

EMPIRE STATE TRAIL TRAIL USER PROJECTIONS

JULY 20, 2018



Hudson River
Valley Greenway



TRAIL USER PROJECTIONS

In his January, 2017 State of the State address, Governor Andrew Cuomo announced the Empire State Trail (EST), a new initiative placing New York State at the forefront of national efforts to enhance outdoor recreation, community vitality, and tourism development. The FY2017-18 state budget, enacted in April, 2017 provides \$200 million to fund construction of the Trail. When completed by the end of 2020, the Trail will be a continuous 750-mile route which will span the state from New York City to Canada and Buffalo to Albany, creating the longest multi-use state trail in the nation.

This report, prepared for the Hudson River Valley Greenway by Alta Planning + Design, answers the question “How many people will use the Empire State Trail annually?”. This is a complex question:

- Data quantifying current trail use on existing sections of the EST route has been gathered at only a handful of locations along the 750-mile route.
- “Trail users” encompasses a wide variety of visitors, ranging from those out for a short 20-minute walk, to bicyclists traveling hundreds of miles over multi-day trips.
- And no data exists for those sections of the EST that have not yet been built.

Given these constraints, this report utilizes a statistical analysis to generate a projection of the total number of trail users that will visit the Empire State Trail annually. Specifically, the

report provides a projection of the number of walkers, runners, and bicyclists that will visit the trail annually at eighty-one (81) sample points along the trail, and extrapolates a “trail-wide” visitor projection for the entire 750-mile route. To accomplish this, the report analyzes trail use data compiled at more than 50 other trail locations in New York State, and applies a statistical analysis to create an annual trail user estimate for the EST.

Visitation for the entire 750-mile EST is projected to be approximately 8.6 million trail users annually. Trail usage is expected to be highest within the largest population centers of New York State including New York City, Buffalo, and Rochester. Lower levels of trail use will occur in rural areas, and on the 110-mile EST section from Whitehall to Rouses Point in the Champlain Valley, where the EST will be an on-road bicycle route. Annual trail user estimates have been developed for eighty-one (81) points along the EST, which are shown in the EST User Estimates map on page 2 and within Tables 1 and 2 on pages 7 and 8.

**WHEN COMPLETED IN 2020,
THE EMPIRE STATE TRAIL
WILL HOST AN ESTIMATED
8.6 MILLION ANNUAL
VISITORS ACROSS ITS 750-
MILE ROUTE**

METHODOLOGY

Trail user estimates are typically conducted on existing trails or for extensions of existing trails. Historically, trail managers utilized volunteers to physically count the number of trail users at a specific trail location during two-hour sample periods, during various times and days of the week. A standard formula was used to translate sample data into an annual trail user estimate. In the past several years, new technology has become available that uses sensors to automatically count trail users. These sensors, which run continuously for a year, can identify the precise number of people passing by (including counting the number of individuals in larger groups) and differentiate between pedestrians and bicyclists, providing highly accurate trail count data.

However, automated trail sensors count the number of trail users only at the specific locations where they are installed. There is no standard formula for translating user data collected at individual sites – to develop an estimate of the total number of users on longer sections of trail.

To estimate the number of EST trail users, this report develops a methodology to correlate existing trail counts collected elsewhere in New York State to develop a comprehensive projection of annual trail use along the entire 750-mile Empire State Trail.

Data from 54 annual existing trail count locations across New York State were collected and mapped. These existing trail user counts were conducted by Parks & Trails New York (PTNY)

during 2016 and 2017.¹ These existing counts serve as the primary basis for the EST user projection. The existing count conducted near the Walkway Over the Hudson, a destination and significant generator, was excluded from the analysis (see detailed description of methodology).

Population density was used to correlate these existing points to the proposed trail. Research has shown that there is a correlation between trail users and surrounding population density.^{2,3} Population density has also been used as a method to adjust trail counts to evaluate other trail characteristics, such as trail surface types.

Population densities of variable radii have been used to project or support trail user counts, typically ranging from 1 to 3 miles. Given the length and scope of the EST, and lack of other long distance shared-use paths as alternatives in both the existing and projected count locations, a larger 3 mile radius was used. Population density for a 3-mile radius around each of the existing trail count locations was calculated by using population data from block groups within this radius and dividing it by the total area. The 53 existing trail count locations were used to

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- 1 <https://www.ptny.org/publications/annual-reports>
 - 2 Seamless Travel: Measuring Bicycle and Pedestrian Activity in San Diego County and its Relationship to Land Use, Transportation, Safety, and Facility Type; <http://www.path.berkeley.edu/sites/default/files/publications/PRR-2010-12.pdf>
 - 3 Trail Characteristics as Correlates of Urban Trail Use; Kim D. Reynolds, PhD; Jennifer Wolch, PhD; Jason Byrne, BA; Chih-Ping Chou, PhD; Guanjin Feng, PhD; Susan Weaver, MA, MPI; Michael Jerrett, PhD; https://activelivingresearch.org/sites/default/files/Reynolds_0.pdf



create a trendline which provided the equation used to estimate the number of annual trail users at multiple points along the EST based on each points' surrounding population density. The scatter plot and trendline created from the 53 existing trail count locations are shown in Figure 1 on page 5.

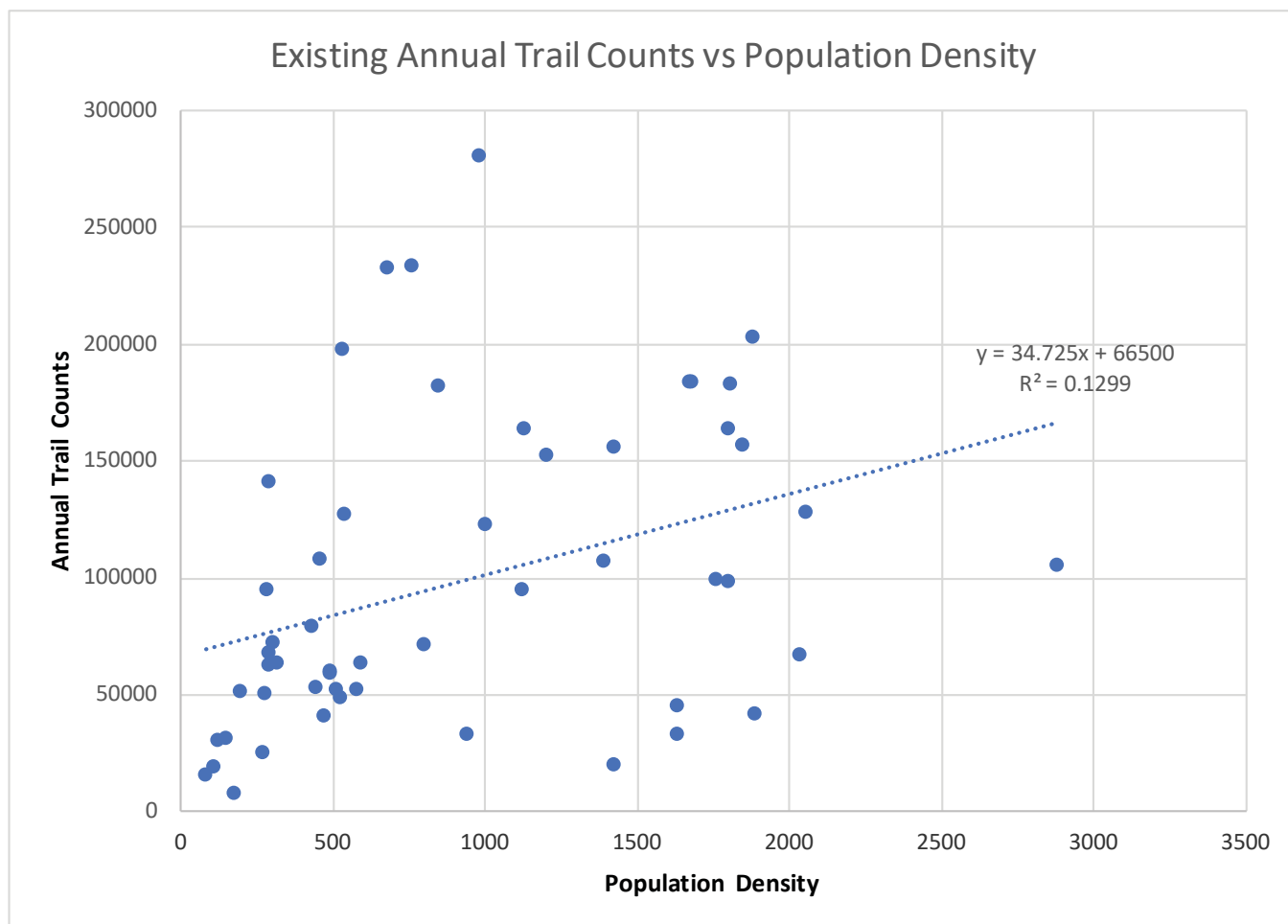
To develop the trail user estimate for the entire EST, it was assumed that all user trips will start and end at the same location, creating an out-and-back user trip. It was assumed that the average pedestrian trip would be a round trip of 4 miles in length and that the average bicycling trip would be a round trip of 10 miles in length. A mode share of 65% pedestrians and 35% bicyclists was also assumed, based on trail user data collected by PTNY since 2005. 81 sample points were strategically placed along the trail to mitigate not counting some users while not double counting users at any one location.

CHAMPLAIN CANALWAY TRAIL CALCULATIONS

Given that the Champlain Canalway Trail is largely comprised of on-road routes and, therefore, more likely to be used by experienced long distance cyclists than typical trail users, the consultant team has opted to alter the bicyclist and pedestrian estimates using the following assumptions:

- It is assumed there will not be any pedestrians on the on-road route from the Town of Whitehall to the Canadian border.
- It is assumed that there will be fewer bicyclists than 35% of the total user estimate, which is the percentage used to estimate the number of bicyclists at each sample point on the remainder of the EST. Therefore, the estimate of bicyclists on the EST at the sample points between the Town of Whitehall and the Canadian border is calculated by taking 15% of the original bicyclists user group estimate.

Figure 1: Graph of Trail User Count Locations Used to Estimate EST User Projections





FUTURE STUDIES

The projection that the Empire State Trail will host 8.6 million annual visitors is just that, a projection utilizing statistical analysis to generate an estimate using best available information. We believe 8.6 million visitors is a good estimate of annual EST visitation across its 750-mile route, but more data is needed to refine and strengthen EST trail user projections. The Hudson River Valley Greenway supports existing efforts by PTNY to utilize automated counters to compile detailed, accurate trail user counts at additional locations along the EST route, and recommends that state and local government agencies invest in similar trail data collection efforts.

Table 1: EST User Projection Table

#	ANNUAL TRAIL USER ESTIMATES	BICYCLISTS (35%)	PEDESTRIANS (65%)
1	2,298,086	804,330	1,493,756
2	650,420	227,647	422,773
3	173,655	60,779	112,876
4	124,772	43,670	81,102
5	86,581	30,303	56,278
6	96,742	33,860	62,883
7	83,520	29,232	54,288
8	75,266	26,343	48,923
9	79,128	27,695	51,433
10	96,485	33,770	62,715
11	112,197	39,269	72,928
12	76,492	26,772	49,720
13	72,202	25,271	46,931
14	76,651	26,828	49,823
15	78,156	27,355	50,802
16	69,847	24,446	45,401
17	76,555	26,794	49,760
18	71,271	24,945	46,326
19	71,694	25,093	46,601
20	72,217	25,276	46,941
21	116,594	40,808	75,786
22	127,197	44,519	82,678
23	79,340	27,769	51,571
24	69,171	24,210	44,961
25	69,825	24,439	45,386
26	73,099	25,585	47,515
27	70,074	24,526	45,548

Table 1: EST User Projection Table (Cont.)

#	ANNUAL TRAIL USER ESTIMATES	BICYCLISTS (35%)	PEDESTRIANS (65%)
28	68,072	23,825	44,247
29*	3,546	3,546	0
30*	3,509	3,509	0
31*	3,514	3,514	0
32*	3,594	3,594	0
33*	3,551	3,551	0
34*	3,534	3,534	0
35*	3,518	3,518	0
36*	3,535	3,535	0
37*	3,528	3,528	0
38*	3,573	3,573	0
39*	3,924	3,924	0
40*	3,657	3,657	0
41*	3,605	3,605	0
42*	3,719	3,719	0
43	104,681	36,638	68,042
44	113,550	39,742	73,807
45	110,094	38,533	71,561
46	69,392	24,287	45,105
47	75,054	26,269	48,785
48	69,382	24,284	45,098
49	68,433	23,951	44,481
50	69,319	24,262	45,058
51	68,066	23,823	44,243
52	68,978	24,142	44,835
53	78,485	27,470	51,015
54	71,211	24,924	46,287

* These sample points fall between the Town of Whitehall and the Canadian border



Table 1: EST User Projection Table (Cont.)

#	ANNUAL TRAIL USER ESTIMATES	BICYCLISTS (35%)	PEDESTRIANS (65%)
55	93,126	32,594	60,532
56	72,908	25,518	47,390
57	72,970	25,539	47,430
58	69,127	24,194	44,933
59	72,178	25,262	46,916
60	73,368	25,679	47,689
61	114,579	40,102	74,476
62	77,556	27,145	50,411
63	70,945	24,831	46,114
64	70,502	24,676	45,826
65	67,936	23,777	44,158
66	68,678	24,037	44,641
67	70,010	24,504	45,507
68	72,500	25,375	47,125
69	74,305	26,007	48,298
70	126,978	44,442	82,536
71	161,727	56,604	105,123
72	78,426	27,449	50,977
73	70,948	24,832	46,116
74	70,565	24,698	45,867
75	69,641	24,374	45,266
76	70,793	24,777	46,015
77	70,719	24,752	45,967
78	83,597	29,259	54,338
79	82,464	28,862	53,601
80	126,434	44,252	82,182
81	264,462	92,562	171,900

Table 2: EST User Projection Summary Table

TOTAL ESTIMATES	
TOTAL BIKES	3,060,093
TOTAL PEDESTRIANS	5,589,607
TOTAL TRAIL USE	8,649,700

DETAILED METHODOLOGY

POPULATION DENSITY

Population densities within a three mile radius of each existing trail count locations were calculated using the following steps:

- 1. Map 54 existing trail count locations conducted by Parks and Trails New York (PTNY) across Upstate New York.** These trail counts were taken from Tables 16 and 17 of the 2017 Who's on the Trail report and the 2016 Capital District Multi-Use Trail User Counts interactive map, both of which were produced by PTNY.
- 2. Input the population and area of all block groups within 3 miles of each existing count location.** Select and extract all block groups that fall within a 3-mile radius of each existing count location. Join American Community Survey (ACS) 2016 5-Year Estimate Total Population data to all block groups (POP). Calculate area of each block group (SQMI).
- 3. Determine the population density for each individual existing count location.** Select all block groups that are within 3 miles of each individual count location. Take the sum of the population (POP_SUM) and sum of the area (SQMI_SUM). Use these values to determine the unique population densities (POP_DEN) associated with each individual existing count location by dividing the sum of the population by the sum of the area ($POP_DEN = [POP_SUM] / [SQMI_SUM]$).

Population densities within a three mile radius of locations along the proposed EST were calculated using the following steps:

- 1. Map 81 sample points along the proposed EST.** Due to the scale of the EST and the assumptions made about trail use, 81 sample points were placed along the trail route. Trail count estimates were calculated at each of these points.
- 2. Input the population and area of all block groups within 3 miles of each sample point.** Select and extract all block groups that fall within a 3-mile radius of each sample point. Join ACS 2016 5-Year Estimate Total Population data to all block groups (POP). Calculate area of each block group (SQMI).
- 3. Determine the population density for each individual EST sample point.** Select all block groups that are within 3 miles of each individual sample point. Take the sum of the population (POP_SUM) and sum of the area (SQMI_SUM). Use these values to determine the unique population densities (POP_DEN) associated with each individual sample count estimate location by dividing the sum of the population by the sum of the area ($POP_DEN = [POP_SUM] / [SQMI_SUM]$).



POPULATION DENSITY AND TRAIL USER PROJECTIONS

Each of the 54 annual trail counts and the corresponding population densities were plotted. As shown on the graph below, the count taken near the Walkway Over the Hudson, with 670,000 users, is an outlier. This point was removed from the final scatter plot and resulting trendline used to estimate trail users at each sample point along the EST route. This same methodology is commonly used in transportation engineering for trip and parking generation estimates.

Population densities at each of the 81 points along the EST were then entered into the equation ($y = 34.725x + 66500$; where x is population density and y is annual trail users). The resulting annual trail user estimates are shown in Table 1, column 2.

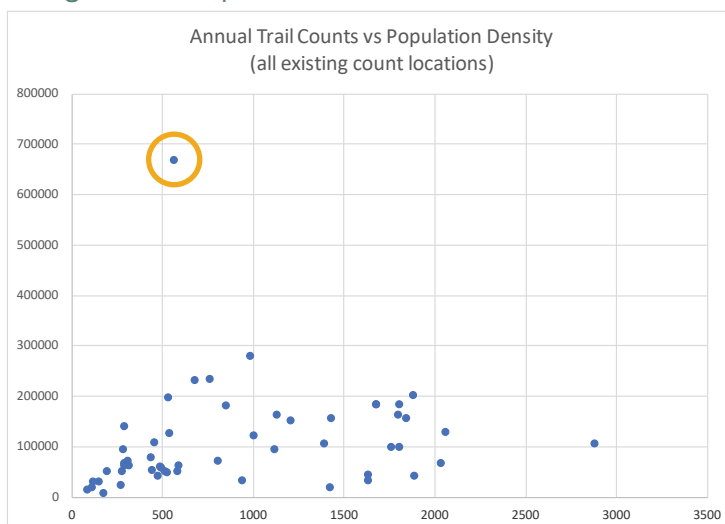
MODE SHARE PROJECTION

Each sample point for annual user projections was adjusted to project the total number of trail users by user type along the EST. Data collected by PTNY and others along the Erie Canalway Trail since 2005 have shown variability in the mode share between these two groups but on average, this split is typically 65% pedestrians and 35% bicyclists. This mode share split was used for the EST.

Annual Bicyclists: Annual Trail User Projection * 35%

Annual Pedestrians: Annual Trail User Projection * 65%

Figure 2: Graph of All Trail User Count Locations



LIMITATIONS

ON-ROAD ESTIMATES

The annual user projections in this report currently assumes the EST is entirely comprised of an off-road trail. At various locations along the 750 miles, where physical constraints preclude creation of an off-road trail, sections of the EST will be designated within the right-of-way of public roadways. It is anticipated that usage will be much lower for on-road sections. The majority of on-road use will be from experienced bicyclists comfortable riding on road shoulders and for those users that are traveling on roads that connect off-road sections (most pedestrians will use off-road sections). The estimates in areas with significant on-road segments were calculated using the same formula as the off-road trail segments, as there is no readily available standard guidance for extrapolating the number of potential on-road route users based on the number of potential off-road trail users. For example, research on the subject did not reveal any standard “rules of thumb” to assume a certain percentage of potential off-road trail users will also utilize on-road facilities.

Sample points which cover an area that is mostly or entirely comprised of on-road routes include points 14 through 17, 23 through 42, and 55. Extra care should be taken when considering the trail use estimates provided at these locations.

HIGH POPULATION DENSITIES

Areas with high population densities, such as New York City, Buffalo, and Rochester, are more difficult to predict. The scatter plot in Figure 1 shows that, as population densities rise, there is a larger variance in trail counts from the trendline when compared to trail counts at areas of lower population density. Therefore, care should be taken when considering the trail use estimates derived from the trendline formula for areas with high population densities.

PEDESTRIAN PROJECTION GAP

It is common for annual trail user estimates to be created by adding annual counts or annual count estimates together at intervals along a trail. The fault with this common methodology is that the estimates will either duplicate trail users if count locations are too close together or leave out trail users if count locations are too far apart.

Due to the spacing of the eighty-one (81) sample points and the assumption that bicyclists will travel 10 miles on average (5 miles out and 5 miles back), we do not assume a projection gap for the number of bicyclists. Pedestrians, however, are assumed to travel an average of 4 miles (2 miles out and 2 miles back). Due to the fact that the spacing between sample points is greater than 4 miles, it is possible the analysis does not take into account some pedestrians that may use the trail only between sample points.

However, since the number of pedestrian users may be underestimated as a result of the pedestrian projection gap limitation and the number of bicyclists are overestimated due to the on-road estimates limitation, it is assumed that the overall trail user estimate projection for number of total users is appropriately balanced.



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