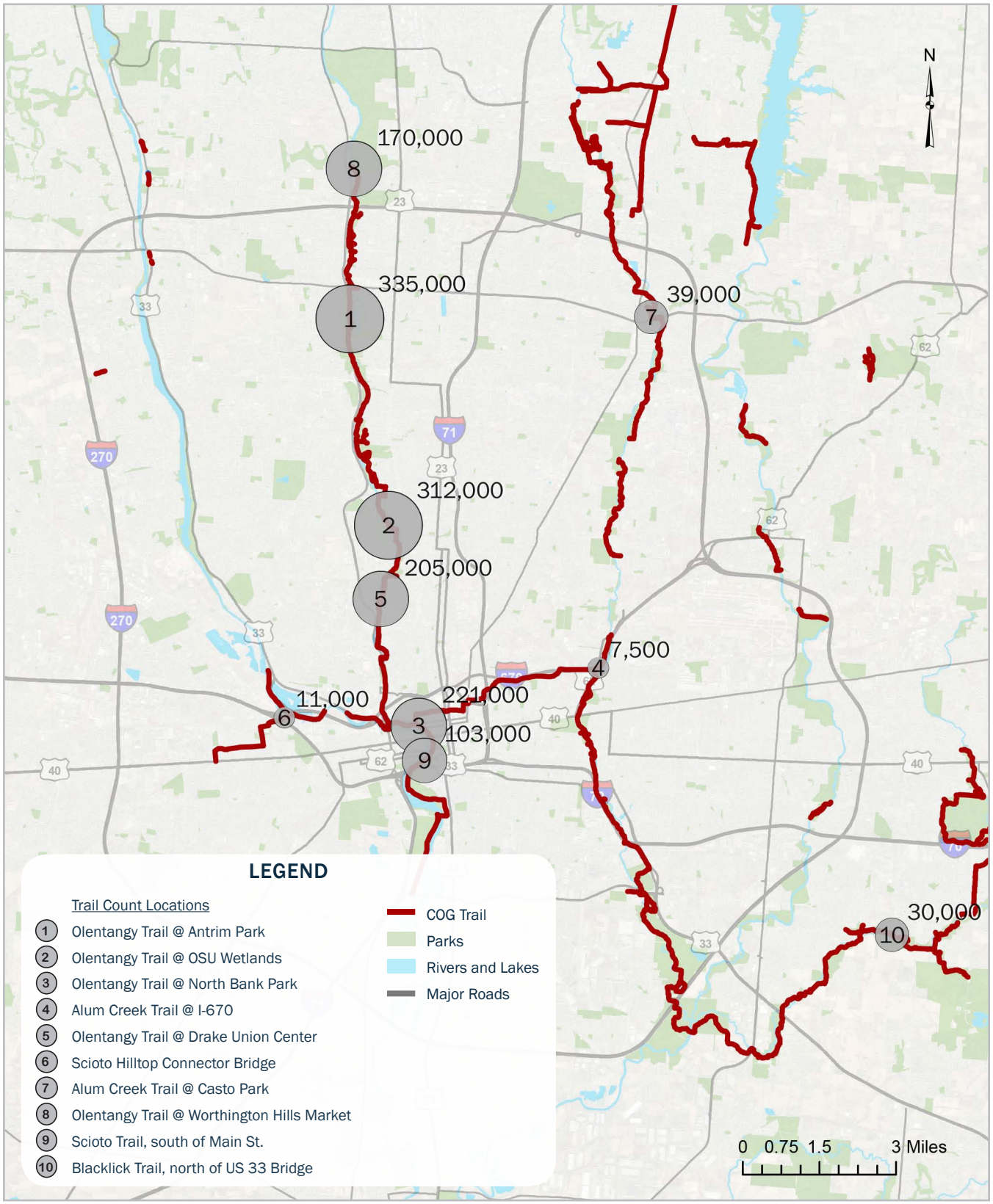
Figure 1. Estimated Annual Trail Volume by Location, 2010-2012



Key Facts

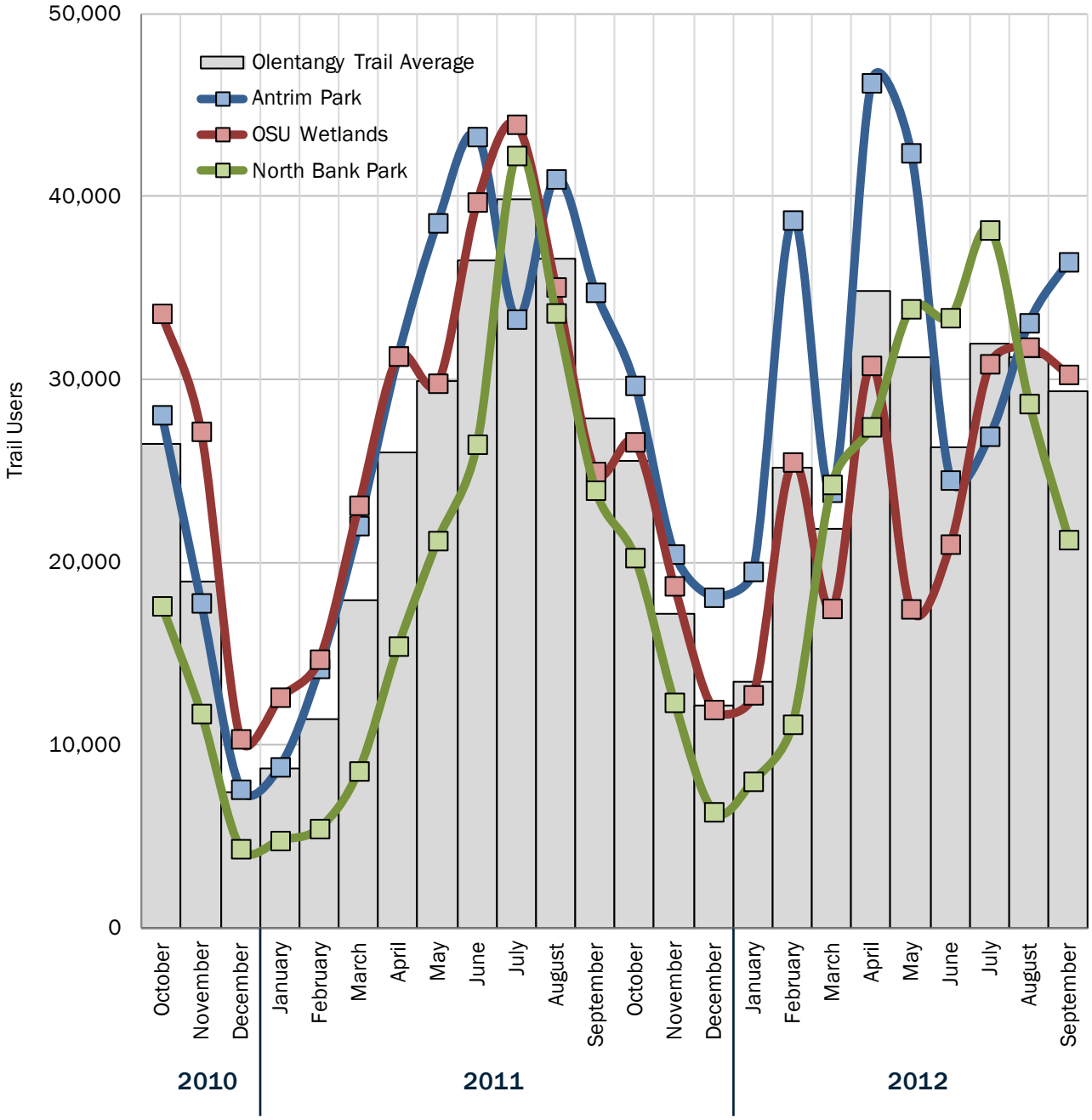
- Trail use increased by 25% at North Bank Park and by 8% at Antrim Park from 2010 to 2012.
- Trail use declined at OSU Wetlands, but this is undoubtedly due to the construction of the Dodridge Bridge. The portion of the trail south of the Wetlands was closed from July 2011 until October 2012.

Map 2. Estimated Annual Trail Volume by Location, 2011



2.2.2 Monthly Trail Usage

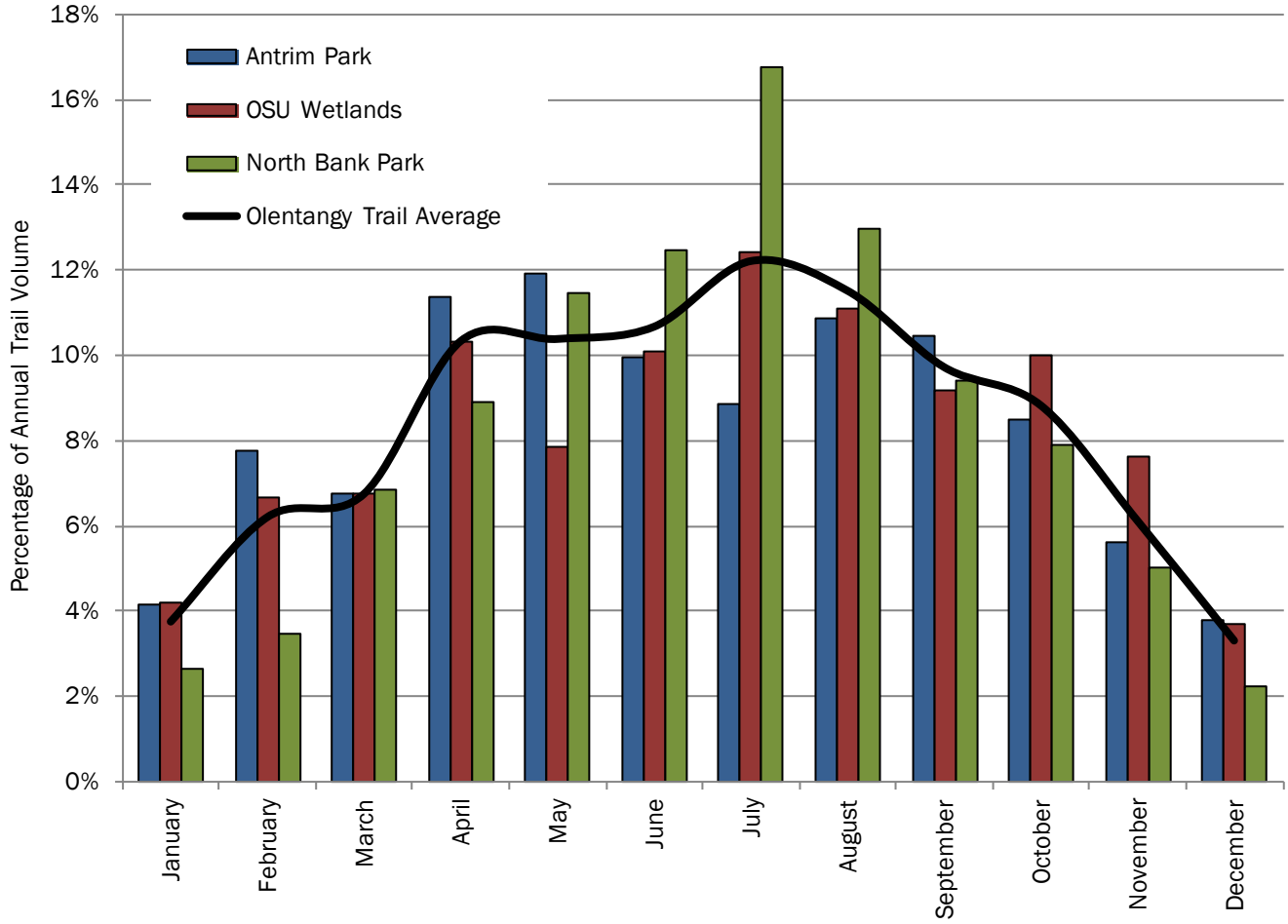
Figure 2. Estimated Trail Usage by Month, Olentangy Trail



Key Facts

- Trail use at the OSU Wetlands was typically the highest of the three sites prior to the beginning of the Dodridge Bridge construction project, which began in July 2011.
- Trail volume was much higher in winter 2012, which was unusually warm, but lower in summer 2012, which was unusually hot.

Figure 3. Percent of Annual Trail Usage by Month, Olentangy Trail

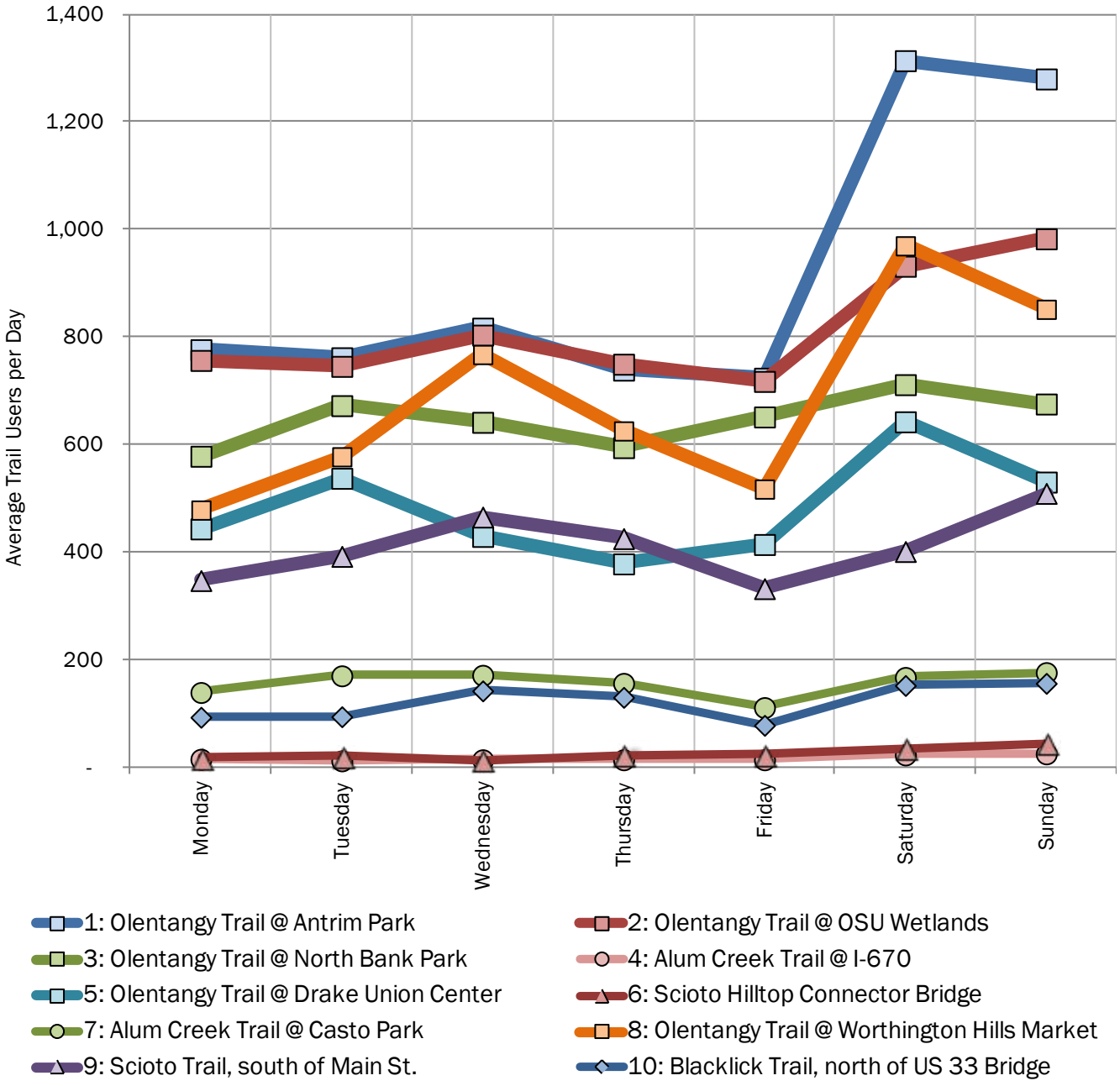


Key Facts

- July is the busiest month for all sites combined, and for OSU Wetlands and North Bank Park individually.
- April and May are busier at Antrim Park. However, this may be due in part to the unusually warm weather experienced in the spring of 2012.
- Heavy trail use at North Bank Park in July and August is partly due to special events, such as the Jazz & Ribs Fest, which takes place in July.
- December is the least busy month for all sites. Trail use begins to pick up in January.

2.2.3 Daily Trail Usage

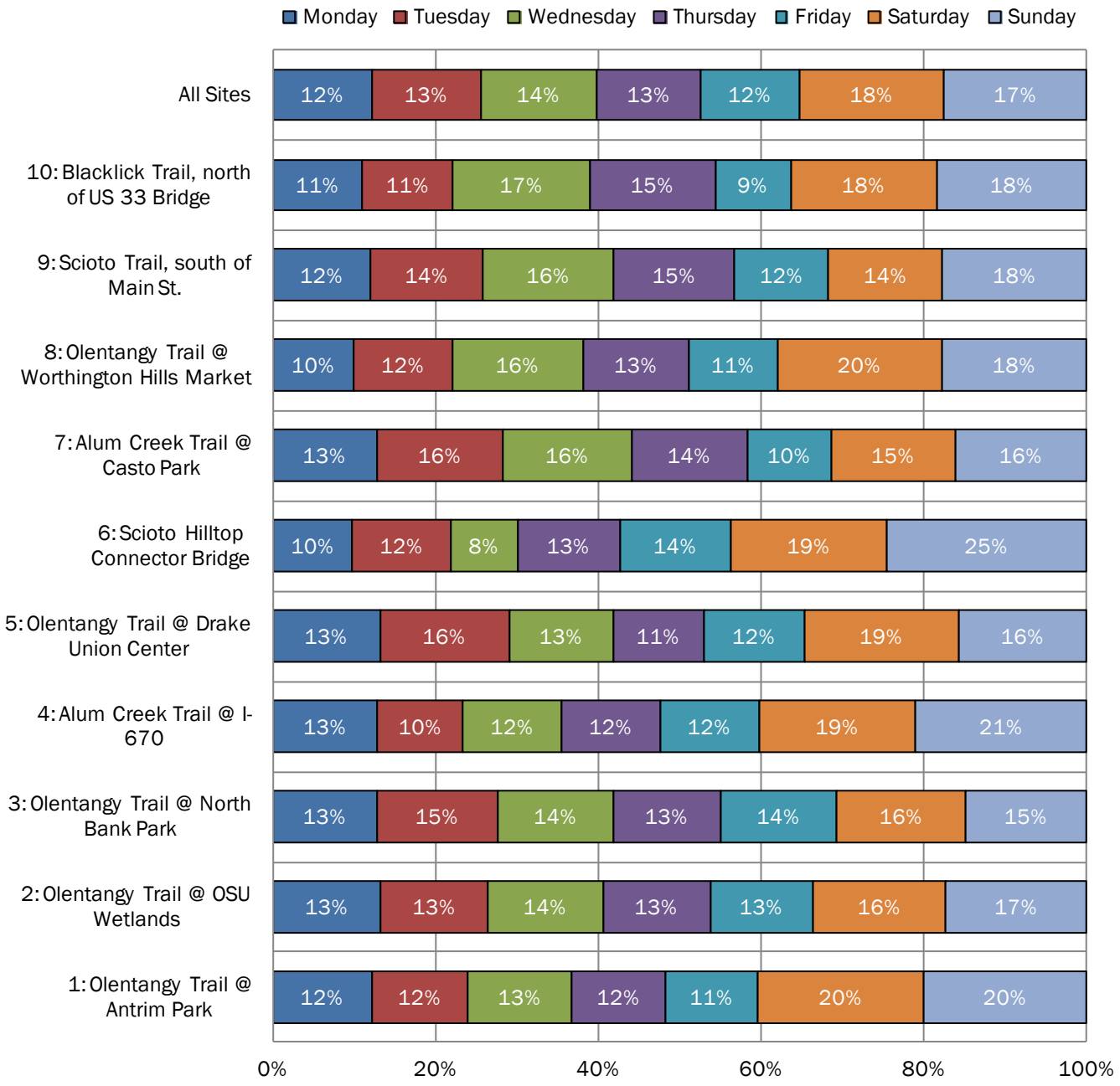
Figure 4. Average Daily Trail Usage by Day of Week



Key Facts

- Trail use is generally higher on the weekends than during the week. This is most pronounced at location 1 (Antrim Park) and location 8 (Worthington Hills Market).
- There is a noticeable peak in activity at locations 1, 2, 8, and 9 on Wednesdays.
- Trail use during the week is essentially the same at the Antrim and OSU Wetlands locations.

Figure 5. Percent of Weekly Trail Usage by Day of Week

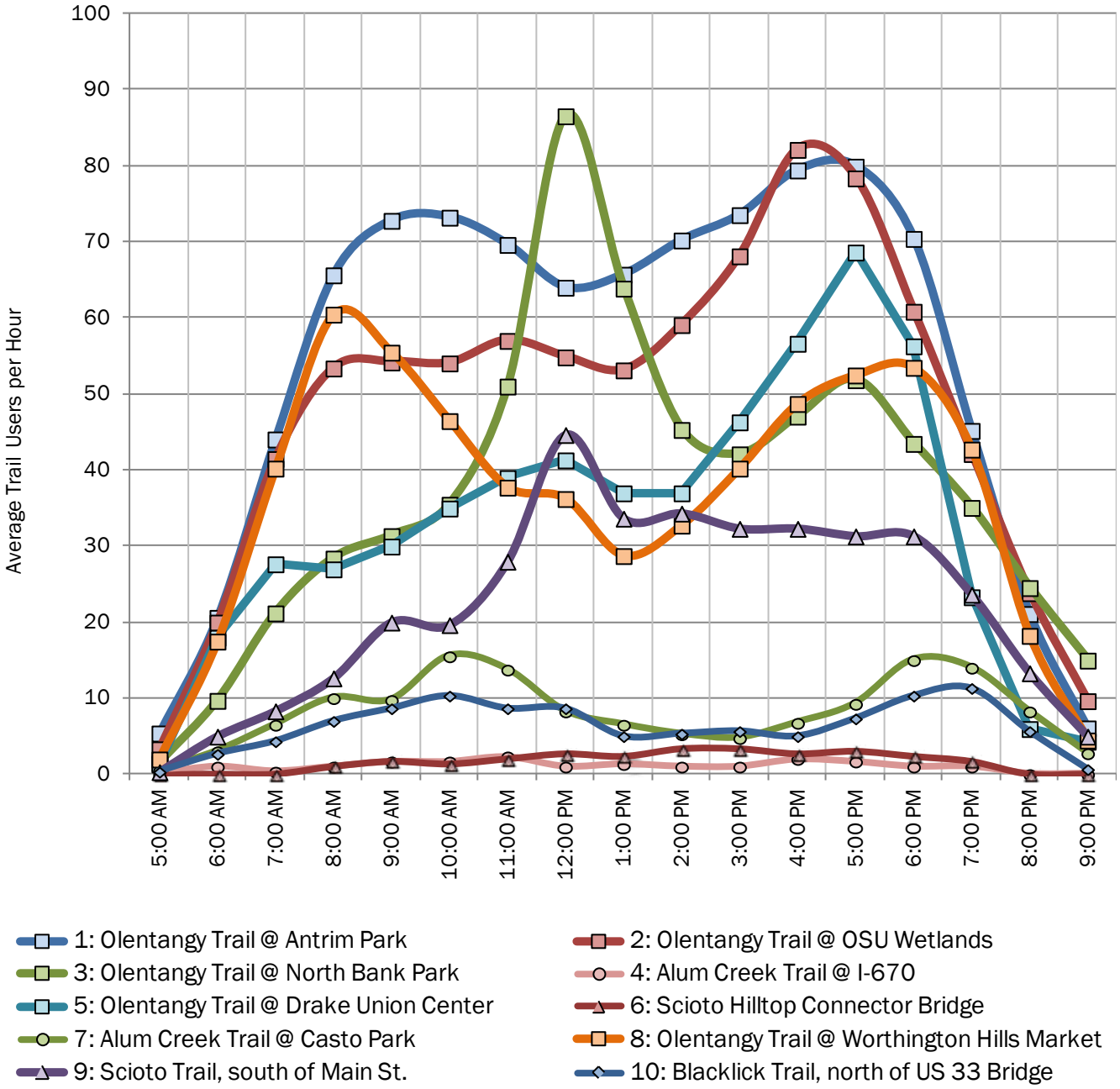


Key Facts

- The highest overall trail volume is on Saturday (18% of weekly total), followed closely by Sunday (17%).
- More dense urban areas appear to have relatively higher weekday volumes. For example, weekdays account for 69% of total volume at location 3 (North Bank Park) and 68% at location 5 (Scioto Trail), compared to only 60% at location 1 (Antrim Park) and 62% at location 8 (Worthington Hills Market).

2.2.4 Hourly Trail Usage

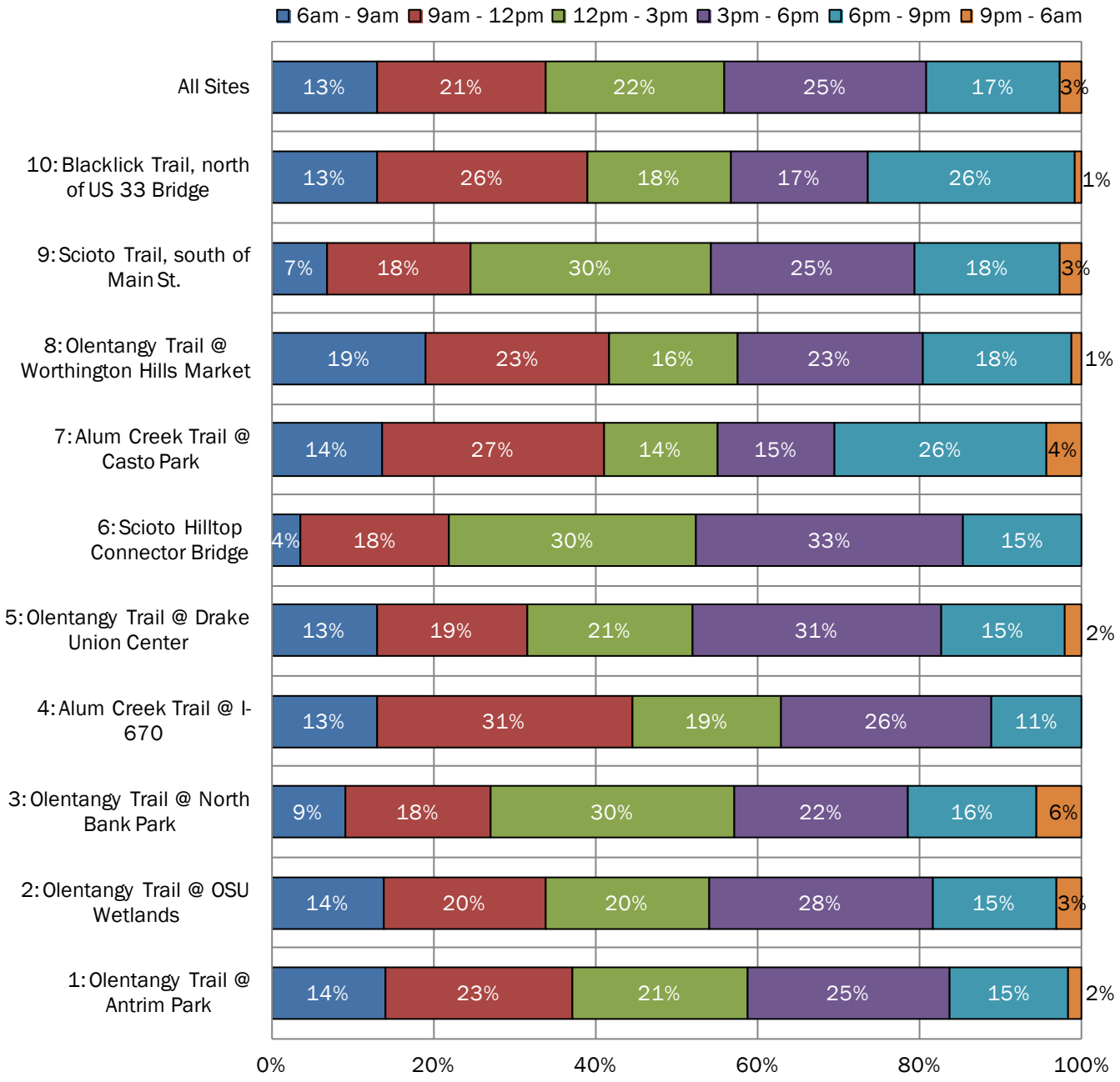
Figure 6. Average Hourly Trail Usage by Time of Day, 5am - 10pm



Key Facts

- The highest average hourly volume is 87 at location 3 (North Bank Park) from 12pm to 1pm. Location 9 (Scioto Trail) also shows a distinct lunch hour peak.
- Location 1 (Antrim Park) shows a clear commuting pattern, combined with steady use throughout the day. Location 3 (OSU Wetlands) shows a similar, but less distinct pattern, likely due to the large number of students at Location 2.

Figure 7. Percent of Daily Trail Usage by Time of Day



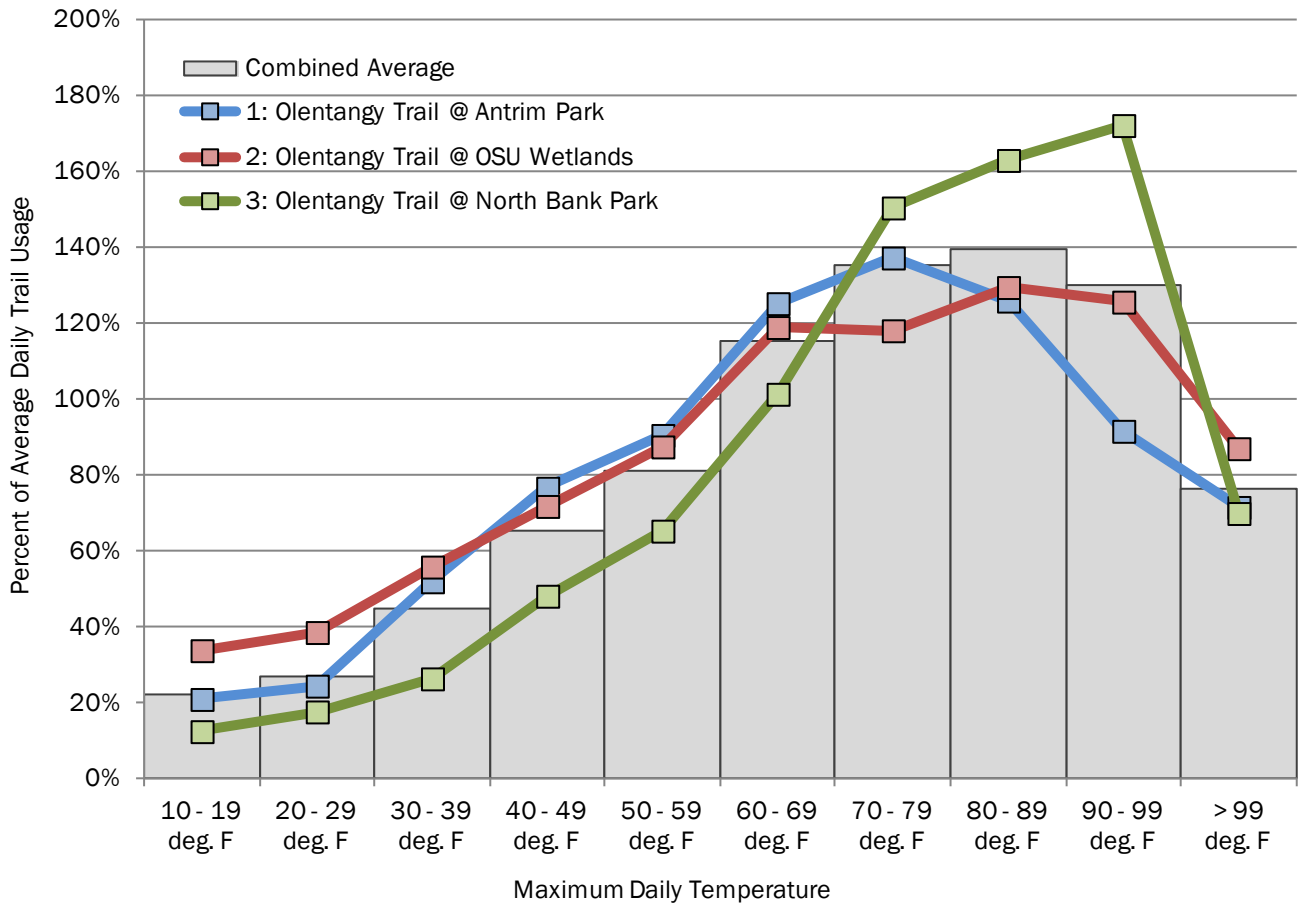
Key Facts

- 30% of trail volume at locations 3 (North Bank Park) and 9 (Scioto Trail) occur between the hours of 12pm and 3pm, indicating significant lunchtime activity.
- Location 1 (Antrim Park) has a relatively steady distribution of trail use throughout the day, suggesting both commuting and recreational activity.
- Location 7 (Casto Park) shows high levels of late morning and late evening activity, which is suggestive of recreational use.

2.3 Influence of Weather on Trail Volume

2.3.1 Temperature

Figure 8. Percent of Average Daily Trail Usage by Temperature, Olentangy Trail

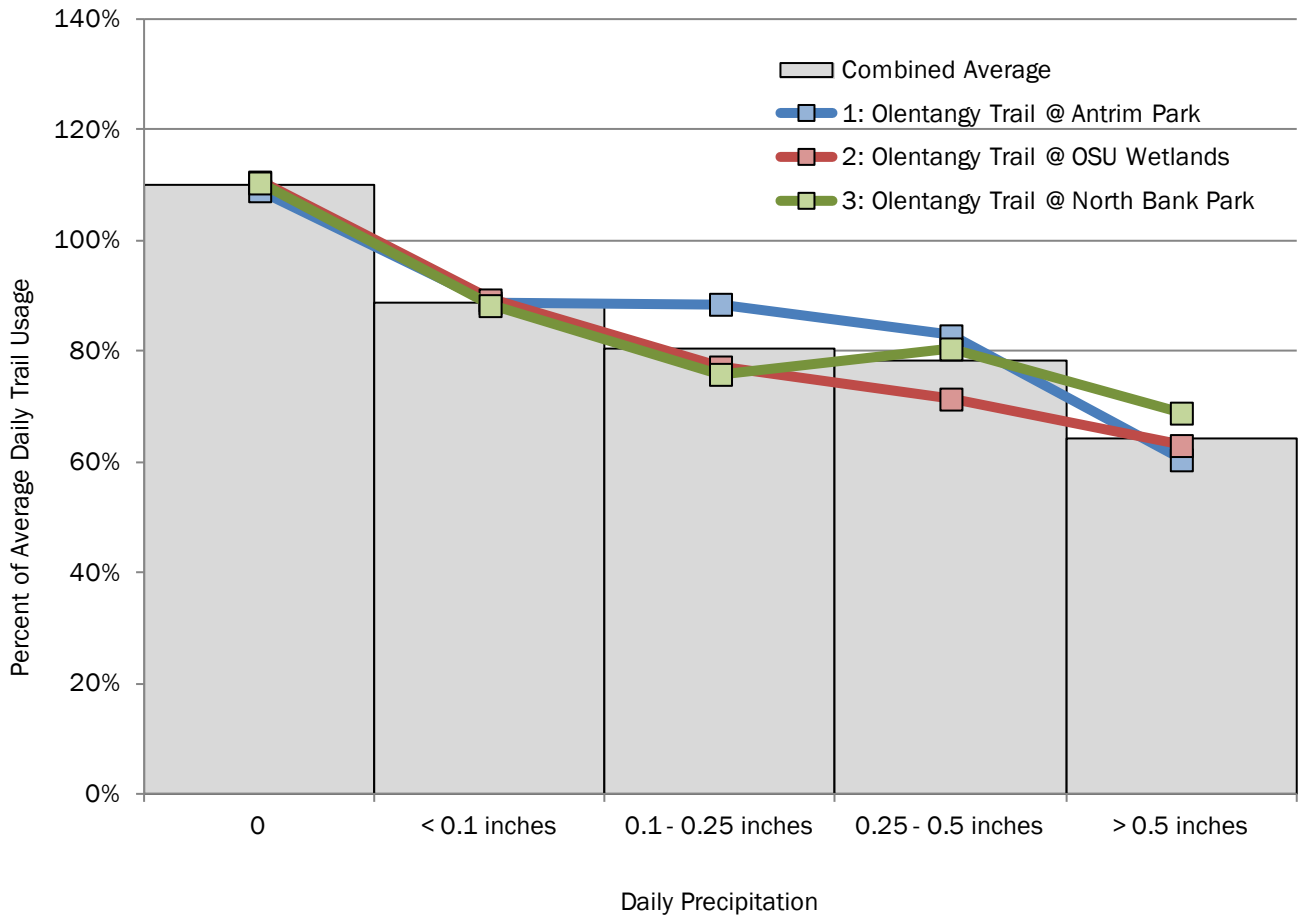


Key Facts

- Highest trail use occurs when temperatures range from 70 deg. F to 90 deg. F.
- Trail use at location 3 (North Bank Park) appears to be most heavily affected by weather. This reinforces that a greater portion of trips at this site is recreational.
- Location 1 (Antrim Park) shows greater sensitivity to weather than location 2 (OSU Wetlands). This may indicate that trail users passing through the OSU Wetlands are more likely to be reliant on biking or walking, as compared to those at Antrim Park.

2.3.2 Precipitation

Figure 9. Percent of Average Daily Trail Usage by Precipitation, Olentangy Trail



Key Facts

- Even on rainy days, trail volume remains above 60% of typical daily use.

2.4 Influence of Special Events on Trail Volume

2.4.1 Olentangy Trail Construction (July 2011 - October 2012)

Figure 10. Olentangy Trail Use before and during Dodridge Bridge Construction

Key Facts

- Trail use at location 2 (OSU Wetlands Park) declined by 19% during construction, compared to the prior similar period before construction began.
- Taking into account the increase at locations 1 (Antrim Park) and 3 (North Bank Park), trail use was 39% lower at the OSU Wetlands location during construction compared to what it would have been if the same trend had applied there.

2.4.2 Festivals and Bike Rides

Table 5. Daily Use during Special Events, Olentangy Trail

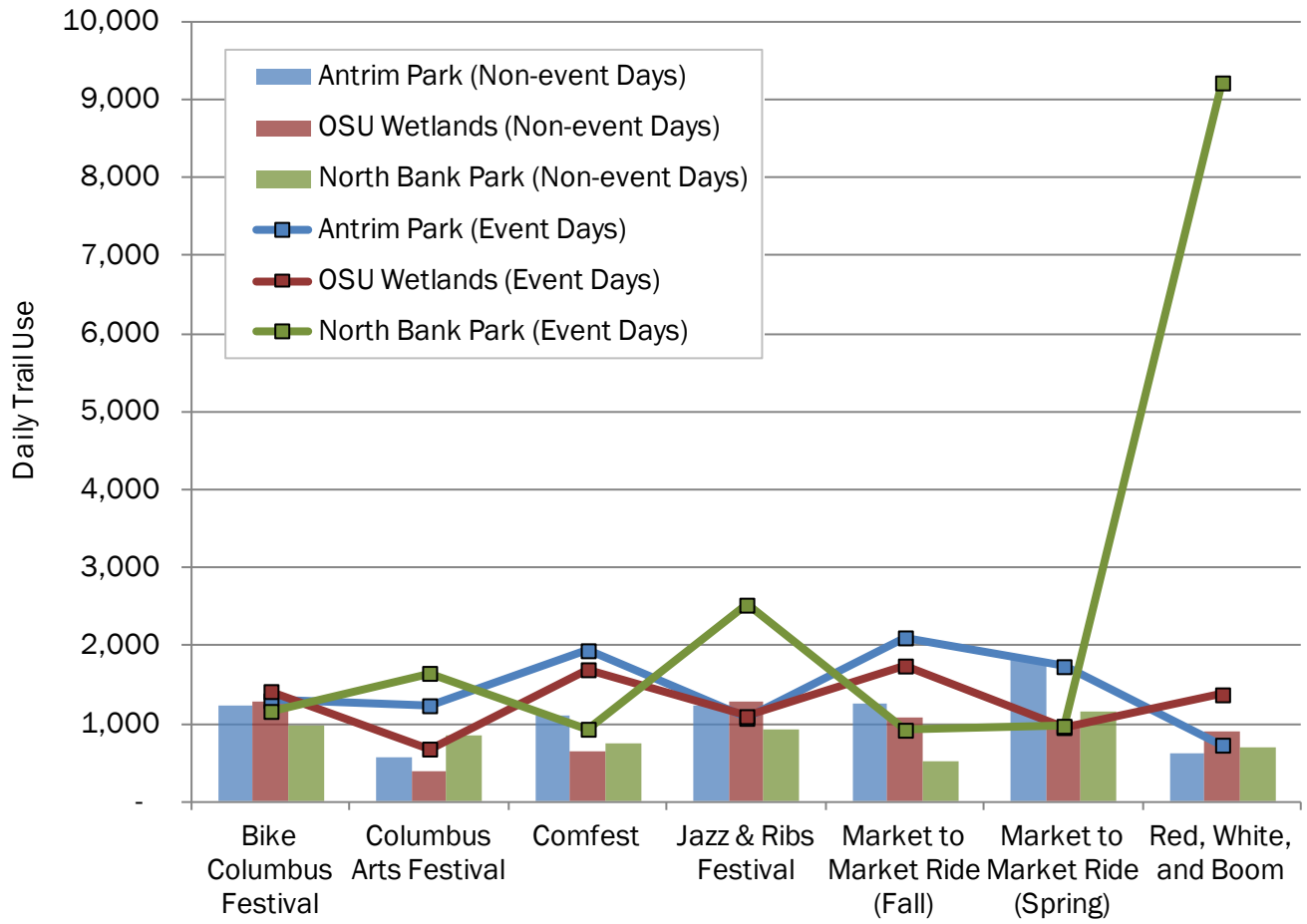
EVENT	DAY OF THE WEEK	DATE	WEATHER		LOCATION		
			RAIN (IN.)	DAILY HIGH TEMP. (DEG. F)	ANTRIM PARK	OSU WETLANDS	NORTH BANK PARK
Bike Columbus Festival	Friday	7/15/2011	0.0	85	995	1,367	1,109
	Saturday	7/16/2011	0.0	87	2,041	2,039	1,624
	Sunday	7/17/2011	0.0	88	1,487	1,972	1,390
	Friday	7/13/2012	0.0	85	654	896	978
	Saturday	7/14/2012	0.0	87	1,342	831	731
Columbus Arts Festival	Friday	6/1/2012	0.7	66	461	310	480
	Saturday	6/2/2012	0.0	71	2,550	1,410	2,345
	Sunday	6/3/2012	0.0	79	707	332	2,138
Comfest	Saturday	6/25/2011	0.0	78	2,847	2,393	1,138
	Sunday	6/26/2011	0.0	75	1,991	1,753	751
	Friday	6/22/2012	0.0	86	-	1,063	-
	Saturday	6/23/2012	0.0	87	1,607	1,627	1,032
	Sunday	6/24/2012	0.0	90	1,330	1,667	831
Jazz & Ribs Festival	Friday	7/22/2011	0.4	96	563	610	1,270
	Saturday	7/23/2011	0.6	94	1,041	1,290	2,388
	Sunday	7/24/2011	1.6	91	938	1,054	1,628
	Friday	7/20/2012	0.1	76	547	448	1,437
	Saturday	7/21/2012	0.0	84	1,906	1,553	5,704
	Sunday	7/22/2012	0.0	89	1,473	1,645	2,743
Market to Market Ride (Fall)	Saturday	10/2/2010	0.1	66	1,864	1,290	401
	Saturday	10/8/2011	0.0	80	2,354	2,207	1,450
Market to Market Ride (Spring)	Saturday	5/7/2011	0.4	65	1,983	1,368	497
	Saturday	5/5/2012	0.0	79	1,497	551	1,456
Red, White, and Boom	Friday	7/1/2011	0.0	90	932	1,777	10,400
	Tuesday	7/3/2012	0.0	93	536	981	8,039

Table 6. Average Daily Use on Special Event Days vs. Non-event Days, Olentangy Trail

EVENT	ANTRIM PARK			OSU WETLANDS			NORTH BANK PARK		
	Event Day(s)	Non-event Days	Percent Difference	Event Day(s)	Non-event Days	Percent Difference	Event Day(s)	Non-event Days	Percent Difference
Bike Columbus Festival (7/15-17/2011, 7/13-14/2012)	1,304	1,227	6%	1,421	1,289	10%	1,166	971	20%
Columbus Arts Festival (6/1-3/3012)	1,239	566	119%	684	404	69%	1,654	855	94%
Comfest (6/25-27/2011, 6/22-24/2012)	1,944	1,097	77%	1,701	648	162%	938	756	24%
Jazz & Ribs Festival (7/22-24/2011, 7/20-22/2012)	1,078	1,222	-12%	1,100	1,293	-15%	2,528	939	169%
Market to Market Ride (Fall; 10/2/2010, 10/8/2011)	2,109	1,255	68%	1,749	1,084	61%	926	510	81%
Market to Market Ride (Spring; 5/7/2011, 5/5/2012)	1,740	1,827	-5%	960	1,031	-7%	977	1,156	-16%
Red, White, and Boom (7/1/2011, 7/3/2012)	734	624	18%	1,379	904	53%	9,220	698	1222%

Note: Comparison days (non-event days) are based on the average of trail use from the same month and day of week as the event. For example, since Comfest takes place on Friday, Saturday, and Sunday in June, it is compared with other Fridays, Saturdays, and Sundays in June.

Figure 11. Average Daily Trail Use on Special Event Days vs. Non-event Days, Olentangy Trail



Key Facts

- Close to 10,000 users were counted at North Bank Park during Red,White, and Boom. The actual number is likely to be much higher since the trail counters cannot distinguish side-by-side users. Trail use at OSU Wetlands was about 50% higher than normal during Red, White, and Boom, while only a small increase was observed at Antrim Park.
- A total of nearly 10,000 users was observed at North Bank Park during the Jazz & Ribs Festival in 2012, compared to around 5,300 in 2011.
- Trail use nearly doubled at North Bank Park during the Columbus Arts Festival.
- Comfest most significantly impacts the OSU Wetlands, where trail use more than doubled. However, increased use was observed at all sites.
- The Market to Market Ride appears to have had a greater impact in the fall than spring, but this may be due to other factors, such as weather.

3. CONCLUSION

The 2012 Columbus Trail Count report provides a strong foundation for understanding and documenting trail use in central Ohio. The report demonstrates that completed trails, such as the Olentangy Trail, can serve well over 400,000 users annually. It also shows that the use characteristics of each trail can vary significantly by location. Some locations seem to cater to both recreational users and commuters, while others are more specific to one type or the other.

Overall, the analysis indicates that trail use is increasing in central Ohio. This theory can be tested over the upcoming years. It will be especially interesting to see whether the trail volume at the OSU Wetlands location increases to its level prior to the temporary closure of the trail at Dodridge St.

The report suggests that trail use patterns have important implications for the design and maintenance of trail facilities. For example, trails with more dramatic peaks of activity may need to be wider than those with a more even distribution throughout the day.

The influence of weather was shown to be significant, but there are clearly many users who still rely on the trail system during inclement weather. This indicates that maintenance of the trails during ice or snow conditions should be a high priority. Similarly, designing trails that remain usable during periods of heavy rain should be standard practice.

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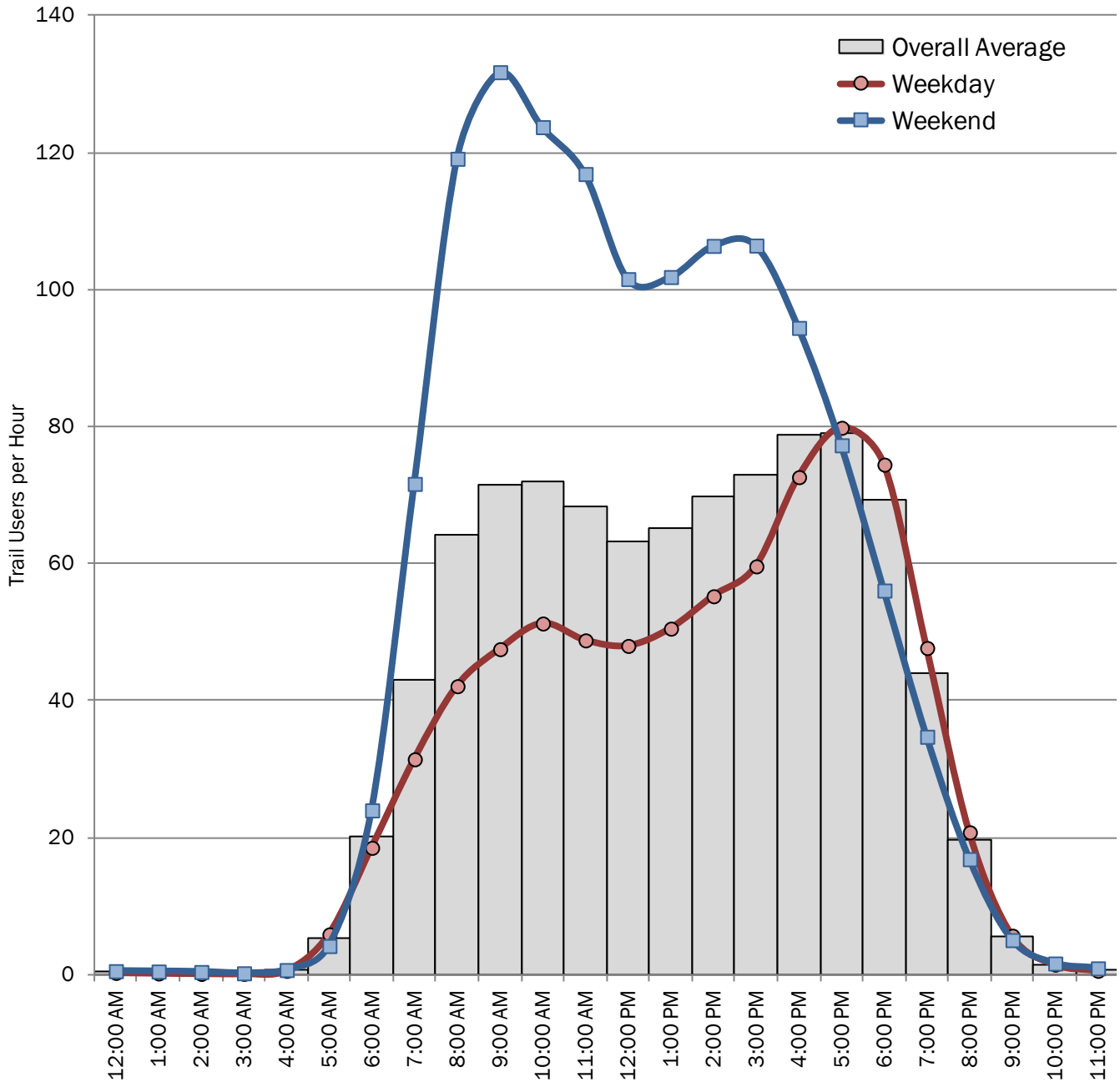
APPENDIX 1. HOURLY TRAIL USE FOR EACH LOCATION

Appendix 1.1 Location 1: Olentangy Trail @ Antrim Park

Table 7. Average Trail Use by Hour (Location 1)

HOUR	HOURLY AVERAGE		
	Weekday	Weekend	Overall
12:00 AM	0	1	0
1:00 AM	0	1	0
2:00 AM	0	0	0
3:00 AM	0	0	0
4:00 AM	1	1	1
5:00 AM	6	4	5
6:00 AM	19	24	20
7:00 AM	31	72	43
8:00 AM	42	119	64
9:00 AM	48	132	72
10:00 AM	51	124	72
11:00 AM	49	117	68
12:00 PM	48	102	63
1:00 PM	51	102	65
2:00 PM	55	106	70
3:00 PM	60	106	73
4:00 PM	73	94	79
5:00 PM	80	77	79
6:00 PM	74	56	69
7:00 PM	48	35	44
8:00 PM	21	17	20
9:00 PM	6	5	6
10:00 PM	2	2	2
11:00 PM	1	1	1

Figure 12. Average Trail Use by Hour (Location 1)

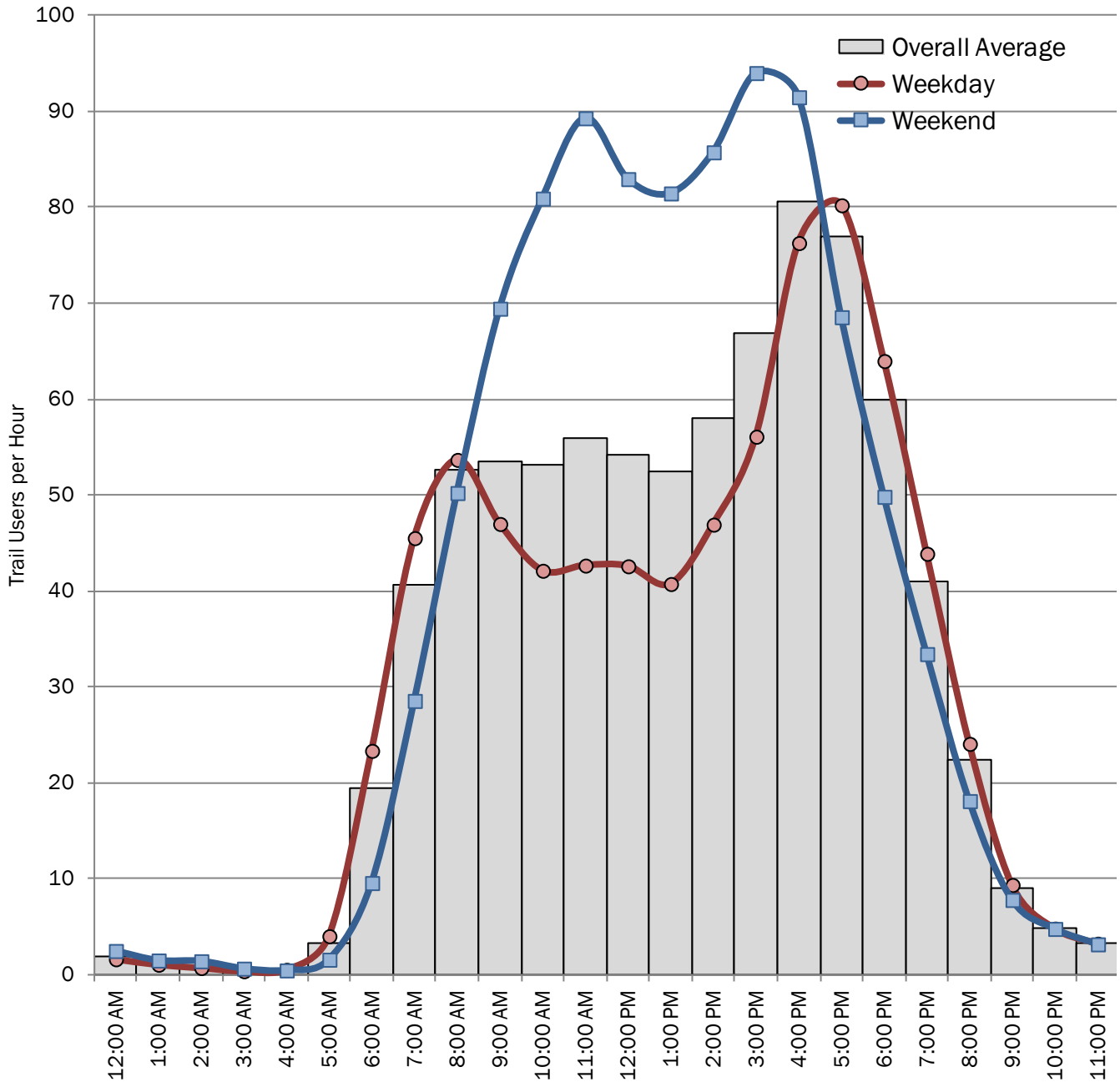


Appendix 1.2 Location 2: Olentangy Trail @ OSU Wetlands

Table 8. Average Trail Use by Hour (Location 2)

HOUR	HOURLY AVERAGE		
	Weekday	Weekend	Overall
12:00 AM	2	2	2
1:00 AM	1	2	1
2:00 AM	1	1	1
3:00 AM	0	1	0
4:00 AM	1	0	1
5:00 AM	4	2	3
6:00 AM	23	10	19
7:00 AM	46	29	41
8:00 AM	54	50	53
9:00 AM	47	69	53
10:00 AM	42	81	53
11:00 AM	43	89	56
12:00 PM	43	83	54
1:00 PM	41	81	52
2:00 PM	47	86	58
3:00 PM	56	94	67
4:00 PM	76	91	81
5:00 PM	80	69	77
6:00 PM	64	50	60
7:00 PM	44	33	41
8:00 PM	24	18	22
9:00 PM	9	8	9
10:00 PM	5	5	5
11:00 PM	3	3	3

Figure 13. Average Trail Use by Hour (Location 2)

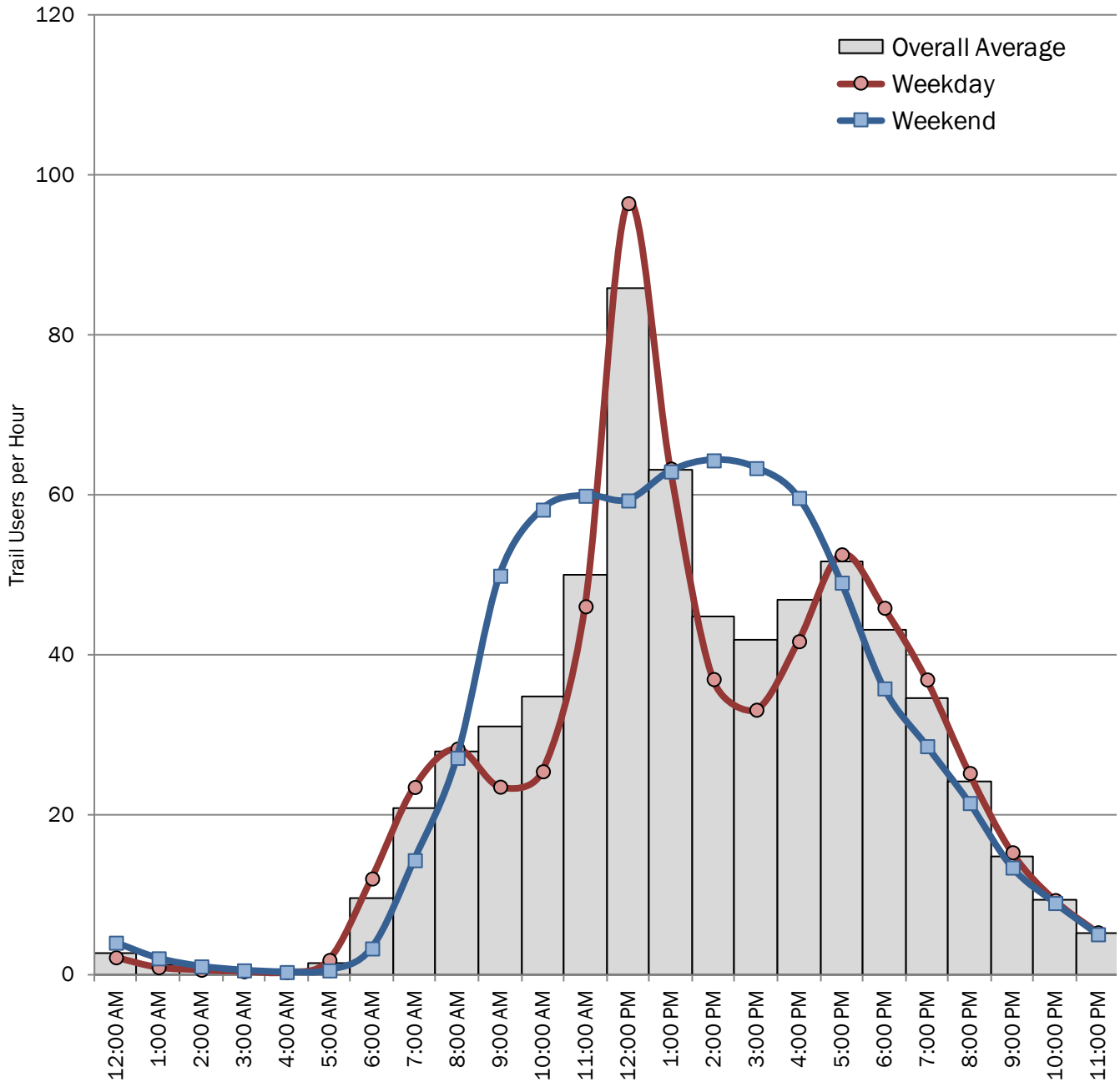


Appendix 1.3 Location 3: Olentangy Trail @ North Bank Park

Table 9. Average Trail Use by Hour (Location 3)

HOUR	HOURLY AVERAGE		
	Weekday	Weekend	Overall
12:00 AM	2	4	3
1:00 AM	1	2	1
2:00 AM	1	1	1
3:00 AM	0	1	0
4:00 AM	0	0	0
5:00 AM	2	1	1
6:00 AM	12	3	10
7:00 AM	24	14	21
8:00 AM	28	27	28
9:00 AM	24	50	31
10:00 AM	25	58	35
11:00 AM	46	60	50
12:00 PM	97	59	86
1:00 PM	63	63	63
2:00 PM	37	64	45
3:00 PM	33	63	42
4:00 PM	42	60	47
5:00 PM	53	49	52
6:00 PM	46	36	43
7:00 PM	37	29	35
8:00 PM	25	22	24
9:00 PM	15	13	15
10:00 PM	9	9	9
11:00 PM	5	5	5

Figure 14. Average Trail Use by Hour (Location 3)

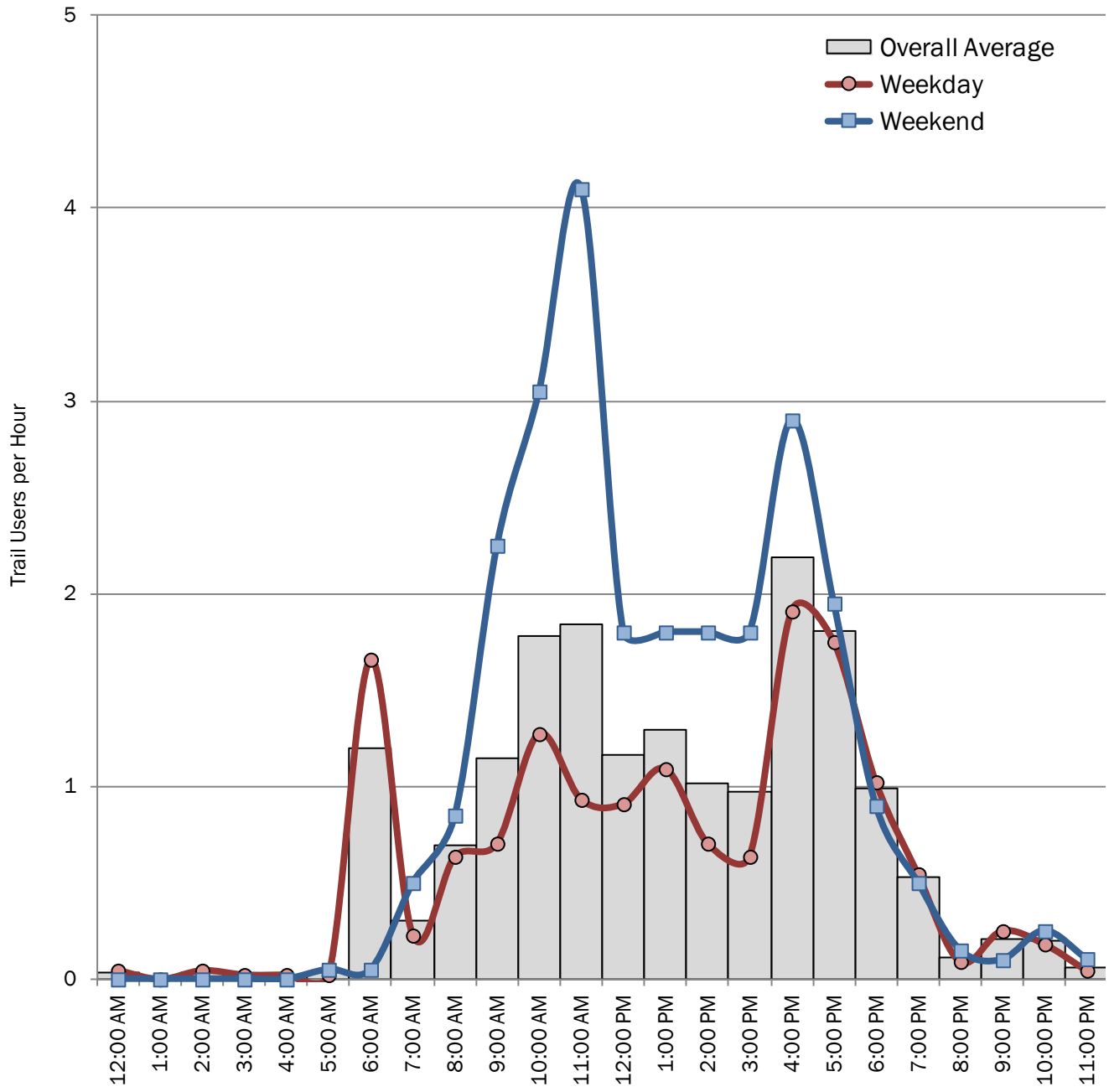


Appendix 1.4 Location 4: Alum Creek Trail @ I-670

Table 10. Average Trail Use by Hour (Location 4)

HOUR	HOURLY AVERAGE		
	Weekday	Weekend	Overall
12:00 AM	0	0	0
1:00 AM	0	0	0
2:00 AM	0	0	0
3:00 AM	0	0	0
4:00 AM	0	0	0
5:00 AM	0	0	0
6:00 AM	2	0	1
7:00 AM	0	1	0
8:00 AM	1	1	1
9:00 AM	1	2	1
10:00 AM	1	3	2
11:00 AM	1	4	2
12:00 PM	1	2	1
1:00 PM	1	2	1
2:00 PM	1	2	1
3:00 PM	1	2	1
4:00 PM	2	3	2
5:00 PM	2	2	2
6:00 PM	1	1	1
7:00 PM	1	1	1
8:00 PM	0	0	0
9:00 PM	0	0	0
10:00 PM	0	0	0
11:00 PM	0	0	0

Figure 15. Average Trail Use by Hour (Location 4)

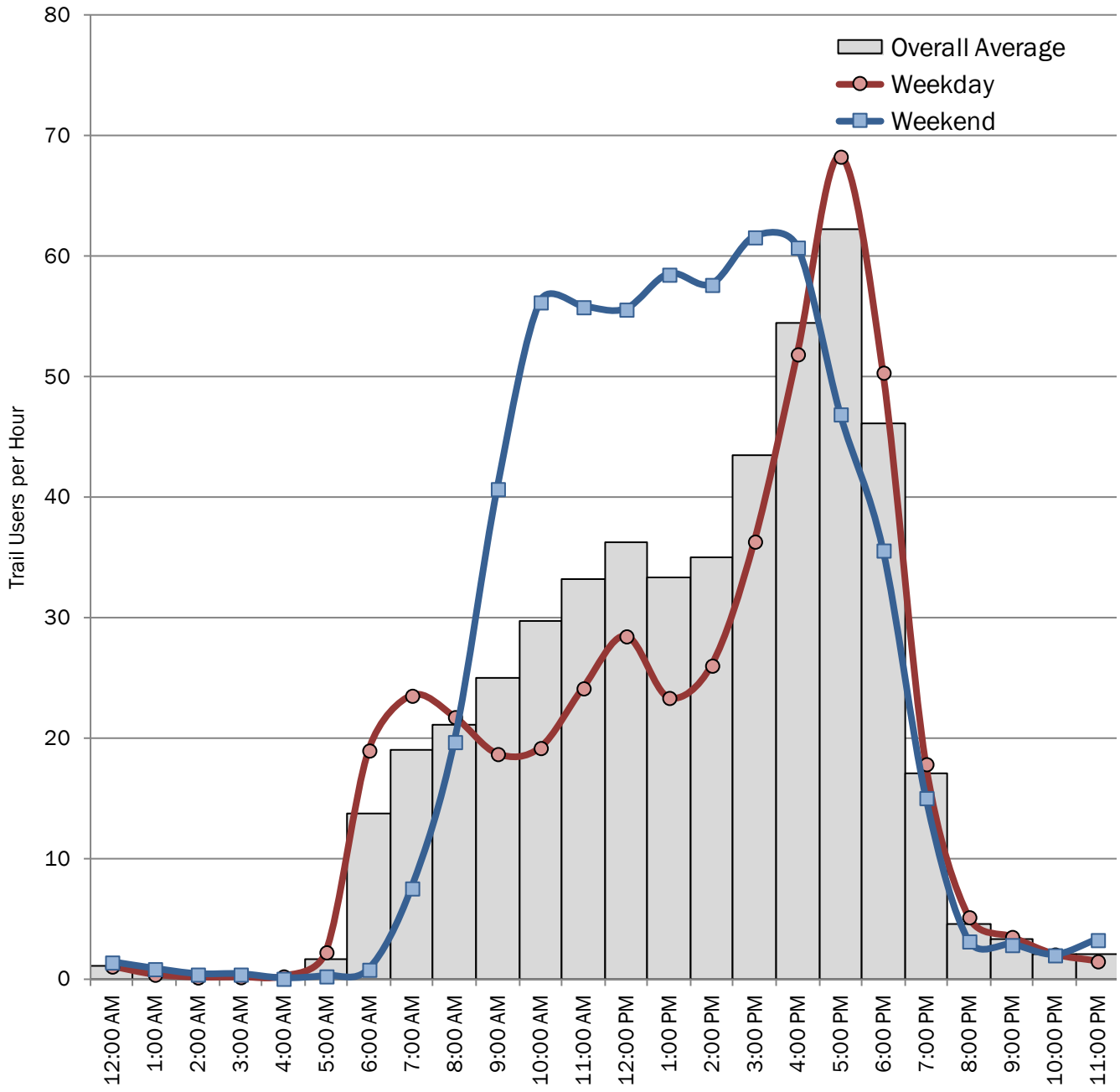


Appendix 1.5 Location 5: Olentangy Trail @ Drake Union Center

Table 11. Average Trail Use by Hour (Location 5)

HOUR	HOURLY AVERAGE		
	Weekday	Weekend	Overall
12:00 AM	1	1	1
1:00 AM	0	1	1
2:00 AM	0	0	0
3:00 AM	0	0	0
4:00 AM	0	0	0
5:00 AM	2	0	2
6:00 AM	19	1	14
7:00 AM	24	8	19
8:00 AM	22	20	21
9:00 AM	19	41	25
10:00 AM	19	56	30
11:00 AM	24	56	33
12:00 PM	28	56	36
1:00 PM	23	59	33
2:00 PM	26	58	35
3:00 PM	36	62	44
4:00 PM	52	61	54
5:00 PM	68	47	62
6:00 PM	50	36	46
7:00 PM	18	15	17
8:00 PM	5	3	5
9:00 PM	4	3	3
10:00 PM	2	2	2
11:00 PM	2	3	2

Figure 16. Average Trail Use by Hour (Location 5)

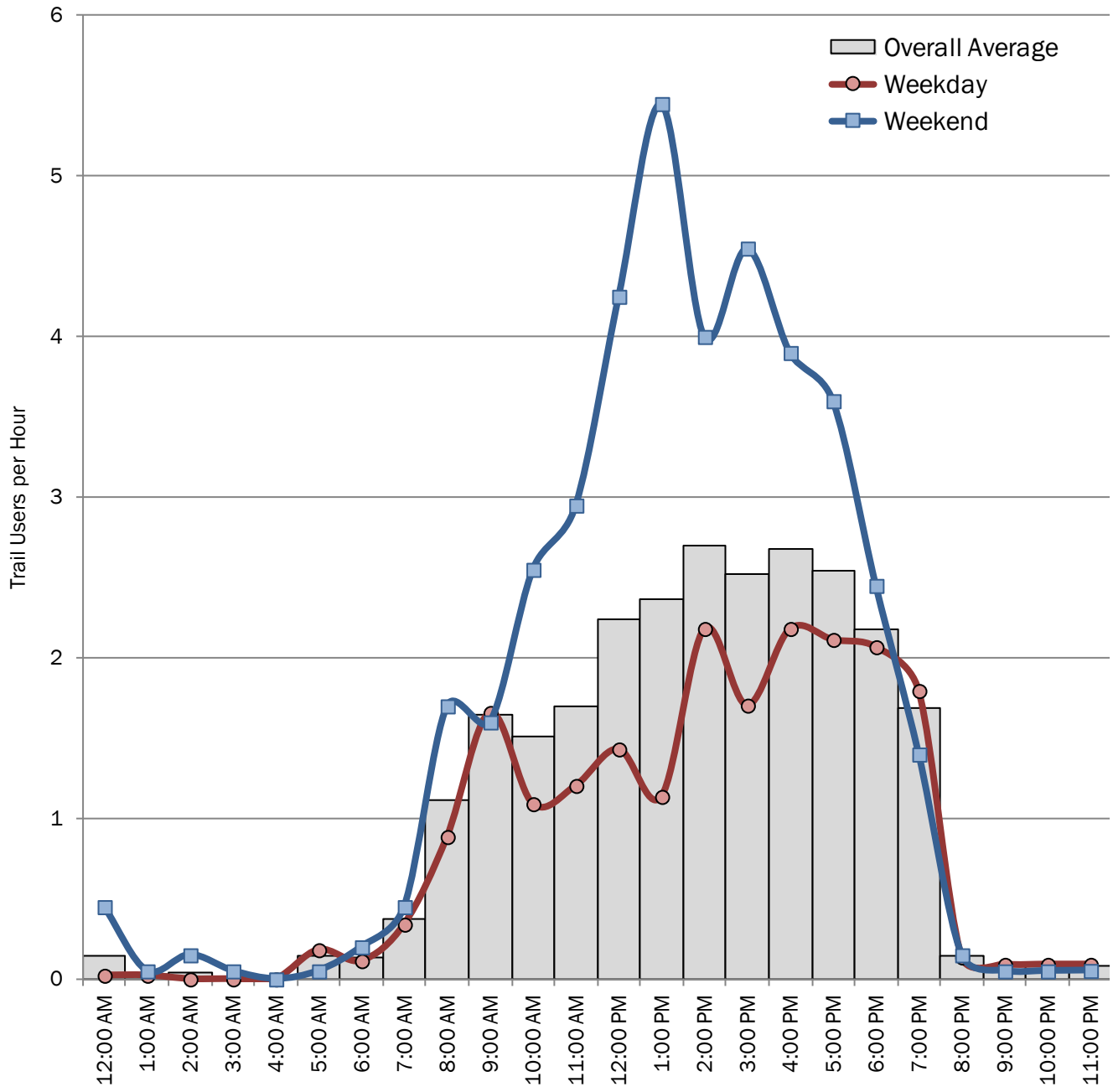


Appendix 1.6 Location 6: Scioto Hilltop Connector Bridge

Table 12. Average Trail Use by Hour (Location 6)

HOUR	HOURLY AVERAGE		
	Weekday	Weekend	Overall
12:00 AM	0	0	0
1:00 AM	0	0	0
2:00 AM	0	0	0
3:00 AM	0	0	0
4:00 AM	0	0	0
5:00 AM	0	0	0
6:00 AM	0	0	0
7:00 AM	0	0	0
8:00 AM	1	2	1
9:00 AM	2	2	2
10:00 AM	1	3	2
11:00 AM	1	3	2
12:00 PM	1	4	2
1:00 PM	1	5	2
2:00 PM	2	4	3
3:00 PM	2	5	3
4:00 PM	2	4	3
5:00 PM	2	4	3
6:00 PM	2	2	2
7:00 PM	2	1	2
8:00 PM	0	0	0
9:00 PM	0	0	0
10:00 PM	0	0	0
11:00 PM	0	0	0

Figure 17. Average Trail Use by Hour (Location 6)

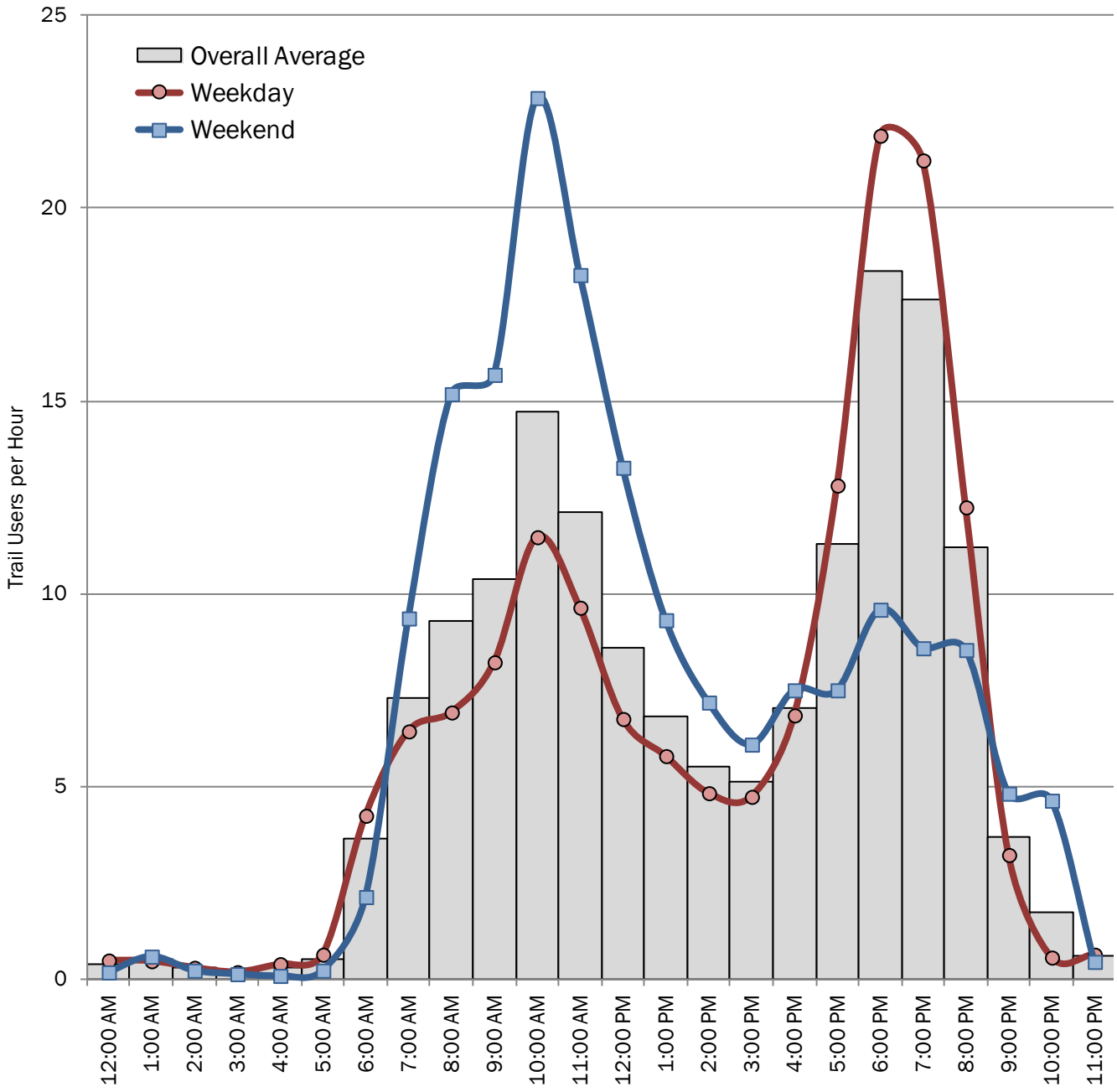


Appendix 1.7 Location 7: Alum Creek Trail @ Casto Park

Table 13. Average Trail Use by Hour (Location 7)

HOUR	HOURLY AVERAGE		
	Weekday	Weekend	Overall
12:00 AM	0	0	0
1:00 AM	0	1	1
2:00 AM	0	0	0
3:00 AM	0	0	0
4:00 AM	0	0	0
5:00 AM	1	0	1
6:00 AM	4	2	4
7:00 AM	6	9	7
8:00 AM	7	15	9
9:00 AM	8	16	10
10:00 AM	11	23	15
11:00 AM	10	18	12
12:00 PM	7	13	9
1:00 PM	6	9	7
2:00 PM	5	7	6
3:00 PM	5	6	5
4:00 PM	7	8	7
5:00 PM	13	8	11
6:00 PM	22	10	18
7:00 PM	21	9	18
8:00 PM	12	9	11
9:00 PM	3	5	4
10:00 PM	1	5	2
11:00 PM	1	0	1

Figure 18. Average Trail Use by Hour (Location 7)

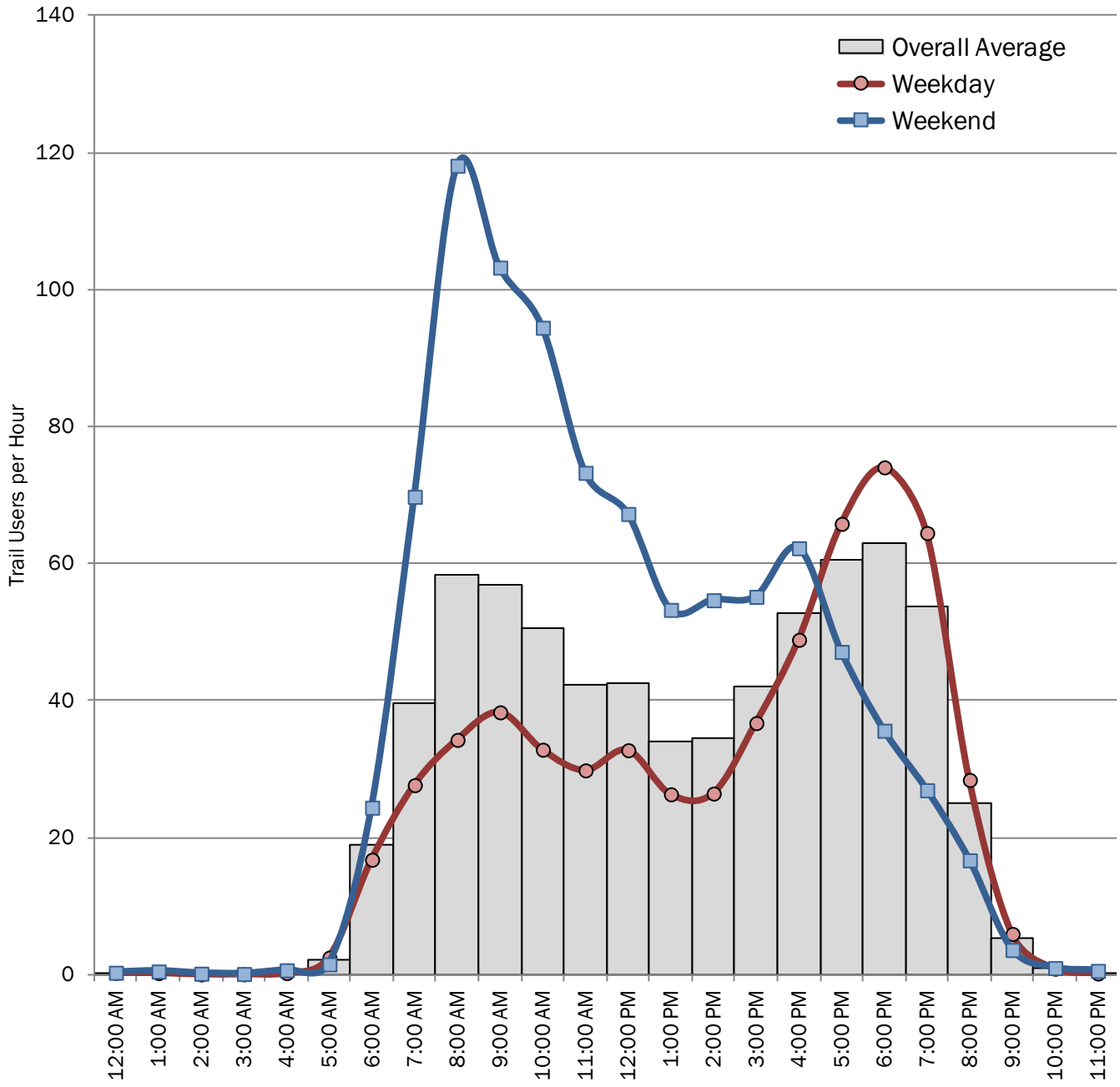


Appendix 1.8 Location 8: Olentangy Trail @ Worthington Hills Market

Table 14. Average Trail Use by Hour (Location 8)

HOUR	HOURLY AVERAGE		
	Weekday	Weekend	Overall
12:00 AM	0	1	0
1:00 AM	0	1	0
2:00 AM	0	0	0
3:00 AM	0	0	0
4:00 AM	1	1	1
5:00 AM	6	4	5
6:00 AM	19	24	20
7:00 AM	31	72	43
8:00 AM	42	119	64
9:00 AM	48	132	72
10:00 AM	51	124	72
11:00 AM	49	117	68
12:00 PM	48	102	63
1:00 PM	51	102	65
2:00 PM	55	106	70
3:00 PM	60	106	73
4:00 PM	73	94	79
5:00 PM	80	77	79
6:00 PM	74	56	69
7:00 PM	48	35	44
8:00 PM	21	17	20
9:00 PM	6	5	6
10:00 PM	2	2	2
11:00 PM	1	1	1

Figure 19. Average Trail Use by Hour (Location 8)

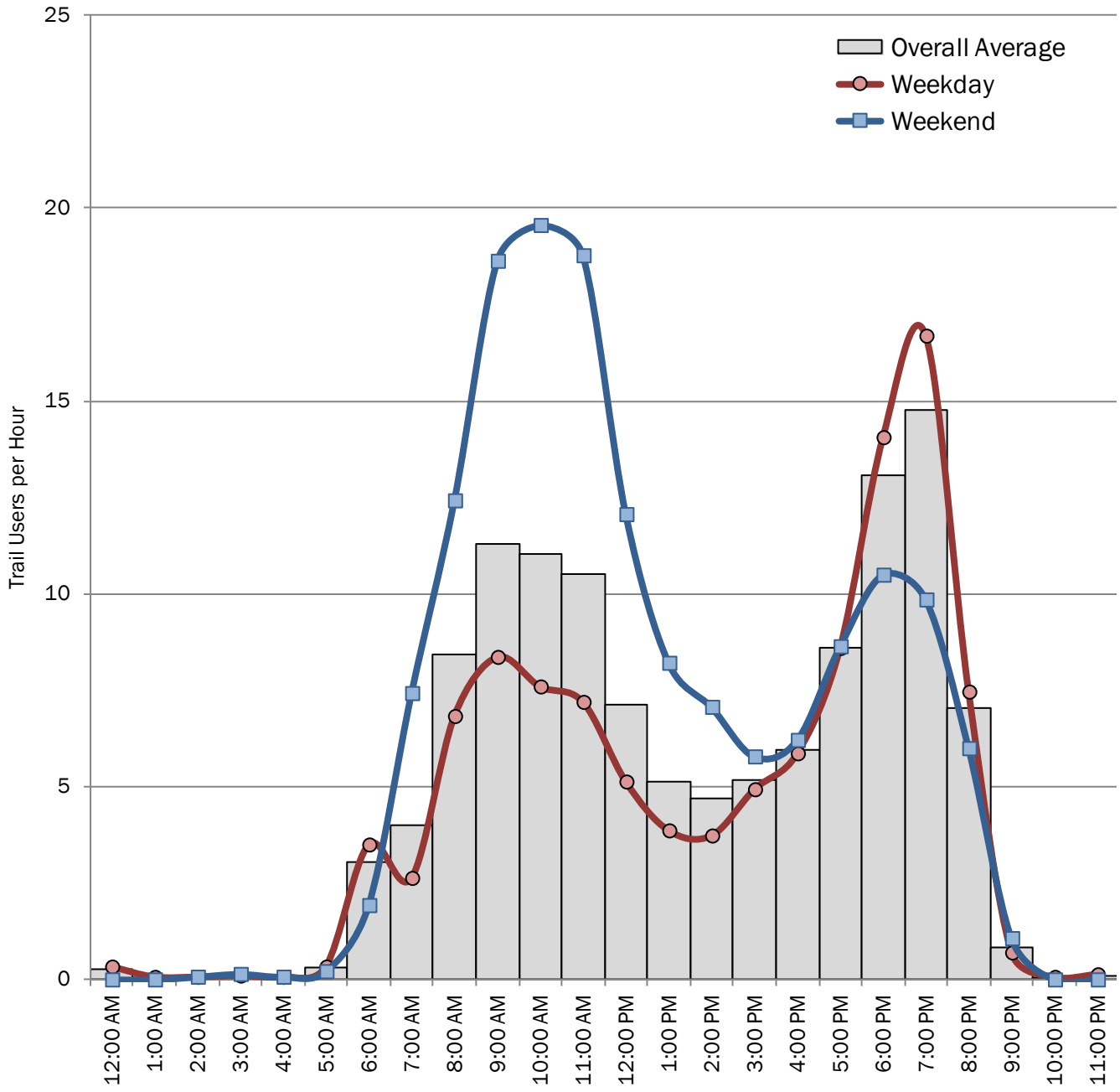


Appendix 1.9 Location 9: Scioto Trail, south of Main St.

Table 15. Average Trail Use by Hour (Location 9)

HOUR	HOURLY AVERAGE		
	Weekday	Weekend	Overall
12:00 AM	0	0	0
1:00 AM	0	0	0
2:00 AM	0	0	0
3:00 AM	0	0	0
4:00 AM	0	0	0
5:00 AM	0	0	0
6:00 AM	4	2	3
7:00 AM	3	7	4
8:00 AM	7	12	8
9:00 AM	8	19	11
10:00 AM	8	20	11
11:00 AM	7	19	11
12:00 PM	5	12	7
1:00 PM	4	8	5
2:00 PM	4	7	5
3:00 PM	5	6	5
4:00 PM	6	6	6
5:00 PM	9	9	9
6:00 PM	14	11	13
7:00 PM	17	10	15
8:00 PM	7	6	7
9:00 PM	1	1	1
10:00 PM	0	0	0
11:00 PM	0	0	0

Figure 20. Average Trail Use by Hour (Location 9)

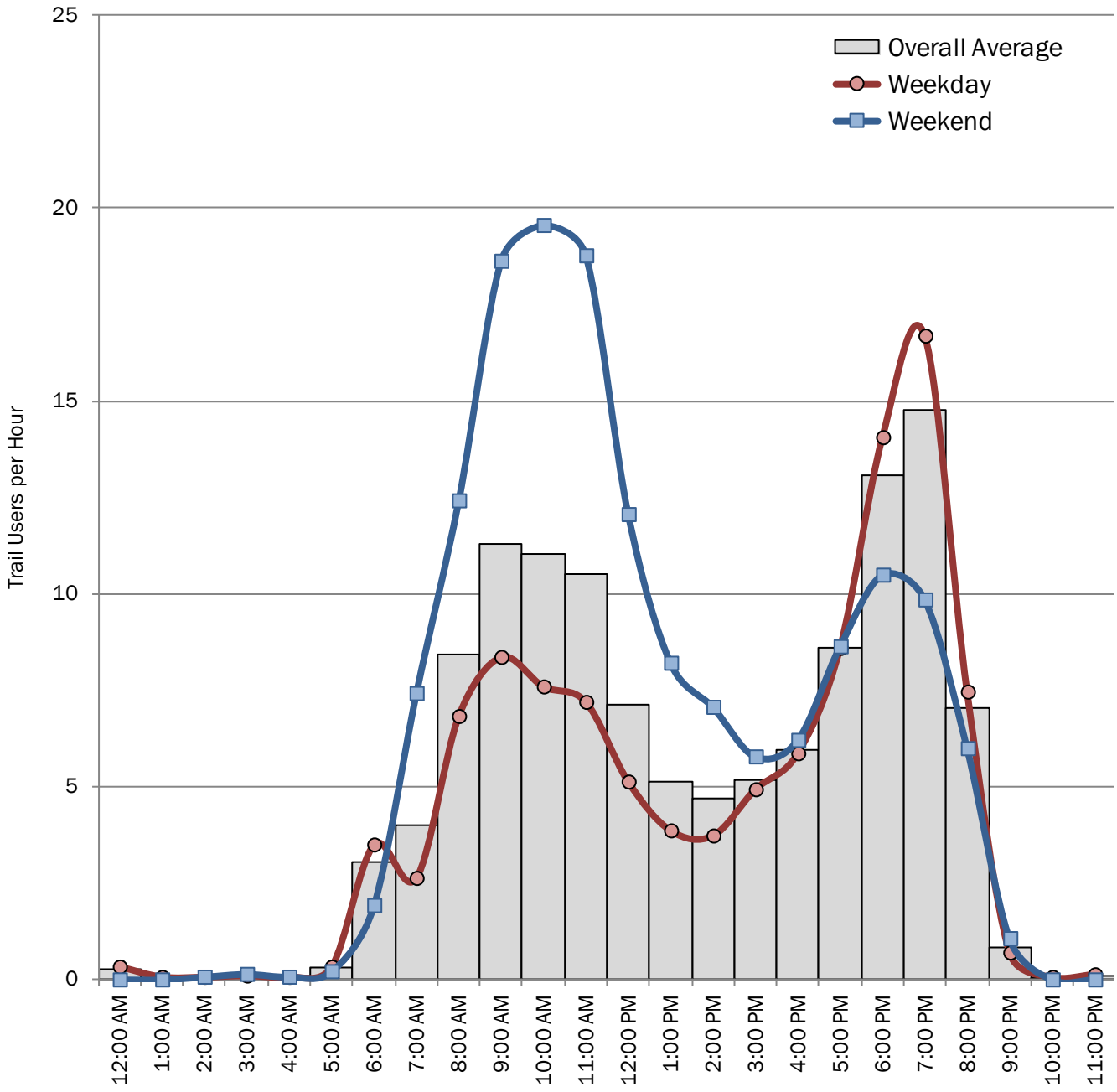


Appendix 1.10 Location 10: Blacklick Trail, north of US 33 Bridge

Table 16. Average Trail Use by Hour (Location 10)

HOUR	HOURLY AVERAGE		
	Weekday	Weekend	Overall
12:00 AM	0	0	0
1:00 AM	0	0	0
2:00 AM	0	0	0
3:00 AM	0	0	0
4:00 AM	0	0	0
5:00 AM	0	0	0
6:00 AM	4	2	3
7:00 AM	3	7	4
8:00 AM	7	12	8
9:00 AM	8	19	11
10:00 AM	8	20	11
11:00 AM	7	19	11
12:00 PM	5	12	7
1:00 PM	4	8	5
2:00 PM	4	7	5
3:00 PM	5	6	5
4:00 PM	6	6	6
5:00 PM	9	9	9
6:00 PM	14	11	13
7:00 PM	17	10	15
8:00 PM	7	6	7
9:00 PM	1	1	1
10:00 PM	0	0	0
11:00 PM	0	0	0

Figure 21. Average Trail Use by Hour (Location 10)



APPENDIX 2. DETAILED METHODOLOGY

To better understand the results presented in the report, the study methodology is described in more detail below. Some important aspects of trail use can also be gleaned from this section.

Appendix 2.1 Data Collection

Automated counts were used to determine trail volumes at ten locations (see Table 17 below, and Map 1. COG Trails and Count Locations, p. 2). The automated counters used for this study (TRAFx Infrared Trail Counters) use passive infrared technology to count trail users as they cross the counter. They were installed immediately adjacent to the trail at a height of between three and four feet, depending on the site. More information on the TRAFx counters can be found here: http://www.trafx.net/products.htm#Infrared%20Trail%20Counter.

At three of the ten sites (locations 1-3), counters were installed in October 2010. These counters remained in place throughout the study, with the exception of a few weeks in June 2011, when they were removed temporarily. Data collection was interrupted at location 3 during September 2012 due to a minor vandalism incident (the infrared beam was covered up by a cigarette butt).

At each of the seven other locations, the counters were installed for a period of two to three months, as shown in Table 17.

Table 17. Automated Trail Count Locations and Dates

LOCATION ID	DESCRIPTION	COUNT DATES
1	Olentangy Trail @ Antrim Park	10/1/2010 - 5/31/2011; 5/18/2011 - 9/30/2012
2	Olentangy Trail @ OSU Wetlands	
3	Olentangy Trail @ North Bank Park	10/1/2010 - 5/31/2011; 5/18/2011 - 9/8/2012; 9/25/2012 - 9/30/2012
4	Alum Creek Trail @ I-670	9/24/2011 - 11/30/2011
5	Olentangy Trail @ Drake Union Center	
6	Scioto Hilltop Connector Bridge	
7	Alum Creek Trail @ Casto Park	4/21/2012 - 7/4/2012
8	Olentangy Trail @ Worthington Hills Market	
9	Scioto Trail, south of Main St.	4/21/2012 - 6/18/2012
10	Blacklick Trail, north of US 33 Bridge	4/21/2012 - 6/4/2012

Appendix 2.2 Calibration

To account for potential sources of error in the count results, manual counts were also conducted at locations 1-3. It is known, for instance, that when two or more trail users pass the infrared counters at the same time, the automated counters register only one count event.

The manual counts were conducted in accordance with the standards established by the National Bicycle and Pedestrian Documentation Project (for more information, please see http://bikepeddocumentation.org/).

In addition to manual counts, MORPC supplemented the TRAFx counters with its own Trailmaster TM1550 counters for a period of nine days to provide a longer basis of comparison. MORPC has extensively tested the Trailmaster counters and therefore has a high level of confidence in their results. The comparison of manual and automated count results is shown in Table 18 below, along with the resulting calibration factors for locations 1-3.

The calibration factors in the last column of Table 18 were multiplied by the raw hourly counts downloaded from the TRAFx counters. Each location (1-3) had a different calibration factor according to the variation observed. For locations 4-10, a calibration factor of 1.1 was used, based on advice from Rails-to-Trails Conservancy (RTC) staff, which has determined that their counters typically undercount by 10-15%.

Table 18. Manual and Automated Calibration Counts (September 2012)

LOCATION	MANUAL & AUTOMATED COUNTS (SEP. 26, 2012)			RATIO OF MANUAL TO AUTOMATED COUNTS		AUTOMATED COUNTER COMPARISON (SEP. 21-30, 2012)			FINAL TRAFX CALIBRATION FACTOR
	Manual	Trailmaster	TRAFx	Trailmaster	TRAFx	Trailmaster	TRAFx	Trailmaster/ TRAFx	
Loc.1: Antrim Park	86	76	58	1.13	1.48	12,133	7,523	1.61	**1.7**
Loc.2: OSU Wetlands	156	137	86	1.14	1.81	5,166	3,649	1.42	**1.5**
Loc.3: North Bank Park	173	174	129	0.99	1.34	4,429	3,925	1.13	**1.2**
Overall Average	415	387	273	1.07	1.52	21,728	15,097	1.44	1.5

Note: The last column was calculated by multiplying the overall Trailmaster/Manual ratio (1.07) by the Trailmaster/ TRAFx ratio for each site (1.61, 1.42, and 1.13 for locations 1-3, respectively). For example, the calibration factor for Loc. 1 was calculated as follows: (1.07 x 1.61) = 1.7.

Appendix 2.3 Adjustment Factors

After the data wer calibrated annual adjustment factors were calculated. Adjustment factors allow the results from a relatively short count to be extrapolated to produce an annual estimate.

For this study, data from locations 1 (Antrim Park) and 3 (North Bank Park) were used to develop adjustment factors. Location 2 (OSU Wetlands) was excluded due to the closure of the trail south of the count location in July, 2011. Locations 4-10 could not be used for this purpose as data were not collected there for an entire year.

Assuming that the trends at Antrim Park and North Bank Park are similar to the overall trends of trail use in central Ohio, adjustment factors make it possible to estimate annual trail use at other locations based on counts from one or more months. However, it should be noted that longer count periods are preferred, as any given month, or even several months, may be subject to influence from weather or other factors.

The adjustment factors were calculated by comparing the daily average for each month compared to the average for all months combined. Since Antrim Park and North Bank Park differ significantly in their land-use context, the average of the two locations is likely to provide a reasonable basis for extrapolating results at other locations. However, the adjustment factors may not be appropriate for some locations.

Table 19. Monthly Adjustment Factors

MONTH	AVERAGE DAILY TOTAL			PERCENT OF ANNUAL TOTAL			MONTHLY ADJUSTMENT FACTOR
	Antrim Park	North Bank Park	Combined Average	Antrim Park	North Bank Park	Combined Average	
January	457	203	330	4%	3%	3%	**2.4**
February	928	291	610	8%	4%	6%	**1.3**
March	739	523	631	7%	7%	7%	**1.3**
April	1,292	714	1,003	12%	9%	11%	**0.8**
May	1,306	888	1,097	12%	11%	12%	**0.7**
June	1,025	1,036	1,031	9%	13%	11%	**0.8**
July	971	1,297	1,134	9%	16%	12%	**0.7**
August	1,195	1,005	1,100	11%	13%	12%	**0.7**
September	1,186	770	978	11%	10%	10%	**0.8**
October	931	611	771	8%	8%	8%	**1.0**
November	637	401	519	6%	5%	5%	**1.5**
December	413	173	293	4%	2%	3%	**2.7**
Average	**932**	**657**	**795**	**8%**	**8%**	**8%**	**1.0**

Notes: The monthly adjustment factors in the last column were calculated by dividing the overall daily average for both sites (795) by each month's daily average. For example, the monthly adjustment factor for January was calculated as follows: 795/330 = 2.4. The formula for converting a January count to an annual estimate is: [January daily average] * 2.4 * 365. More generally, the formula for converting any count to an annual estimate is: [daily average for month i] * [monthly adjustment factor for month i] * 365.

Appendix 2.4 Estimation

The adjustment factors were used to estimate annual trail volumes at locations 1-3 for 2010 and 2012, since only partial counts were available for those years. Since counts at locations 4-10 were limited to a few months, annual estimates were developed for 2010, 2011, and 2012. To this end, a few different approaches were taken.

First, a simple ratio of trail volume was developed for each location, as compared to locations 1 and 3. The ratios were calculated by comparing the days for which count data were available at the site in question. Each month of missing data was then estimated based on the corresponding counts from locations 1 and 3.

The second method used adjustment factors to fill in the missing months. Annual trail use was estimated in this way for locations 4-6 in 2011, and locations 7-10 in 2012. The third method was based on RTC's

process for developing annual estimates from monthly counts. The final estimates presented in the report are based on the median of these three methods, as shown in Table 20.

Table 20. Comparison of Estimation Methods for Locations 4-10

YEAR	LOCATION	ESTIMATION METHOD			MEDIAN ESTIMATE
		1 (Site Comparison)	2 (Adjustment Factors)	3 (Rails-to-Trails)	
2011	4: Alum Creek Trail @ I-670	6,919	7,531	8,231	**7,531**
	5: Olentangy Trail @ Drake Union Center	189,123	205,014	209,102	**205,014**
	6: Scioto Hilltop Connector Bridge	10,286	10,963	11,441	**10,963**
2012	7: Alum Creek Trail @ Casto Park	43,760	42,939	43,559	**43,559**
	8: Olentangy Trail @ Worthington Hills Market	189,648	187,603	193,876	**189,648**
	9: Scioto Trail, south of Main St.	116,116	111,693	114,663	**114,663**
	10: Blacklick Trail, north of US33 Bridge	33,032	33,335	36,669	**33,335**

Once the annual estimates were generated for each location in the year for which counts were taken (2011 for locations 4-6 and 2012 for locations 7-10), the other study years were estimated according to the trend observed at locations 1 and 3. In particular, it was assumed that trail use increased by 6.3% between 2010 and 2011, and by 11.7% between 2011 and 2012, as shown in Table 21 below.

Table 21. Annual Growth in Trail Use at Locations 1 and 3

LOCATION	2010	2011	2012
1: Olentangy Trail @ Antrim Park	321,000	335,000	350,000
3: Olentangy Trail @ North Bank Park	202,000	221,000	271,000
Combined Total	523,000	556,000	621,000
Annual Change	n/a	6.3%	11.7%
Percent of 2011 Trail Volume	94%	100%	112%