Analysis of 2015 Trail Usage Patterns along the Great Allegheny Passage

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Executive Summary

- The Great Allegheny Passage trail system is well-used. I estimate the total number of trail visits to be in the range of 816,677 to 925,567 in 2015, with a mid-range estimate of 867,719. This represents a 23.0% increase in trail use compared to 2013.

- Two important changes were made in data collection since 2013, the last year for which I produced a trail use report. First, the number of TrafX counter locations increased from 9 to 12. Second, the synchronized counts were moved from trailhead locations to the TrafX locations.

- I recommend making every reasonable effort to gather the data in a consistent manner from year to year. Specifically, this would mean keeping the TrafX locations the same from year to year and continuing to conduct the synchronized counts at the TrafX locations.

- I also recommend collecting as much data as possible. With regard to the TrafX counters, this would mean setting up each counter in early March in order to provide a more complete set of TrafX data. With regard to the synchronized counts, this would mean making every effort to conduct counts at every location on each count date.

- Finally, I recommend that at least two of the synchronized counts be conducted on a weekend day (Saturday and/or Sunday). It is likely that some locations see relatively more weekend traffic than others, and conducting weekend synchronized counts would help to pick up on this trend.

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 synchronized counts occurred on six dates in 2015: Thursday, June 25, Wednesday, July 22, Friday, August 21, Tuesday, September 22, Thursday, October 22, and Tuesday, November 10. In each case, these counts were conducted over a two-hour period from 11 am to 1 pm.

I have conducted similar GAP trail use reports in previous years (2010, 2011, 2012, and 2013).[1] Those reports also relied heavily on information gathered from TrafX counters and synchronized manual counts, but there were key differences in the 2015 data collection. To start, more TrafX counters were used in 2015 (12 versus 9 in 2013), and several of the existing counters were relocated. In addition, there were substantial differences in the way the 2015 synchronized counts were conducted. First, the synchronized count locations were moved to the TrafX counter locations. In previous years, the counts were conducted close to trailhead locations. Second, the synchronized counts were conducted at fewer locations in 2015 (11 locations versus 18 in 2013). Finally, all of the synchronized counts occurred during the week in 2015. In previous years, synchronized counts were conducted on both weekday and weekend days. **As a result of these differences in data collection, the trail count numbers reported in 2015 are not directly comparable to those of previous years.**

I use the following methodology to estimate trail use along the GAP. First, I report the TrafX counts by location and month for April through November (Table 2). These numbers are based on direct TrafX counts, but I also fill in data for days in which no counts are reported or in which the counts do not seem to be reasonable. Next, I adjust the initial counts to account for the fact that the TrafX counters typically under-count the actual number of trail users. I use the 2015 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 I use these adjusted TrafX counts to derive high-, middle-, and low-range estimates of total trail use along the GAP.

TrafX Data

In 2015, 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.[2]

[1] See *Analysis of Trail Usage Patterns along the Great Allegheny Passage, November 15, 2011, Analysis of 2011 Trail Usage Patterns along the Great Allegheny Passage, May 21, 2012, Analysis of 2012 Trail Usage Patterns along the Great Allegheny Passage, April 4, 2013,* and *Analysis of 2013 Trail Usage Patterns along the Great Allegheny Passage, April 4, 2014*.

[2] The milepost locations of the TrafX counters were provided by David Cotton in an email dated June 2, 2016.

Table 1: Summary of TrafX Count Data (2015)

Location	Counter milepost	# Usable Count Days	First Date	Last Date
Cumberland	1.5	164	30-Apr	24-Nov
Frostburg	16.5	185	29-Apr	23-Nov
Deal	22.5	214	29-Apr	6-Dec
Garrett	34.5	201	29-Apr	6-Dec
Rockwood	45.5	214	29-Apr	6-Dec
Ohiopyle	69.0	213	29-Apr	6-Dec
Connellsville	85.0	147	29-Apr	6-Dec
Perryopolis	102.0	214	1-May	6-Dec
West Newton	111.5	212	1-May	6-Dec
Boston	122.0	212	1-May	6-Dec
Rankin Bridge	138.0	120	3-Aug	6-Dec
Hot Metal Bridge	146.0	211	1-May	6-Dec

Table 2 displays counts by month (April-November) at the 12 TrafX counter locations, with some modifications.[3] One modification relates to 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.[4] On days in which a counter has missing or "bad" data, I insert the average count for that location and month. Specifically, I interpolated counts in this manner for 44 days at the Cumberland counter, 22 days at Frostburg, 10 days at Garrett, and 3 days at the Hot Metal Bridge.

Furthermore, two TrafX counters (Connellsville and Rankin Bridge) produced no usable data for multiple months during the May-November time period. Specifically, the Connellsville counter began producing unreasonably low counts on September 25 and continued to do so for the remainder of the year. Thus, the Connellsville counter produced no usable counts for the months of October and November. The Rankin Bridge counter, on the other hand, produced no counts at all until August 3. Thus, no count data exists for Rankin Bridge for the months of May, June, and July.

For the months in which no good data exists for Connellsville and Rankin Bridge, I estimate these counts using data from the counters on either side of these locations. For Connellsville, the adjacent counters are at Ohiopyle and Perryopolis, and for Rankin Bridge, at Boston and Hot Metal Bridge. In months in which good data does exist for Connellsville and Rankin Bridge, I calculate the average weekday and weekend counts relative to the adjacent counters. Then, for months in which no good data exists, I assume that counts at Connellsville and Rankin Bridge are the same relative to the adjacent counters as they were during the "good data" months.

[3] In 2015, the TrafX counters did not provide any data until the very end of April or the beginning of May. This is in contrast to previous years, when the counters began to provide counts in the middle of March or early April. I decided to include April counts in Table 2, because I had included April counts in each of my previous reports. Specifically, the April counts reported in Table 2 are exactly half of the May counts for each location. Based on historical data, I believe that this is a conservative estimate of April counts.

[4] 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 2015, I counted the following holidays as weekend days: Memorial Day, July 4th, Labor Day, Thanksgiving day, and the day after Thanksgiving.

Finally, it should be noted that the counters are intentionally located away from the trailheads, sometimes as much as 2 miles away. Because of this, many walkers are not included in the count. With these caveats in mind, Table 2 summarizes the raw TrafX counts for each location by month.

Table 2: Raw TrafX Counts by Location and Month (2015)

Location (dist. to next counter)	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov
Cumberland (15 miles)	2,250	4,499	4,389	4,799	5,351	4,102	4,840	2,567
Frostburg (6 miles)	1,698	3,396	3,075	3,336	2,868	2,250	2,167	1,340
Deal (12 miles)	1,179	2,358	2,441	2,653	2,721	2,010	1,703	420
Garrett (11 miles)	331	662	527	700	2,345	1,243	735	214
Rockwood (23.5 miles)	909	1,817	2,067	2,140	2,212	1,909	1,522	389
Ohiopyle (16 miles)	2,306	4,612	4,067	7,466	8,520	4,912	3,467	643
Connellsville (17 miles)	1,792	3,584	2,783	3,618	3,746	3,049	2,138	583
Perryopolis (9.5 miles)	1,147	2,293	2,118	2,508	2,511	2,161	1,591	552
West Newton (10.5 miles)	4,475	8,949	6,681	9,449	10,877	5,816	3,793	2,242
Boston (16 miles)	2,052	4,103	3,117	4,358	4,912	3,570	2,564	1,261
Rankin Bridge (8 miles)	3,177	6,618	4,757	5,821	6,507	5,498	4,377	3,183
Hot Metal Bridge (NA)	6,796	13,592	10,069	10,320	11,616	10,367	11,688	9,335
Total	28,109	56,483	46,091	57,168	64,185	46,887	40,585	22,729

Synchronized Counts

Synchronized counts were conducted on Thursday, June 25, Wednesday, July 22, Friday, August 21, Tuesday, September 22, Thursday, October 22, and Tuesday, November 10. In each case, these counts were conducted from 11 am to 1 pm. Table 3 summarizes the Synchronized Count data as well as the TrafX count at each counter during the corresponding time period.

As noted earlier, there were substantial differences in the way that 2015 synchronized counts were conducted compared to previous years. In 2015, the synchronized counts were conducted at the TrafX counters rather than near the trailheads, and the synchronized counts were conducted at fewer locations. In addition, all of the synchronized occurred during the week in 2015. In previous years, synchronized counts were conducted on both weekday and weekend days.

With regard to the first point, moving the synchronized counts to the TrafX locations allowed these counts to be used to calculate Count-to-Pass Factors (CP Factors). The CP Factor equals the manual count divided by the TrafX count, and the last column of Table 3 lists the CP Factor for each location. On the other hand, moving these counts away from the trailheads caused a loss of information regarding the relative "busyness" of the various trailhead locations. The proportion of nearby trail users who pass a TrafX counters varies substantially from location to location. A TrafX counter will record a larger fraction of nearby traffic if it is located close to a trailhead and in the direction on the trail that most trail users travel. In previous years, the synchronized counts helped to pick up on these differences. For example, previous synchronized counts have consistently shown that actual trail use at Ohiopyle is substantially heavier than indicated by the TrafX counts.

With regard to the second point, having fewer synchronized count locations reduces the number of locations for which I can estimate trail use. In 2013, I estimated trail use at 18 trailhead locations; by contrast, in 2015, I can estimate trail use only at the 12 trailheads near the TrafX counters.

Finally, the fact that synchronized counts were conducted only during the week (and not on weekends) likely affected the resulting CP Factors. The TrafX counters often register only a single count when multiple riders pass, particularly if they are riding side-by-side or in a tight group. For example, if two riders pass a counter riding side-by-side, it is likely that the TrafX counter will only count one rider. Given that trail use is generally heavier on weekends, it is reasonable to assume that CP Factors will be higher on the weekends than during the week. For this reason, I recommend that synchronized counts be conducted on both weekends and weekdays in the future.

Table 3: Synchronized Trail Counts (2015)

Location	25-Jun-15		22-Jul-15		21-Aug-15		22-Sep-15		22-Oct-15		10-Nov-15		Total		
	Manual	Trafx	Manual	Trafx	Manual	Trafx	Manual	Trafx	Manual	Trafx	Manual	Trafx	Manual	Trafx	CP
Cumberland	23	15	36	12	61	51	39	20	49	36	4	2	212	136	1.559
Frostburg	38	36	38	19	38	23	12	4	33	21	-----	-----	159	103	1.544
Deal	-----	-----	30	23	-----	-----	-----	-----	-----	-----	-----	-----	30	23	1.304
Garrett	49	6	31	5	32	22	-----	-----	-----	-----	1	1	113	34	3.324
Rockwood	28	23	14	15	-----	-----	39	22	-----	-----	-----	-----	81	60	1.350
Ohiopyle	58	35	77	52	122	79	32	14	17	10	-----	-----	306	190	1.611
Connellsville	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Perryopolis	17	7	19	19	26	15	18	11	-----	-----	-----	-----	80	52	1.538
West Newton	26	20	99	84	41	90	40	27	-----	-----	-----	-----	206	221	0.932
Boston	41	16	77	43	97	52	54	33	48	21	-----	-----	317	165	1.921
Rankin Bridge[5]	-----	-----	-----	-----	123	55	48	36	50	27	-----	-----	221	118	1.873
Hot Metal Bridge	131	45	208	65	161	59	110	49	-----	-----	10	4	620	222	2.793
Total	411	203	629	337	701	446	392	216	197	115	15	7	2,345	1,324	1.771

Please note that the 2015 synchronized counts were incomplete. No counts were taken at Connellsville for the entire year, and only one count was taken at Deal. With 12 TrafX counters and six count dates, a full set of synchronized counts would have included 72 observations, but in reality only 47 observations occurred. The synchronized counts are important in interpreting the raw count data. A robust effort should be made to assure that volunteers are recruited to help with this important task.

[5] Synchronized counts were conducted at Rankin Bridge on June 25 and July 22; however, its TrafX counter was not operating on those dates. For this reason, I did not include the Rankin Bridge counts for these dates. For the record, the synchronized counts for Rankin Bridge for June 25 and July 22 were 30 and 89, respectively.

CP Factors

By their nature, the TrafX do not count trail use perfectly. Specifically, when riders are traveling side-by-side or following close behind one another or traveling in a group, TrafX counters tend to undercount the number of riders. Thus, the accuracy of a TrafX counter declines when trail use is heavy.

In order to gauge the accuracy of each TrafX counter, volunteers conduct manual counts at the TrafX counters. These manual counts are then compared to the counts registered by the TrafX counters during the same time period. I use this data to calculate a CP Factor by dividing the manual count by the TrafX count. I then use the CP Factors to derive adjusted TrafX counts at each location.

In previous years, the manual counts were conducted separately from the synchronized counts. But in 2015, the synchronized counts were moved to the TrafX counter locations and therefore provided the data needed to calculate a more precise CP Factors. The last column of Table 3 lists the CP Factor for each location. In addition, volunteers have been conducting manual counts for many years. Table 4 exhibits this data for 2010-2013 and 2015.[6]

Table 4: Historic CP Factors (2010-2013 and 2015)

Year	Manual	TrafX	CP Factor
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
2015	2,345	1,324	1.771
Total	8,735	4,949	1.765

Table 4 shows considerable consistency in the overall CP Factors from year to year. In contrast, the CP Factors vary widely between locations, as shown in the last column of Table 3. In order to calculate the adjusted TrafX counts, I must choose a CP Factor for each location. For this report, I have chosen to use the specific CP Factor for each counter based on the 2015 synchronized counts. These CP Factors are listed in Table 3, but I also show them below in Table 5.

[6] No manual counts were conducted in 2014.

Table 5: CP Factors by Location (2015)

Location	Manual	TrafX	CP Factor
Cumberland	212	136	1.559
Frostburg	159	103	1.544
Deal	30	23	1.304
Garrett	113	34	3.324
Rockwood	81	60	1.350
Ohiopyle	306	190	1.611
Connellsville[7]	-----	-----	1.611
Perryopolis	80	52	1.538
West Newton	206	221	0.932
Boston	317	165	1.921
Rankin Bridge	221	118	1.873
Hot Metal Bridge	620	222	2.793

It is worth noting that the 2015 Ohiopyle CP Factor (1.611) is considerably lower than the CP Factors at that location in previously. Specifically, aggregating 2010-2013 data yields a CP Factor of 2.161. One reason why this may be the case is the fact that no synchronized counts were conducted on the weekend. Ohiopyle tends to experience uncommonly heavy trail use on the weekends, and CP Factors tend to be higher during periods of heavy trail use due to the fact that riders traveling side-by-side as only one unit, rather than two. For this study, I will use the CP Factor listed in Table 5 for Ohiopyle (1.611), but I strongly recommend that weekend synchronized counts be conducted in future years so that we can obtain a more accurate CP Factor for Ohiopyle and other locations.

Adjusted TrafX Counts

As mentioned previously, the TrafX counters tend to undercount trail use, particularly when users 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 April through November, 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 1.559, and its raw count for April (listed in Table 2) is 2,250. Thus, the adjusted count for Cumberland in April in Table 6 is 3,507 = (1.559) x (2,250). All other counts listed for April through November in Table 6 are calculated in a similar manner.

[7] No synchronized counts were conducted at Connellsville in 2015. However, manual counts have been conducted there in previous years. Aggregating the Connellsville counts from 2010-2013 yields a manual count of 875, a TrafX count of 543, and a resulting CP Factor of 1.611.

Table 6: Adjusted Monthly TrafX Counts (2015)

Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
Cumberland	100	100	1,753	3,507	7,013	6,841	7,481	8,341	6,394	7,545	4,002	100	53,176
Frostburg	100	100	1,311	2,621	5,242	4,747	5,150	4,427	3,473	3,345	2,068	100	32,685
Deal	100	100	769	1,538	3,076	3,184	3,460	3,550	2,622	2,221	548	100	21,267
Garrett	100	100	550	1,100	2,200	1,752	2,327	7,793	4,131	2,443	711	100	23,307
Rockwood	100	100	613	1,226	2,453	2,790	2,889	2,986	2,577	2,055	525	100	18,415
Ohiopyle	100	100	1,857	3,714	7,428	6,550	12,024	13,722	7,911	5,584	1,036	100	60,124
Connellsville	100	100	1,444	2,888	5,775	4,485	5,830	6,037	4,913	3,444	939	100	36,055
Perryopolis	100	100	882	1,764	3,528	3,258	3,858	3,863	3,325	2,448	849	100	24,075
West Newton	100	100	2,085	4,171	8,342	6,227	8,808	10,138	5,421	3,536	2,090	100	51,118
Boston	100	100	1,971	3,941	7,883	5,989	8,373	9,437	6,859	4,926	2,423	100	52,100
Rankin Bridge	100	100	2,975	5,949	12,395	8,910	10,902	12,187	10,297	8,198	5,961	100	78,073
Hot Metal Bridge	100	100	9,490	18,980	37,960	28,120	28,822	32,442	28,953	32,642	26,071	100	243,779
Total	1,200	1,200	25,699	51,399	103,294	82,853	99,923	114,922	86,877	78,386	47,222	1,200	694,175

The March counts listed in Table 6 are calculated as half of the April counts for each location.[8] For the remaining months (January, February, and December), I simply estimated 100 trail visits for each month at each location. During these months, the TrafX counters are not operational and no manual counts were conducted. As such, we have no data from which to estimate trail use during these months, and we must make an educated guess on trail use. In the past, I have estimated 100 trail visits per month at each location, and I have use the same estimate in this report.

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 times trail users pass a TrafX counter. Moreover, the adjusted TrafX counts at any location also represent a reasonable estimate of the number of trail users who enter at the trailhead closest to that counter.

Consider, for example, trail use at 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 other direction, toward Connellsville. These trail users will not pass the TrafX counter at Ohiopyle. Some might be counted by the Connellsville counter, but many 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. So 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 roughly are roughly equal. If this is the case, then the adjusted TrafX count provides a good estimate of the number of trail use at Ohiopyle.

So, given the data available, I view the last column of Table 6 as the best estimate of 2015 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 provides a preliminary estimate of 694,175 total trail use at the 12 TrafX counter locations. As I have argued above, this number is a reasonable estimate of the number of trail users 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

[8] Historically, the TrafX counters have been set up in mid-April. As such, we previously have received little or no TrafX data on trail use in March. This year (2016), the TrafX counters were set up in mid-March, so we now have some data on March trail use. In 2016, the daily average TrafX count for March was 77.1 versus 116.9 for April. Thus, the average March count was approximately 66% of the average April count. It is worth noting that the March data started near the middle of the month and it is reasonable to think that trail use generally increased during the month of March, as the weather improved. Given all of this, it seems that estimating March trail use at 50% of April trail use is a reasonable estimate.

that 80% of the trail users enter at the trail at the trailheads closest to the TrafX counters, with a range of 75% to 85%.[9]

If we assume the midpoint estimate of 80%, then the resulting mid-range estimate of total trail use is 867,719 = (694,175 ÷ 0.80). The low-range and high-range estimates are 816,677 = (694,175 ÷ 0.85) and 925,567 = (694,175 ÷ 0.75), respectively. This represents a 23.0% increase in trail use compared to 2013, the last year in which I produced a trail-use report.

One piece of evidence suggests that a 23.0% increase in trail use between 2013 and 2015 is a reasonable estimate. The Town Crier Program of the Confluence Tourism Association published a report summarizing trail use at Confluence from 2013-1015[10]. Volunteers in Confluence recorded weekend trail use from Memorial Day through Labor Day and found that trail use increased from a daily average of 260 in 2013 to 307 in 2015. This represents an 18.1% increase in trail use between 2013 and 2015.

Findings and Recommendations

The Great Allegheny Passage trail system is well-used, with an estimated 816,677 to 925,567 trail visits in 2015. My mid-range estimate for 2015 is 867,719 trail visits along the GAP, which represents a 23.0% increase compared to 2013.

Two important changes were made in data collection since 2013, the last year for which I produced a trail use report. First, the number of TrafX counter locations increased from 9 to 12. The increase in TrafX counters increases the amount of data available and therefore increases the accuracy of trail use estimates. Second, the synchronized counts were moved from trailhead locations to the TrafX locations. In addition, the number of synchronized count locations decreased from 18 to 11. This resulted in less data being available and complicated the process of estimating trail use.

I have three primary recommendations with regard to gathering trail use data. The first is to make every reasonable effort to gather the data in a consistent manner from year to year. Specifically, this would mean keeping the TrafX locations the same from year to year and continuing to conduct the synchronized counts at the TrafX locations. Trail use estimates will never be perfect, but if the data is collected consistently each year, we can then make reasonably accurate estimates of the amount by which trail use increases or decreases each year.

My second recommendation is to collect as much data as possible. With regard to the TrafX counters, this would mean setting them up earlier in the season, perhaps in early March. This is exactly what has been done in 2016, as each of the counters was set up in March. This will provide a more complete set of TrafX data. With regard to the synchronized counts, it is critical to collect as complete a set of data as possible. In 2015, no synchronized counts were conducted at Connellsville, and only one was conducted at Deal. Ideally, a full set of data would be collected on each synchronized count date. This would help to generate more accurate CP Factors for each location, and it would provide a better picture of relative trail use at the various locations.

My final recommendation is that at least two of the synchronized counts be conducted on a weekend day (Saturday and/or Sunday). In 2015, each of the counts was conducted during the week (Monday-Friday). It is quite possible that some locations see higher weekend traffic than others, and conducting weekend synchronized counts would help to pick up on this trend.

[9] These estimates are based on input and estimates by ATA.
[10] *Visitor Data 2013-2015* by the Town Crier Program of the Confluence Tourism Association.