Analysis of 2020 Trail Usage Patterns along the Great Allegheny Passage

Final Report to the Great Allegheny Passage Conservancy
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Executive Summary

- The Great Allegheny Passage is well used. I estimate the total number of visits to be in the range of 1.4 to 1.6 million in 2020, with a mid-range estimate of 1,491,963. This represents an increase in trail use of 50.8% compared to 2019. This increase likely reflects the impact of COVID-19 restrictions, which prohibited many forms of recreation and entertainment in 2020. It seems that the trail offered a safe recreational opportunity at a time when many other activities were unavailable.

- Volunteers identified "thru-riders" when conducting their synchronized counts. Based on this data, I estimate a total of 117,457 thru-riders on the GAP in 2020, an 85.8% increase over 2019.

- This year's report is the sixth report since 2015, when the TRAFx locations and synchronized count protocol changed substantially. Trail use estimates have varied considerably year-to-year since 2015, but overall, the linear trend shows an increase in trail use of approximately 14.4% per year.

Summary of Methodology

This report estimates trail use patterns along the Great Allegheny Passage (GAP), from Cumberland to Pittsburgh. These estimates are based on two primary data sources. The first is information gathered from TRAFx counters, infrared counters that track trail use at fixed locations along the trail. The second is information gathered from synchronized manual counts conducted at TRAFx counter locations. These counts occurred on six dates in 2020: Friday, May 29, Tuesday, June 23, Monday, July 20, Wednesday, August 12, Thursday, September 17, and Saturday, October 17. In each case, counts were conducted over a two-hour period (10-noon, 11-1, noon-2, or 1-3 pm).

I have conducted similar GAP trail use reports in previous years (2010–2013 and 2015–2019). The 2010-13 reports also relied heavily on information gathered from TRAFx counters and synchronized manual counts, but significant changes in data collection occurred in 2015. To start, three TRAFx counters were added, and several existing counters were relocated. In addition, the method for conducting synchronized counts changed substantially in 2015. Previously, synchronized counts were conducted close to trailhead locations, but the synchronized counts were moved to the TRAFx counter locations starting in 2015. In addition, synchronized counts are now conducted at fewer locations (12 locations starting in 2015 versus 18 in years prior to 2015). **As a result of different data collection methods, trail count numbers for 2015 and later years are not directly comparable to those of previous years.**

I use the following methodology to estimate trail use along the GAP. First, I report raw TRAFx counts by location and month for March through December (Table 2). Next, I adjust these raw counts to account for the fact that the TRAFx counters typically under-count the actual number of people passing by the counters. I use the 2020 synchronized counts to derive a Count-to-Pass Factor (CP Factor) for each location (Tables 3 and 5). I then apply these CP Factors to derive adjusted TRAFx counts (Table 6) and use these adjusted TRAFx counts to derive low-, middle-, and high-range estimates of total trail use along the GAP.

TRAFx Data

In 2020, TRAFx counters collected data at 12 locations along the Great Allegheny Passage. Table 1 provides information on these counters and the data that they gathered.[1]

Table 1: Summary of TRAFx Count Data (2020)

Location	Counter milepost	# Usable Count Days	First Date	Last Date
Cumberland	1.5	257	20-Mar	3-Dec
Frostburg	16.5	257	20-Mar	3-Dec
Deal	23.9	257	20-Mar	3-Dec
Garrett	34.5	257	20-Mar	3-Dec
Rockwood	45.5	217	20-Mar	3-Dec
Ohiopyle	69.5	260	20-Mar	6-Dec
Connellsville	85.5	259	21-Mar	6-Dec
Perryopolis	102.5	260	20-Mar	6-Dec
West Newton	111.5	260	20-Mar	6-Dec
Boston	122.5	238	21-Mar	15-Nov[2]
Rankin Bridge	138.3	258	20-Mar	6-Dec
Hot Metal Bridge	146.5D	256	20-Mar	6-Dec

[1] The milepost locations of the TRAFx counters were provided by David Cotton in an email dated June 2, 2016.
[2] We removed the Boston counter on this date in advance of construction that began along this section of the GAP on November 16.

In 2020, the TRAFx counters provided a total of 3,036 usable count days, an average of 253 per counter location.

Table 2 displays counts by month (March-December) at the 12 TRAFx counter locations, with slight modifications for days in which a counter registers no data or registers a count that is unreasonably high or low. For each counter, I calculate an average weekday and weekend count for each month.[3] On days in which a counter has missing or "bad" data, I insert the average count for that location and month.[4] It is worth noting that the December counts are based on a small number of TRAFx counts at the beginning of the month, as all counters were disabled by December 6.

Finally, it should be noted that the counters are intentionally located away from the trailheads, sometimes as far as two miles away, in order to reduce the number of walkers included in the count. With these caveats in mind, Table 2 summarizes the raw TRAFx counts for each location by month.

Synchronized Counts

Volunteers conducted synchronized counts on six dates in 2020: Friday, May 29, Tuesday, June 23, Monday, July 20, Wednesday, August 12, Thursday, September 17, and Saturday, October 17. In each case, counts were conducted over a two-hour period (10-noon, 11-1, noon-2, or 1-3 pm).

Given 12 locations and 6 synchronized count dates, a full set of data would include 72 synchronized count observations. In fact, 68 observations occurred. The missing observations occurred at Rockwood (July 20 and October 17), Frostburg (August 12), and Connellsville (May 29), when volunteers did not show for their scheduled assignments. In addition, three instances occurred at Rockwood in which a volunteer counted trail users (13 on May 29, 39 on June 23, and 23 on September 17), but the TRAFx counter registered 0 for the entire day, so I did not include these in Table 3. Finally, a volunteer took counts at Hot Metal Bridge on October 17 but mistakenly walked back and forth in front of the counter while doing so. As a result, the corresponding TRAFx count was dramatically inflated, perhaps by a factor of 5. As a result of these TRAFx glitches, I excluded these four observations from Table 3 (May 29, June 23, and September 17 at Rockwood and October 17 at Hot Metal), leaving a total of 64 observations.[5]

Table 3 summarizes the Synchronized Count and TRAFx count at each counter for each count day. The last column calculates the overall Count-to-Pass Factor (CP Factor) for each location. The CP Factor equals the manual count divided by the TRAFx count.

[3] I define "weekday" as Monday through Friday and "weekend" as Saturday and Sunday. I also count holidays as "weekend" days, even if they occur during the week. In 2019, I counted the following holidays as weekend days: Memorial Day, July 4th, Labor Day, Thanksgiving Day, and the day after Thanksgiving.

[4] Specifically, I interpolated counts in this manner for 40 days (June 11 – July 20) at the Rockwood counter and for 5 days (April 2-6) at the Hot Metal Bridge counter. The missing counts at Rockwood were due to lose batteries, while the missing counts at Hot Mental Bridge were caused by the counter rejecting a particular brand of batteries.

[5] While I exclude the "TRAFx glitch" counts at Rockwood and Hot Metal Bridge from Table 3, I later include these counts in Table 7, which summarizes thru-riders compared to all riders. Table 7 focuses solely on the manual counts, which were accurate on these observation days.

Table 2: Raw TRAFx Counts by Location and Month (2020)

Location	March	April	May	June	July	August	September	October	November	December	Total
Cumberland	5,649	4,752	7,292	8,131	6,864	5,648	5,461	4,767	3,375	2,222	54,161
Frostburg	1,885	2,082	2,888	3,085	2,875	2,815	3,797	3,319	1,685	269	24,700
Deal	618	775	1,947	2,144	1,095	1,455	1,578	1,557	479	10	11,658
Garrett	815	831	2,157	2,442	2,325	2,209	2,686	2,021	629	31	16,146
Rockwood	590	418	348	530	211	665	586	516	289	31	4,184
Ohiopyle	883	972	3,059	3,712	3,264	4,140	4,093	3,366	1,346	211	25,046
Connellsville	1,755	2,008	3,808	4,372	4,430	4,379	4,892	3,844	1,516	160	31,164
Perryopolis	1,239	1,657	2,326	2,295	1,522	2,229	2,423	1,989	1,125	166	16,972
West Newton	4,793	4,659	7,215	5,251	1,397	2,582	2,983	2,509	2,646	686	34,721
Boston	2,956	4,283	8,380	7,258	2,560	4,226	4,923	3,030	1,988	772	40,376
Rankin Bridge	8,585	9,410	14,811	10,547	6,276	13,445	14,325	9,114	5,876	1,476	93,865
Hot Metal Bridge	17,815	17,519	22,870	19,729	19,820	19,652	22,570	19,438	14,702	4,610	178,725
Total	47,583	49,366	77,101	69,496	52,639	63,445	70,317	55,470	35,656	10,644	**531,716**

Table 3: Synchronized Trail Counts (2020)

Location	29-May-20		23-Jun-20		20-Jul-20		12-Aug-20		17-Sep-20		17-Oct-20		Total		
	Manual	TRAFx	Manual	TRAFx	Manual	TRAFx	Manual	TRAFx	Manual	TRAFx	Manual	TRAFx	Manual	TRAFx	CP
Cumberland	37	29	79	35	42	18	23	34	49	19	84	37	314	172	1.826
Frostburg	24	17	21	9	39	18	-----	-----	49	20	137	74	270	138	1.957
Deal	18	12	19	7	66	6	42	8	48	15	126	44	319	92	3.467
Garrett	9	5	19	6	50	12	20	11	19	6	62	39	179	79	2.266
Rockwood	-----	-----	-----	-----	-----	-----	22	6	-----	-----	-----	-----	22	6	3.667
Ohiopyle	22	7	59	13	121	24	126	45	60	14	281	130	669	233	2.871
Connellsville	-----	-----	40	24	17	12	42	33	31	25	78	61	208	155	1.342
Perryopolis	13	9	19	6	27	9	35	3	23	7	78	39	195	73	2.671
West Newton	29	7	43	7	73	2	94	36	81	8	119	68	439	128	3.430
Boston	40	16	13	0	89	10	52	8	65	23	126	45	385	102	3.775
Rankin Bridge	53	36	68	32	82	13	95	51	91	71	159	138	548	341	1.607
Hot Metal Bridge	123	54	86	23	109	67	115	53	112	64	-----	-----	545	261	2.088
Total	**368**	**192**	**466**	**162**	**715**	**191**	**666**	**288**	**628**	**272**	**1,250**	**675**	**4,093**	**1,780**	**2.299**

Count-to-Pass (CP) Factors

By their nature, the TRAFx counters do not count trail users perfectly. For example, when cyclists ride side-by-side, follow close behind one another, or travel in a group, TRAFx counters tend to undercount the number of riders, because they do not have enough time to reset themselves between cyclists. Thus, the accuracy of a TRAFx counter declines when trail use is heavy.

In order to gauge the accuracy of each TRAFx counter, volunteers have conducted manual counts at the TRAFx counters for many years. These manual counts can be compared to the counts registered by the TRAFx counters during the same time period. I use this data to calculate a Count-to-Pass (CP) Factor by dividing the manual count by the TRAFx count and then use the CP Factors to derive adjusted TRAFx counts at each location. Table 4 exhibits this data for 2010-2020.[6] Note that the CP Factor in 2020 (2.299) is slightly higher than the average CP Factor since 2010 (1.979).

Table 4: Historic CP Factors (2010-2020)

Year	Manual	TRAFx	CP
2010	2,564	1,524	1.682
2011	1,821	1,000	1.821
2012	882	468	1.885
2013	1,123	633	1.774
2014	NA	NA	NA
2015	2,345	1,324	1.771
2016	5,858	3,107	1.885
2017	3,169	1,593	1.989
2018	3,405	1,270	2.681
2019	4,893	2,538	1.928
2020	4,093	1,780	2.299
Total	30,153	15,237	1.979

Table 5 lists the CP Factors by location for 2020. Note that the CP Factors range from 1.342 at Connellsville to 3.775 at Boston, with an average of 2.299.

Table 5: CP Factors by Location (2020)

Location	Manual	TRAFx	CP Factor
Cumberland	314	172	1.826
Frostburg	270	138	1.957
Deal	319	92	3.467
Garrett	179	79	2.266
Rockwood	22	6	3.667
Ohiopyle	669	233	2.871
Connellsville	208	155	1.342
Perryopolis	195	73	2.671
West Newton	439	128	3.430
Boston	385	102	3.775
Rankin Bridge	548	341	1.607
Hot Metal Bridge	545	261	2.088
Total	4,093	1,780	2.299

[6] No manual counts were conducted in 2014.

Adjusted TRAFx Counts

As mentioned previously, the TRAFx counters tend to undercount trail users, particularly when cyclists ride side-by-side or in groups. For this reason, it is appropriate to apply CP Factors to the raw TRAFx counts to obtain a more accurate estimate of actual trail use.

Table 6 lists the adjusted TRAFx counts by location and month after applying the CP Factors. For the months of March through December, each count listed in Table 6 equals the corresponding count in Table 2 multiplied by the CP Factor for each location. For example, Cumberland's CP Factor is 1.826, and its raw count for March (listed in Table 2) is 5,649. Thus, the adjusted count for Cumberland in March in Table 6 is 10,313 = (1.826) x (5,649). All other counts listed for March through December in Table 6 are calculated in a similar manner.[7]

The TRAFx counters are removed to prevent damage from freeze-thaw cycles and do not operate during the months of January and February. I estimated trail use for these months by assuming total trail use at all locations is 1,200. This is the same assumption that I have made for several years in this report. I then allocate the trail use at each location according to the patterns observed during the March-December period. For example, during the months of March through December, Cumberland accounted for 8.3% of total trail use. So for January and February, I estimate trail use at Cumberland as 8.3% of 1,200, which is 100. I do a similar calculation for all 12 locations.

Table 6 reports total adjusted trail use in 2020 as 1,193,570. This represents a 50.8% increase compared to 2019, when total adjusted trail use was at 791,564. This dramatic increase in trail use is likely explained by two factors. First and foremost, substantial COVID-19 were imposed throughout the entire trail use season. These restrictions eliminated many recreational and entertainment activities, and it seems that the public flocked to the trail as a safe alternative. Second, 2020 was a drier year than 2019 in the Pittsburgh area (39.2 inches of precipitation in 2020, compared to 52.5 inches in 2019) thus allowing more opportunities for outdoor recreation. Regardless of the reason, ***my analysis indicates that trail use along the Great Allegheny Passage (GAP) increased by 50.8% between 2019 and 2020.***

Interpreting the Adjusted TRAFx Counts

The adjusted TRAFx counts in Table 6 are derived by multiplying the raw TRAFx counts by the CP Factor for each location. As such, the adjusted TRAFx counts are a best estimate of the number of times a trail user passes a TRAFx counter. Moreover, the adjusted TRAFx counts at any location also represents a reasonable estimate of trail usage by those who enter at the trailhead closest to that counter.

Consider, for example, Ohiopyle. The TRAFx counter is located a couple miles down the trail toward Confluence. A rider traveling from Ohiopyle to Confluence and back will pass the counter twice, and the adjusted TRAFx count would, on average, double-count this trail user. But other trail users at Ohiopyle will go the opposite direction, toward Connellsville. These trail users will not pass the TRAFx counter at Ohiopyle. Some might be counted by the Connellsville counter, but some will not be counted by any TRAFx counter. In addition, most walkers who enter at Ohiopyle will not pass a TRAFx counter, even if they walk toward Confluence. As a result, we must balance those trail users who will double-counted with those who are not counted at all. It seems reasonable to assume that these two groups are roughly equal. If this is the case, then the adjusted TRAFx count provides a good estimate of trail usage at Ohiopyle.

[7] One exception is Rockwood. As mentioned previously in this report, only one truly legitimate manual count was conducted at Rockwood in 2020. We feel that this is not enough data to generate a reliable CP Factor. As a result, we used the 2019 CP Factor for Rockwood (2.957) when converting the raw TRAFx count (Table 2) into an adjusted count (Table 6), rather than the 2020 CP Factor of 3.667 that is reported in Tables 3 and 5.

So, given the data available, I view the last column of Table 6 as the best estimate of 2020 trail use at each of the trailheads listed. These estimates will be better for some locations than others depending on how far the TRAFx counter is from the trailhead and the proportion of trail users who go in the direction toward the counter. These two factors vary between trailheads, so the estimates in Table 6 likely overestimate trail use at some trailheads and underestimate at others.

Total Trail Use Estimate

The bottom row of Table 6 estimates that trail users passed by the 12 TRAFx counter locations a total of 1,193,564 times. As I have argued above, this number is a reasonable estimate of the number of trail usage by those who enter the trail at the trailheads closest to the TRAFx counters. But these 12 locations are not the only places where users may enter the trail. As such, this number likely *underestimates* total trail use.

The locations of the TRAFx counters were chosen to capture as many as possible while minimizing the occurrence of trail users passing multiple counters on a single trip. I will assume as a midpoint estimate that 80% of trail visits begin at the trailheads closest to the TRAFx counters, with a range of 75% to 85%.[8] Put another way, I estimate that somewhere between 15% and 25% of trail visits begin at a trailhead other than the 12 trailhead locations where TRAFx counters are located.

If we assume the midpoint estimate of 80%, then the resulting mid-range estimate of total trail use is 1,491,963 = (1,193,564 ÷ 0.80). The low-range and high-range estimates are 1,404,200 = (1,193,564 ÷ 0.85) and 1,591,427 = (1,193,963 ÷ 0.75), respectively. I estimate that trail use along the GAP increased by 50.8% between 2019 and 2020.

Thru-Riders

The GAP offers the opportunity for cyclists to take lengthy, multi-day trips. The form that volunteers used when tallying the synchronized manual counts in 2020 provided a section to mark "thru-riders." The Great Allegheny Passage Conservancy asked volunteers to use his or her judgment to determine whether a passing cyclist was on an extended ride, and provided examples, such as a cyclist riding with a substantial pack, one with two loaded panniers, or one carrying camping gear might be a thru-rider. Some volunteers take initiative to ask cyclists as they pass by.

Table 7 summarizes the number of riders identified by a volunteer as a thru-rider relative to the total number of trail users. The hours in parentheses next to each location indicates the total number of manual count hours for each location. The last column of Table 7 estimates the total number of Thru-Riders at each location by applying the % of Thru-Riders at that location times the adjusted TRAFx count at that location (from Table 6).

[8] These estimates are based on input and estimates by the Great Allegheny Passage Conservancy.

Table 6: Adjusted Monthly TRAFx Counts (2020)

Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
Cumberland	100	100	10,313	8,675	13,312	14,844	12,531	10,311	9,970	8,703	6,161	4,056	**99,074**
Frostburg	49	49	3,689	4,073	5,650	6,036	5,625	5,508	7,429	6,494	3,297	526	**48,423**
Deal	41	41	2,142	2,687	6,751	7,434	3,797	5,045	5,472	5,399	1,661	36	**40,505**
Garrett	37	37	1,846	1,883	4,887	5,533	5,268	5,005	6,086	4,579	1,425	70	**36,657**
Rockwood	12	12	1,744	1,236	1,029	1,567	624	1,966	1,733	1,526	854	92	**12,394**
Ohiopyle	72	72	2,536	2,791	8,783	10,658	9,372	11,887	11,752	9,665	3,865	606	**72,059**
Connellsville	42	42	2,355	2,695	5,110	5,867	5,945	5,876	6,565	5,158	2,034	215	**41,904**
Perryopolis	46	46	3,310	4,426	6,213	6,130	4,066	5,954	6,472	5,313	3,005	444	**45,426**
West Newton	120	120	16,438	15,979	24,745	18,009	4,791	8,855	10,231	8,605	9,075	2,353	**119,321**
Boston	154	154	11,158	16,166	31,630	27,395	9,663	15,951	18,582	11,437	7,502	2,914	**152,706**
Rankin Bridge	152	152	13,796	15,122	23,802	16,949	10,086	21,607	23,021	14,647	9,443	2,371	**151,148**
Hot Metal Bridge	376	376	37,200	36,582	47,755	41,197	41,387	41,036	47,129	40,589	30,700	9,627	**373,952**
Total	1,200	1,200	106,527	112,315	179,669	161,620	113,153	139,001	154,440	122,113	79,023	23,309	**1,193,570**

Table 7: Thru-Riders in Comparison to All Users (2020)

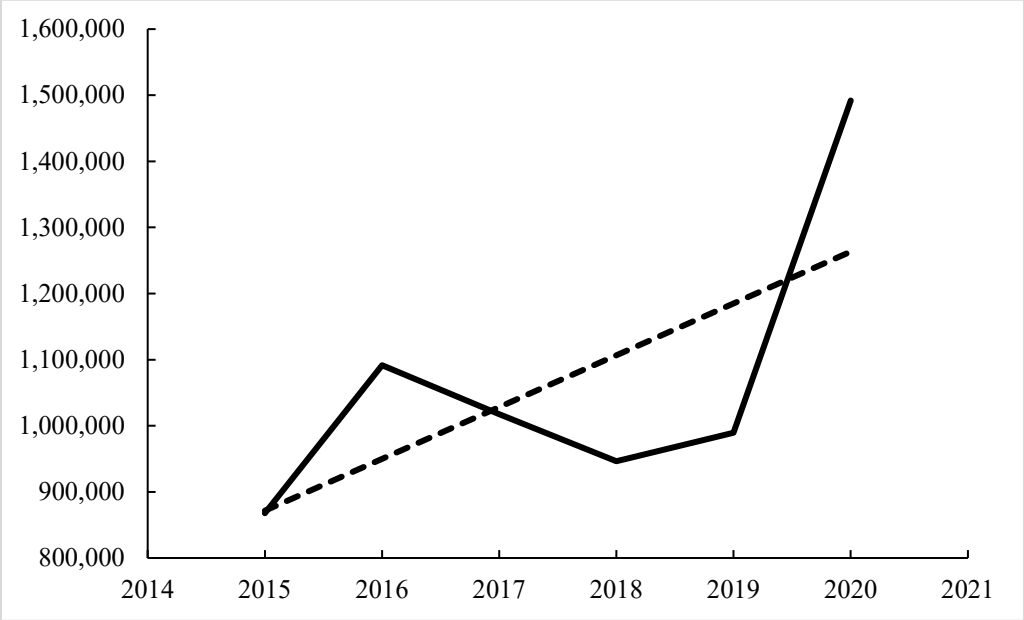
Location	Thru-Riders	All Riders	% Thru-Riders	Estimated # of Thru-Riders
Cumberland (12 hrs)	28	230	12.2%	12,062
Frostburg (10 hrs)	56	133	42.1%	20,391
Deal (12 hrs)	18	193	9.3%	3,778
Garrett (12 hrs)	54	117	46.2%	16,920
Rockwood (8 hrs)	34	97	35.1%	4,345
Ohiopyle (12 hrs)	21	388	5.4%	3,900
Connellsville (10 hrs)	39	130	30.0%	12,573
Perryopolis (12 hrs)	28	117	23.9%	10,872
West Newton (12 hrs)	20	320	6.3%	7,458
Boston (12 hrs)	17	259	6.6%	10,024
Rankin Bridge (12 hrs)	30	389	7.7%	11,658
Hot Metal Bridge (12 hrs)	6	545	1.1%	3,475
Total	**351**	**2,918**	**12.0%**	**117,457**

The data in Table 7 show considerable variation in the percentage of thru-riders, ranging from 1.1% at Rankin Bridge to 46.2% at Garrett. One would expect some variation between locations arising from differences in the types of trail users at each location. In other words, some locations may attract a higher percentage of casual trail users, while other, more remote locations may naturally have a larger percentage of cyclists on longer journeys. Consider the difference between Garrett, with 46.2% thru-riders, and Deal (just 12 miles away) with 9.3% thru-riders. Deal is adjacent to the Eastern Continental Divide, Big Savage Tunnel, and the Mason & Dixon Line, which tend to draw day users, while Garrett is farther from popular photo ops. However, some portion of the variation is almost certainly due to the judgment of the volunteers using different criteria to identify thru-riders. With these caveats in mind, the data in Table 7 suggest that there were 117,457 thru-riders on the GAP in 2020, an 85.8% increase over 2019.

Historical Perspective

This year's report is the fifth report since 2015, when the TRAFx locations and synchronized count protocol changed substantially. Given this, it worth looking back over the past five years for trends in GAP trail use.

Figure 1: Total GAP Trail Use (2015-2020)



Year	Total Trail Use
2015	867,719
2016	1,091,706
2017	1,017,662
2018	946,284
2019	989,455
2020	1,491,963

Figure 1 shows the mid-range total trail use estimate for 2015-2020 along with a linear trendline. Clearly, trail use estimates have varied considerably year-to-year. Some of the fluctuation is likely due to fluctuations in the quality of data generated by the TRAFx counters, and some is likely due to true year-to-year fluctuations caused by factors such as rainy weather. The dramatic increase in trail use between 2019 and 2020 undoubtedly reflects the impact of the COVID-19 pandemic combined more favorable weather conditions. It seems that the trail offered a safe recreational opportunity at a time when many other activities were unavailable. Overall, the linear trendline shows an increase in trail use of approximately 14.4% per year from 2015-2020.