Analysis of 2013 Trail Usage Patterns along the Great Allegheny Passage

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Key Findings

- Based on TrafX and manual counts of trail users, I estimate the number of trail users along the Great Allegheny Passage in 2013 to be in the range of 470,138 to 940,276, with a mid-range estimate of 705,207. This represents a substantial increase in trail use over the previous two years. My mid-range trail use estimates for 2011 and 2012 were 612,991 and 555,795, respectively.

- Compared to previous years, the TrafX data in 2013 was more complete and more reliable. The 9 counter locations recorded data usable data on a total of 1,788 days, or nearly 200 days per counter. This is a dramatic improvement over 2012, when TrafX counters recorded usable data on a total of only 1,441 days.

- The manual counts suggest that the counters were working more reliably in 2013 than in the past. The overall CP Factor for 2013 was 1.774, down from 1.885 in 2013. In addition, the range of CP Factors at various locations was smaller in 2013. Specifically, the CP Factors ranged from 1.397 (Garrett) to 2.615 (Deal) in 2013. In 2012, the range was from 0.677 to 4.440.

- In 2013, the synchronized count data was less complete than in previous years. Four synchronized counts were conducted at 18 locations; thus, a complete set of synchronized count data would include 72 observations. In fact, only 6 of the 18 locations reported counts for all four dates, and 16 observations were missing.

Recommendations

- TrafX counters are the single most important tool in measuring overall trail use. The improved reliability of the counters in 2013 directly improved the reliability of trail use estimates. I strongly recommend that we continue diligently to monitor and maintain the TrafX counters to ensure that they continue to provide reliable counts.

- The synchronized counts are a crucial element in estimating total trail use. As such, I strongly recommend that we make every effort to ensure that we obtain a complete set of data for each synchronized count date.

- A series of surveys should be conducted at all trailheads closest to the counters to determine the starting and ending location for each trail user, as well as how far the user traveled in each direction from the trailhead. This information would improve our understanding of the percentage of trail users who: (1) pass the same counter twice during a single trail use; (2) pass multiple counters during a single trail use; or (3) pass no counters during their use of the trail.

Summary of Methodology

This report estimates trail use patterns along the Great Allegheny Passage, from Pittsburgh to Cumberland. These estimates are based on three primary data sources. The first source is information gathered from TrafX counters, infrared counters that track trail use at fixed locations along the trail. The second source is information gathered from manual counts conducted at the TrafX counter locations. During these counts, volunteers tally the number of trail users at TrafX counter locations for a 2-hour period. The manual counts are then compared to the TrafX counts during the same time period. The final source is information gathered from synchronized manual counts conducted at 18 trailhead locations. These synchronized counts occurred on four dates: Saturday, May 25 (Noon-2 pm), Thursday, July 11 (1-3 pm), Saturday, August 17 (noon-2 pm), and Sunday, September 22 (12:30-2:30 pm).

I use the same methodology for this report that I have used to analyze trail use in previous reports.[1] 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. Next, I adjust the initial counts to account for the fact that the TrafX counters typically under-count the number of trail users. I use the manual counts to derive a Count-to-Pass Factor (CP Factor) for each location (Table 3) and apply the CP Factor to derive adjusted TrafX counts (Table 4). I then report the data gathered during the synchronized counts (Table 5). Finally, I use the adjusted TrafX counts and synchronized count to derive high-, medium-, and low-end estimates of trail use at each of the 18 trailhead locations (Table 7).

TrafX Data

In 2013, TrafX counters collected data at 9 locations along the Great Allegheny Passage. Table 1 provides information on these counters and the data that they gathered.[2]

Table 1: Summary of TrafX Count Data (2013)

Location	Trailhead milepost	Counter milepost	# Count Days (Apr-Nov)	First Date	Last Date
Smithton	107.0	108.0	119	15-May	19-Oct
Connellsville	89.0	86.0	200	7-Apr	19-Nov
Ohiopyle	72.0	70.0	227	7-Apr	19-Nov
Rockwood	43.0	44.0	226	11-Apr	23-Nov
Garrett	37.0	38.0	221	11-Apr	23-Nov
Deal	25.0	25.0	222	11-Apr	23-Nov
Frostburg	16.0	17.5	205	14-Apr	4-Nov
Woodcock Hollow	10.0	8.5	157	1-Jun	4-Nov
Cumberland	1.0	2.5	211	2-Apr	4-Nov

[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,* and *Analysis of 2012 Trail Usage Patterns along the Great Allegheny Passage, April 4, 2013*

[2] The milepost locations of the trailheads and TrafX counters were provided by Lara Nagle in an email dated December 29, 2010.

Table 2 displays counts by month at eight TrafX counter locations.[3] The TrafX counters do not operate from December through March, so the numbers listed in Table 2 for these months are pure estimates. Specifically, I use an estimate of 100 trail users per month for each location for January, February, and December. For March, I use an estimate of 500 trail users for all of the locations except for Ohiopyle and Cumberland. I use a higher estimate for these two locations, because they are generally considered to be high-use trailhead locations. I used the same estimates in my previous reports.

For the remaining months (April through November), Table 2 lists the counts generated by the TrafX counters, with some modifications. One modification relates to days in which a counter registers no data or a count of 0. For each counter, I calculated an average weekday and weekend count for each month.[4] On days in which a counter had missing data (or a count of 0), I inserted the average count for that location and month. For example, the Smithton counter recorded a count of 0 on Wednesday, May 22. As a result, I inserted a count of 168.2 for Smithton on that day, which is the average weekday count for Smithton in May.

The Smithton TrafX counters reported no data at all for the months of April and November. For these months, I estimated the trail counts for Smithton based on May through October counts. From May through October, all eight counters reported data. During these months, Smithton's weekday count was 31.8% of the total count of the other seven locations, and its weekend count was 29.7% of the total count of the other locations. As a result, I estimated Smithton's April weekday count as 31.8% of the total weekday count of the seven other locations in April and its weekend count as 29.7% of the total weekend count of the other locations in April. I used the same methodology to estimate Smithton's November count.

With the modifications explained in the preceding paragraphs, Table 2 summarizes the TrafX counts for each location by month.

Manual Counts at TrafX Locations

Manual counts provide valuable information about the accuracy of the TrafX counters. During a typical manual count, volunteers stand next to a TrafX counter and count passing trail users for a two-hour period. This count is then compared to the TrafX count for the same location and time period.

Table 3 summarizes the manual counts conducted in 2013. Notice that not all of the count hours produced useful information. A useful count requires both the manual count and the corresponding TrafX count. On a few occasions, manual counts were conducted, but the TrafX counter did not record data during the time period of the count. In total, 5 of the 64 hours of manual counts were unusable because the TrafX counter did not record data for the corresponding time period.

The CP Factor is the manual count divided by the TrafX count. For example, Smithton's CP Factor is 1.610 = (187/301). No counts were conducted at Frostburg and Cumberland. For these locations, I set the CP Factor equal to the "All Sites Combined" CP Factor of 1.774.

[3] I do not include Woodcock Hollow counts in this report because of the close proximity of this counter to the Cumberland and Frostburg counters. It is worth noting that I have excluded Woodcock Hollow counts in each of my previous reports.

[4] I define "weekday" as Monday through Friday and "weekend" as Saturday and Sunday.

Table 2: TrafX Counts by Location and Month (2013)

	Smithton	Connellsville	Ohiopyle	Rockwood	Garrett	Deal	Frostburg	Cumberland	Total
January	100	100	100	100	100	100	100	100	800
February	100	100	100	100	100	100	100	100	800
March	500	500	1,000	500	500	500	500	1,000	5,000
April	2,954	1,355	1,079	667	457	519	1,677	3,840	12,547
May	6,732	2,786	3,581	1,464	1,116	1,611	2,143	4,570	24,003
June	6,030	3,597	3,882	1,944	1,357	2,057	2,862	4,699	26,428
July	6,799	3,177	4,767	1,807	1,299	1,864	3,105	4,166	26,984
August	7,421	3,674	6,383	1,880	1,173	1,683	3,478	4,549	30,241
September	6,020	2,787	5,194	1,752	928	1,474	2,955	4,646	25,756
October	2,926	2,259	3,194	1,228	695	977	2,371	4,736	18,387
November	1,939	553	570	177	152	201	1,643	3,030	8,264
December	100	100	100	100	100	100	100	100	800
Total	41,621	20,989	29,949	11,718	7,977	11,186	21,034	35,536	180,010

Table 3: Manual Trail Counts (2013)

Location	Total Count Hours	Useful Count Hours	Manual Count	TrafX Count	CP Factor
Smithton	14	10	301	187	1.610
Connellsville	14	9	117	71	1.648
Ohiopyle	14	10	222	89	2.494
Rockwood	12	10	266	176	1.511
Garrett	12	12	81	58	1.397
Deal	8	8	136	52	2.615
Frostburg	0	0	NA	NA	1.774
Cumberland	0	0	NA	NA	1.774
All Sites Combined	64	59	1,123	633	1.774

Table 4 lists the adjusted TrafX counts by location and month after applying the CP Factors. Each count in Table 4 equals the corresponding count in Table 2 multiplied by the relevant CP Factor. For April through November, the relevant CP Factor for each location is listed in Table 3. For example, Smithton's CP Factor is 1.610 for April through November. The April count for Smithton in Table 4 is 4,755, which equals the Table 2 April count for Smithton (2,954) times Smithton's CP Factor (1.610). For the months in which the counters were not operating (January, February, March, and December), I use a CP Factor of 1.000 for all locations.

While the adjusted counts presented in Table 4 provide a solid foundation for estimating overall trail usage patterns, they do not provide a complete picture. First, we must recognize that if a trail user starts and ends at the same location and passes a counter, he or she will be counted twice (once on the way out, and once on the way back). Furthermore, cyclists who go for long rides on the trail may pass multiple counters. On the other hand, many trail users – even those who use trail sections in which counters have been placed – never pass a counter, because they do not travel far enough along the trail or because they travel in a direction away from the counter location.

One way to address this first consideration would be to conduct a survey at all trailheads closest to the counters. The survey would attempt to determine the starting and ending location for each trail user, as well as how far the user traveled in each direction from the trailhead. With this information, we would have a better understanding of the percentage of trail users who: (1) pass the same counter twice during a single trail use; (2) pass multiple counters during a single trail use; or (3) pass no counters during their use of the trail. Thus, one key recommendation of this study is that we should conduct a series of surveys at all trailheads closest to the counters.

Synchronized Manual Counts

A second consideration stems from the fact that there are many trailhead locations between Pittsburgh and Cumberland that are not near a TrafX counter. We have little information regarding trail use at these locations. To address this issue, volunteers conducted synchronized manual counts at 18 trailhead locations during 2013. The counts were coordinated so that they occurred during the same hours on the same dates at each location. Specifically, volunteers conducted two-hour synchronized counts on four dates in 2013: Saturday, May 25 (Noon-2 pm), Thursday, July 11 (1-3 pm), Saturday, August 17 (noon-2 pm), and Sunday, September 22 (12:30-2:30 pm).

Table 5 summarizes the data collected during these of synchronized counts.[5] It is worth noting that synchronized count data was not collected at every location on all four dates. If data had been collected at all 18 locations on all four dates, we would have 72 synchronized count data points. In fact, 12 of the 18 locations are missing data for at least one date, and in total we are missing 16 data points.

In order to fill in the missing synchronized count data, I use the 6 locations that have complete data as a Baseline Group.[6] For each location with missing data, I calculate the count of that location as a percentage of the Baseline Group count for each date in which the location has count data. On the dates when location is missing data, I estimate the count using this percentage.

[5] The raw counts separated cyclists from walkers and reported counts on 30-minute intervals. In Table 5, I aggregate this data into totals for each day and for the four days combined.

[6] The 6 locations with complete data are: Homestead/Waterfront, West Newton (N), Ohiopyle (N), Ohiopyle (S), Garrett (S), and Meyersdale (S). I refer to these locations as the Baseline Group.

Table 4: Adjusted Monthly TrafX Counts (2013)

	Smithton	Connellsville	Ohiopyle	Rockwood	Garrett	Deal	Frostburg	Cumberland	Total
January	100	100	100	100	100	100	100	100	800
February	100	100	100	100	100	100	100	100	800
March	500	500	1,000	500	500	500	500	1,000	5,000
April	4,755	2,233	2,690	1,008	638	1,357	2,976	6,813	22,468
May	10,836	4,591	8,932	2,213	1,559	4,213	3,802	8,108	44,253
June	9,706	5,927	9,683	2,938	1,895	5,380	5,077	8,336	48,944
July	10,943	5,236	11,891	2,731	1,814	4,875	5,509	7,391	50,390
August	11,945	6,054	15,922	2,841	1,638	4,402	6,170	8,070	57,043
September	9,690	4,593	12,956	2,648	1,296	3,855	5,242	8,242	48,523
October	4,710	3,723	7,967	1,856	971	2,555	4,206	8,402	34,390
November	3,121	911	1,422	267	212	526	2,914	5,375	14,749
December	100	100	100	100	100	100	100	100	800
Total	66,506	34,069	72,763	17,302	10,823	27,963	36,697	62,038	328,159

Table 5: Synchronized Manual Counts (2013)

Location	May 25, 2013		July 11, 2013		Aug 17, 2013		Sept 22, 2013		4-day Total		
	Count	% of Total	Count	% of Total	Count	% of Total	Count	% of Total	Count	% of Total	Std. Dev.
Homestead/Waterfront	226	12.2%	115	11.4%	281	10.0%	323	18.3%	945	12.7%	3.66
McKeesport - Trailhead	77	4.2%	88	8.8%	177	6.3%	110	6.2%	452	6.1%	1.88
Boston (S)	182	9.8%	96	9.6%	260	9.3%	168	9.5%	706	9.5%	0.22
Buena Vista	73	3.9%	40	4.0%	120	4.3%	73	4.1%	306	4.1%	0.16
West Newton (N)	92	5.0%	57	5.7%	174	6.2%	187	10.6%	510	6.9%	2.55
Smithton	84	4.5%	39	3.9%	89	3.2%	98	5.6%	310	4.2%	1.01
Connellsville (N)	121	6.5%	62	6.2%	194	6.9%	118	6.7%	495	6.7%	0.32
Connellsville (S)	96	5.2%	22	2.2%	125	4.5%	76	4.3%	319	4.3%	1.29
Ohiopyle (N)	297	16.0%	87	8.7%	377	13.5%	151	8.6%	912	12.3%	3.69
Ohiopyle (S)	160	8.6%	105	10.4%	410[7]	14.6%	122	6.9%	797	10.7%	3.32
Confluence (S)	61	3.3%	27	2.7%	93	3.3%	37	2.1%	218	2.9%	0.58
Rockwood (N)	50	2.7%	47	4.7%	68	2.4%	40	2.3%	205	2.8%	1.12
Garrett (S)	25	1.3%	39	3.9%	47	1.7%	38	2.2%	149	2.0%	1.13
Meyersdale (N)	20	1.1%	30	3.0%	71	2.5%	38	2.2%	159	2.1%	0.81
Meyersdale (S)	40	2.2%	29	2.9%	61	2.2%	0	0.0%	130	1.8%	1.25
Deal (S)	49	2.6%	47	4.7%	67	2.4%	38	2.2%	201	2.7%	1.16
Frostburg (N)	142	7.7%	46	4.6%	127	4.5%	50	2.8%	365	4.9%	2.01
Cumberland	60	3.2%	29	2.9%	60	2.1%	96	5.4%	245	3.3%	1.42
Total	1,855	100.0%	1,005	100.0%	2,801	100.0%	1,763	100.0%	7,424	100.0%	

[7] The August 17 synchronized count at Ohiopyle (S) reported an unusually large number of walkers, 446 in 2 hours to be precise. In fact, on this date, walkers accounted for more than half of the trail users at Ohiopyle (S). During the other three synchronized count days, walkers accounted for only about 10% of trail users. Based on this information, I adjusted downward the "walker" count for Ohiopyle (S) on August 17 so that the walker count was 10% of the total count for that day. The 410 trail users reported for Ohiopyle (S) on August 17 reflects this adjustment. The original count was 816.

For example, McKeesport is missing data for August 17, but it does have data for the other three dates. Aggregating data from the three dates in which McKeesport synchronized counts are available, McKeesport's count is 13.1% of the total count recorded for the Baseline Group on those dates. For August 17, I estimate McKeesport's count as 13.1% of the total Baseline Group count for August 17, which was 1,350. Thus, Table 5 lists a count of 177 for McKeesport on August 17, which equals 13.1% of 1,350. I used the same method to estimate all other missing synchronized count data.

Table 6 reports the adjusted TrafX counts and the synchronized counts for the eight TrafX locations. The "% of total" is the count divided by the total for the eight locations. For example, Smithon's "% of total" is 20.3% = (66,506 ÷ 328,159) for the Adjusted TrafX Count and 12.0% = (310 ÷ 2,591) for the synchronized count.

Table 6: Adjusted TrafX and Synchronized Counts (2013)

	Adjusted TrafX Count		Synchronized Count	
Location	**Count**	**% of total**	**Count**	**% of total**
Smithton	66,506	20.3%	310	12.0%
Connellsville (S)	34,069	10.4%	319	12.3%
Ohiopyle (S)	72,763	22.2%	797	30.8%
Rockwood (N)	17,302	5.3%	205	7.9%
Garrett (S)	10,823	3.3%	149	5.8%
Deal (S)	27,963	8.5%	201	7.8%
Frostburg (N)	36,697	11.2%	365	14.1%
Cumberland (N)	62,038	18.9%	245	9.5%
Total	328,159	100.0%	2,591	100.0%

The total synchronized count for these eight locations is 2,591, which is 34.9% of the total synchronized count of 7,424 reported in Table 5. Furthermore, the total adjusted TrafX count for these locations is 328,159. Assuming that the synchronized count provides an accurate measure of the relative trail use at the various locations, we can infer that the adjusted TrafX count of 328,159 at the TrafX locations represents 34.9% of the total trail count for all locations. If this is the case, then we can estimate total trail use to be 940,276 = (328,159) ÷ (0.349).

Realistically, this estimate probably overstates total trail use, because it essentially assumes that each trail user passes only one trailhead location during any given trail use. While this is undoubtedly true for some trail users, it is also the case that many trail users pass multiple trailhead locations in a single trail use. For this reason, I view the 940,276 estimate as a high-end estimate of total trail use. At the other end of spectrum, a low-end estimate of trail use can be obtained by dividing this number by two, essentially assuming that each trail users passes two trailhead locations during a single trail use. Thus, a low-end estimate of trail use is 470,138. As a mid-range estimate, I calculate the average of the high-end and low-end estimates. Thus, the mid-range estimate of trail use is 705,207.

Table 7 provides high-end, mid-range, and low-end trail use estimates for each of the major trailhead locations. To obtain these estimates, I start with the high-end, mid-range, and low-end estimates for total trail usage (940,276, 705,207, and 470,138, respectively), and I apply to each location a relative use percentage based on the synchronized counts. Specifically, I use the 4-day total relative use percentages found in Table 5. These percentages are shown in the "Estimated % of Total" column of Table 7.

For example, consider the Homestead/Waterfront trailhead location in the first row of Table 7. The "High Estimate" of 119,688 is 12.7% of 940,276, the total High Estimate. Similarly, the Middle and Low Estimates of 89,766 and 59,844 are 12.7% of the total Middle and Low Estimates of 705,207 and 470,138, respectively. I use the same method to estimate trail use at the other trailhead locations.

Table 7: Estimated Trail Use at Major Trailhead Locations (2013)

Location	Estimated % of total	High Estimate	Middle Estimate	Low Estimate
Homestead/Waterfront	12.7%	119,688	89,766	59,844
McKeesport - Trailhead	6.1%	57,247	42,936	28,624
Boston (S)	9.5%	89,417	67,063	44,709
Buena Vista	4.1%	38,756	29,067	19,378
West Newton (N)	6.9%	64,593	48,445	32,297
Smithton	4.2%	39,263	29,447	19,631
Connellsville (N)	6.7%	62,694	47,020	31,347
Connellsville (S)	4.3%	40,402	30,302	20,201
Ohiopyle (N)	12.3%	115,508	86,631	57,754
Ohiopyle (S)*	10.7%	100,943	75,707	50,471
Confluence (S)	2.9%	27,610	20,708	13,805
Rockwood (N)	2.8%	25,964	19,473	12,982
Garrett (S)	2.0%	18,871	14,154	9,436
(Meyersdale (N))	2.1%	20,138	15,103	10,069
Meyersdale (S)	1.8%	16,465	12,349	8,232
Deal (S)	2.7%	25,457	19,093	12,729
Frostburg (N)	4.9%	46,229	34,671	23,114
Cumberland	3.3%	31,030	23,273	15,515
Total	100.0%	940,276	705,207	470,138

Conclusions and Recommendations

The numbers reported in Table 7 highlight the fact that the Great Allegheny Passage trail system is well-used, with an estimated 470,138 to 940,276 trail users in 2013, with a mid-range estimate of 705,207. This represents a substantial increase in trail use over the previous two years. My mid-range trail use estimates for 2011 and 2012 were 612,991 and 555,795, respectively.

Compared to previous years, the TrafX data in 2013 was more complete and more reliable. The 9 counter locations recorded data usable data on a total of 1,788 days, or nearly 200 days per counter. This is a dramatic improvement over 2012, when TrafX counters recorded usable data on a total of only 1,441 days.

In addition, the manual counts suggest that the counters were working more reliably than in the past. The overall CP Factor for 2013 was 1.774, down from 1.885 in 2013. In addition, range of CP Factors at the various locations was smaller in 2013. Specifically, the CP Factors ranged from 1.397 (Garrett) to 2.615 (Deal) in 2013. In 2012, the range was from 0.677 to 4.440. Because they count trail users every day, TrafX counters are the single most important tool in measuring overall trail use. The improved reliability of the counters in 2013 directly improved the reliability of trail use estimates. I strongly recommend that we continue diligently to monitor and maintain the TrafX counters to ensure that they continue to provide reliable counts.

In 2013, the synchronized count data was less complete than in previous years. Four synchronized counts were conducted at 18 locations; thus, a complete set of synchronized count data would include 72 observations. In fact, only 6 of the 18 locations reported counts for all four dates, and 16 observations were missing. The synchronized counts are a crucial element in estimating total trail use. I strongly recommend that we make every effort to ensure that we obtain a complete set of data for each synchronized count date.

Finally, I recommend conducting a series of surveys at all trailheads closest to the TrafX counters to determine the starting and ending location for each trail user, as well as how far the user traveled in each direction from the trailhead. This information used together with the data generated from the TrafX counters and the synchronized counts would enable me to further refine my estimate of trail use along the Great Allegheny Trail.