Buffalo Valley Rail Trail 2012 User Survey and Economic Impact Analysis

Researched and written by
Buffalo Valley Rail Trail Research Team at Bucknell University

Dr. Michelle Oswald Beiler
Assistant Professor of Civil and Environmental Engineering

Dr. Thomas Kinnaman
Professor of Economics

Kelly Burkhart
Class of 2014, Civil and Environmental Engineering

Mike Nicholson
Class of 2014, Economics

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Executive Summary

The Buffalo Valley Rail Trail (BVRT) in Union County, Pennsylvania opened in early November 2011 and spans 9.2 miles between Mifflinburg, PA and Lewisburg, PA. This study, commissioned by the Planning Department of Union County in Pennsylvania, estimates trail usage and economic impact during the trail's first year of use.

This study estimates user demand, user characteristics, the economic impacts of the trail, the value to trail users, and user support for a proposed trail extension. In order to gather this information, a methodology was adopted that includes three data collection techniques: automatic infrared counters, manual counts, and a user survey.

Results suggest 1,136 distinct users visited the trail an estimated 12,026.7 times in the month of June 2012. Annually, it is estimated that just over 100,000 trips are made on the BVRT. Based on the survey results, the average trail user is approximately 48.8 years old and visits the trail about 10.59 times per month. The average user traveled about 5 miles to access the trail and spent an average of 86.85 minutes per visit.

The direct economic impacts of the trail result from recreational purchases of an estimated $280,635 annually. This direct spending increases local incomes which, when spent again via the spending multiplier, are responsible for indirect and induced spending of an estimated $477,080 per year in the Susquehanna Valley and $589,334 per year in the Commonwealth of Pennsylvania.

The economic benefit, or value, to the average trail users from the existence of the trail is estimated via demand analysis at $1,357.81 per year. Alternatively, the Contingent Valuation Method estimates the value to trail users (willingness to pay) at $849.49 per user per year. In terms of the proposed trail extension, the total willingness-to-pay by all users for a proposed trail extension is estimated at $926,984.

This study serves as the basis for identifying the demand and economic impacts of the BVRT during its first year of use, and may facilitate the monitoring of changes over time.

Table of Contents

I. Historic Perspective

The Buffalo Valley Rail Trail (BVRT) is built on the right-of-way of what was originally the Centre & Spruce Creek Railroad in 1853, which ran from Montandon, PA to Tyrone, PA. In 1879, the line was renamed the Lewisburg & Tyrone Railroad Co. and was in operation until 1982 as the emerging international highway system slowly led to a decline in rail demand. The next year, the tracks east of Mifflinburg were acquired by the West Shore Railroad Co., and the line operated until 1997.

In 2009, the Lewisburg Area Recreation Authority (LARA) acquired the right of way from the West Shore Railroad for the rail line from Mifflinburg to Montandon. Construction of the initial portion of the trail began in the spring of 2011 and currently consists of 9.2 miles of finished trail, trailheads, facilities, and parking areas in Mifflinburg, Lewisburg, and Vicksburg. The trail opened to the public in early November 2011. The trail begins near the community park on 8th Street in Mifflinburg and ends at 12th Street in East Buffalo Township. The trail does not yet extend into downtown Lewisburg due to the obstacle created by the heavily traveled Route 15 which separates downtown Lewisburg from the trail. Instead, trail users are advised to cross Route 15 at the intersection of Route 15 and Route 45 (Market Street).

II. Location Analysis

The Buffalo Valley Rail Trail (BVRT) runs 9.2 miles in a northeast direction from the town of Mifflinburg to the town of Lewisburg in Union County, Pennsylvania. The trail runs parallel to PA Route 45 on a flat, straight path, crossing many small roads along the way.

The trail provides users access to places to dine and shop. It starts on 8th Street in Mifflinburg (extending to 10th Street to link to the industrial park), passing through residential areas, the Mifflinburg Community Park and pool, and many small and large businesses. Between Mifflinburg and Lewisburg the trail passes a few small businesses and cuts through the small village of Vicksburg. Most of the route passes through farmland. Currently, the trail ends at 12th Street in a residential area of Lewisburg and is separated from downtown Lewisburg by the heavily traveled U.S. Route 15.

The BVRT has three trailheads which provide parking, restrooms, and signs with trail regulations and information for trail users. These trailheads are located at the start of the trail in Mifflinburg, in Vicksburg, and at the end of the trail in Lewisburg. A map of the BVRT appears in Figure 1 and displays the trail alignment from Mifflinburg to Lewisburg, parking areas, and restrooms.

Buffalo Valley Rail Trail Map

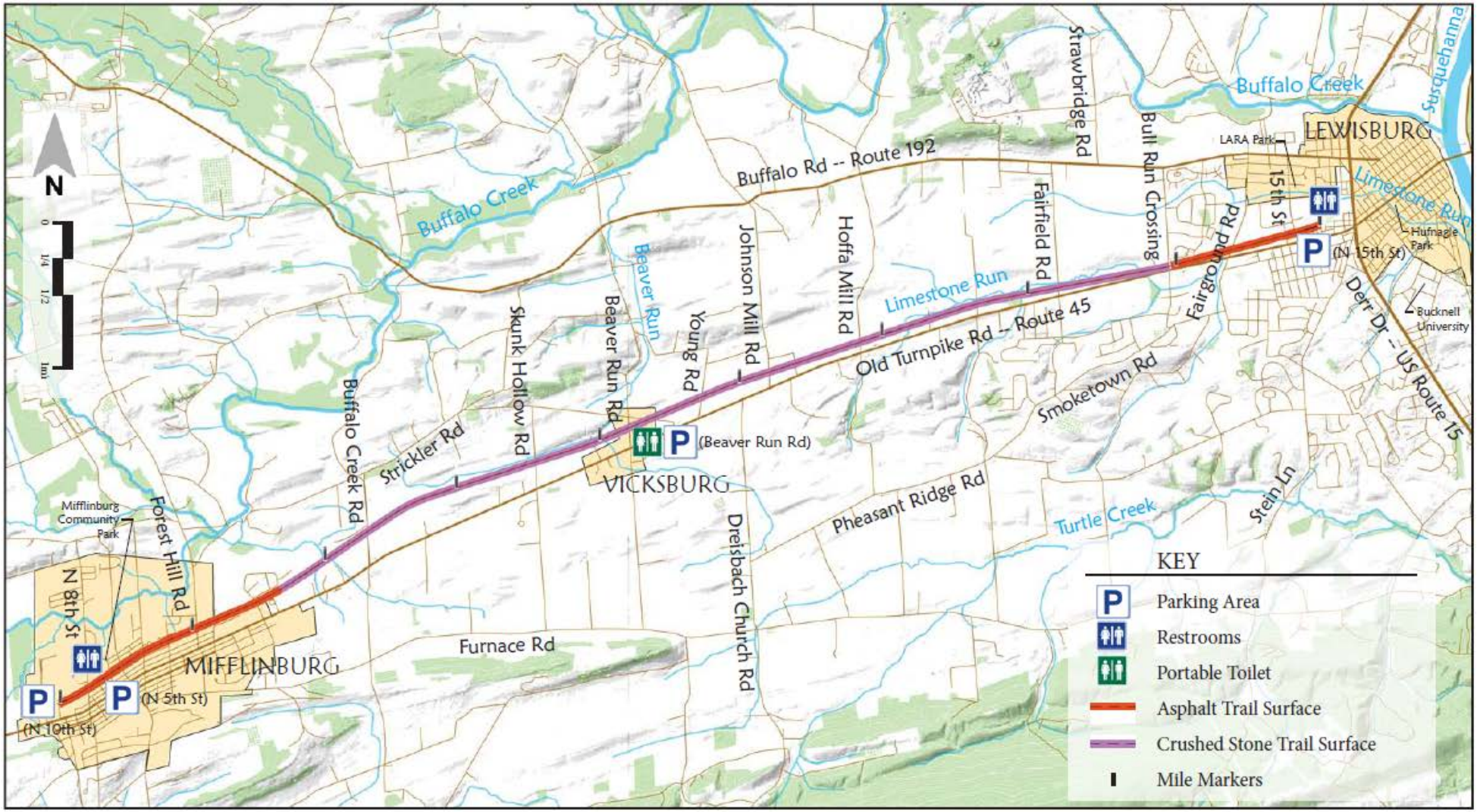

Figure 1: Map of BVRT from Mifflinburg to Lewisburg [1]

III. Buffalo Valley Rail Trail Area Demographics

The Buffalo Valley Rail Trail runs through the Borough of Mifflinburg as well as the village of Vicksburg in Union County, PA. In addition, it crosses three townships: East Buffalo, Buffalo, and West Buffalo. Currently, the Borough of Lewisburg supports the trail and is financial partners with East Buffalo Township in the possible extension of the trail into downtown Lewisburg. The demographics for the Lewisburg Borough, Mifflinburg Borough and the village of Vicksburg, collected from the 2010 United States Census [2], are shown in Table 1 below. Demographic information for Union County, Pennsylvania and the United States as a whole are also shown for comparison.

Table 1 BVRT Demographic Summary (source data from [2] and [3])

2010 U.S. Census Data	**Lewisburg**	**Mifflinburg**	**Vicksburg**	**Union County**	**PA**	**US**
Population [2]	5,792	3,540	261	44,949	12,702,379	308,745,538
Median Age [3]	22.8	41.4	39.1	38.5	40.1	37.2
Median Household Income [2]	$32,934	$42,692	$44,464	$45,474	$50,398	$51,914
Households [2]	2,013	1,554	89	14,963	4,940,581	114,235,996
Persons per household [2]	1.9	2.28	3.23	2.34	2.47	2.59

It should be noted that the Lewisburg data refers to the Borough population and does not include the population of East Buffalo Township, where the first trailhead is located. To provide a more holistic view of the contributing demographics, the township population data [2] is as follows:

- East Buffalo Township- 6,414
- Buffalo Township-3,538
- West Buffalo Township- 2,983

The demographic data is useful for the analysis of user characteristics and economic impact.

IV. Methodology

The methodology used for this study was developed based on methods used in previous rail trail studies, conducted both within Pennsylvania as well as throughout the country. Components of the previous studies were used and a method, specific to the needs of this study on the BVRT, was developed. A flow chart of this method is shown in Figure 2. The method includes four main steps: defining the study area, collecting data, analyzing data, and summarizing the results.

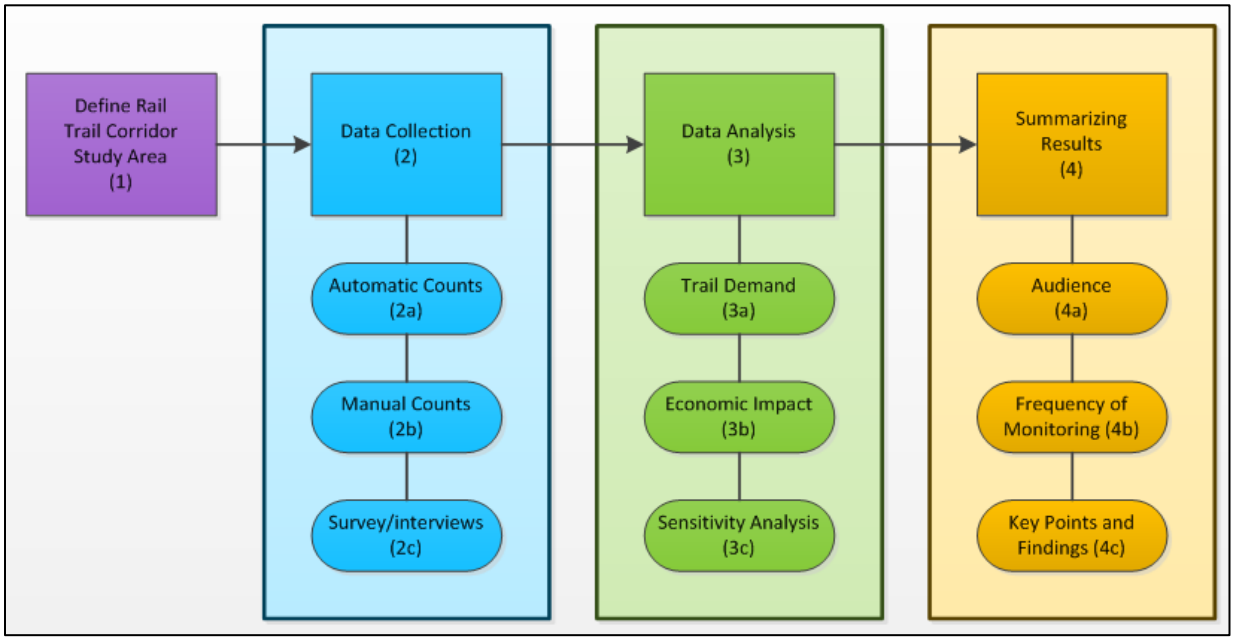

Figure 2: Research Methodology Framework

Three secondary steps were used for the data collection process: automatic counts, manual counts, and surveys/interviews. These secondary steps are described in detail below.

Automatic Counts

Four TRAFx [4] infrared trail counters were placed along the trail to collect travel demand data. When a trail user passes by the counter, it records the time and date of the event. Each counter was secured in a lock box and placed on a mile post. The four counters were placed throughout the trail at the following locations (Figure 3):

- 1.0 mile marker near Forest Hill Road in Mifflinburg
- 4.0 mile marker near Beaver Run Road in Vicksburg
- 6.0 mile marker near Hoffa Mill Road in Lewisburg
- 8.5 mile marker near Fairground Road in Lewisburg

The counters were left in the field for approximately 40 days, from June 1 to July 11.

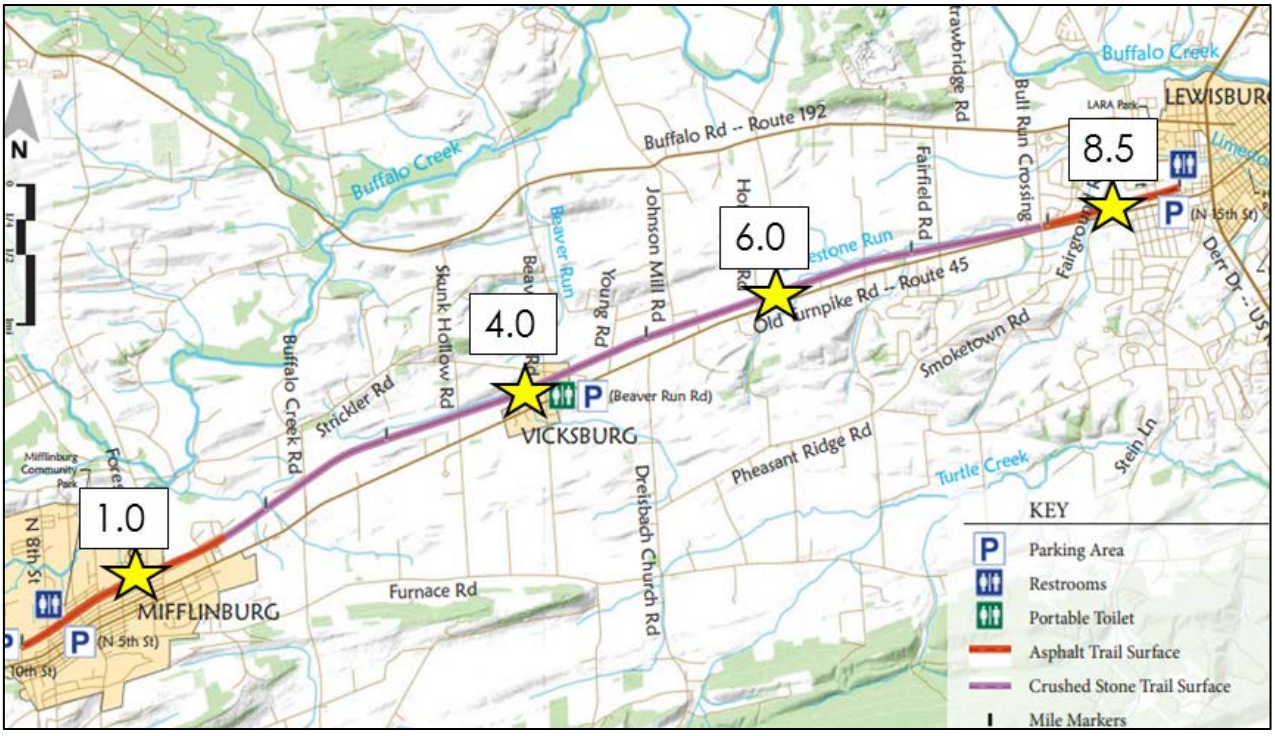

Figure 3: Automatic Counter Locations (source data [1])

Manual Counts

Manual counts were completed at the 1.0 and 8.5 mile markers, which have relatively high trail traffic due to their proximity to the more populated areas of Mifflinburg and Lewisburg, respectively. Manual counts were done at both mile markers on three different occasions: a weekday morning, a weekday evening, and a weekend afternoon. These times were chosen based on preliminary automatic count data collected in April of 2012 that found these three times to be the peak hours of use. Counts were done for two hours. The number of people using the trail was recorded, along with each user's gender, activity, approximate age, and the number of accompanying children. The total count on the automatic infrared trail counter was recorded, both at the start and end times, to compare the result to the actual count.

Surveys

The survey used in this study was developed using a template for rural rail trails from the Rails-to-Trails Conservancy's "Trail User Survey Workbook" [5], as well as from a survey used in the previous economics literature (Bowker et al., 2007). [6]. These previously developed surveys were adapted for use in this study.

The survey is comprised of a screener survey and an interview. The screener survey was completed by the surveyor who simply observed the gender, trail activity, age range, and number of children traveling with the trail user. The second portion of the survey was conducted in interview format, in which questions were asked and responses were

recorded by the surveyor. The questions aimed to determine locality, trail use habits, trail-related spending, and supportiveness for the trail and its proposed extension.

Five of the twenty questions were economic oriented. Three of these questions focused on trail-related expenditures and the other two questions were used to determine users' willingness-to-pay to first access and then expand the trail. The willingness-to pay-questions were phrased as whether the user would accept or reject a hypothetical tax increase at various increments to support the trail. The willingness-to-pay approach is a common method to determine the economic benefits of a public good.

Surveys were conducted over multiple days in July of 2012, spanning approximately two weeks. Surveying times included the same peak times as the manual counts (weekday mornings, weekday evenings, and weekend afternoons) and lasted two hours per collection period. The survey station was set up for an equal number of days at the Lewisburg trailhead and the Mifflinburg trailhead. Every person who passed the survey station was asked to participate.

V. Survey Results

100 surveys were completed, 50 at the Lewisburg trailhead and 50 at the Mifflinburg trailhead. A summary of survey responses is shown below. Not all questions were asked to every user due to follow-up questions being based on previous answers. Therefore, the percentages are based on the number of people who answered the questions and not the total number of surveys completed. A full copy of the survey can be found in Appendix A.

The response rate was 75%. To determine whether the likelihood of responding was linked to any observable characteristics, the survey team recorded observable characteristics of all users that chose not to participate in the survey. Results, summarized in Table 2, suggest that non-responders were more likely to be male, between the ages of 31 and 60, and less likely to be joined by children.

Table 2 Responders vs. Non Responders

Characteristic	Responders	Non-Responders
Female	40%	53%
Biking	67%	65%
Walking	30%	29%
Jogging	3%	6%
Age 18-30	12%	6%
Age: 31-60	31%	82%
Age: 60+	57%	12%
Children	14%	0%

Survey Results

1. Originating zip code of trail user

Vicksburg (17883)	0
Mifflinburg (17844)	29%
Lewisburg (17837)	28%
Other	43%

2. On average, how often do you use the trail?

Daily	19%
3-5 times/week	17%
1-2 times/week	30%
2-4 times/month	11%
Once a month	2%
A few times a year	11%
First time	10%

3. What is your usual activity?

Biking	70%
Walking	25%
Jogging	5%
Other	0

4. When do you usually use the trail?

Weekdays	28%
Weekends	20%
Both	52%

5. Generally, how long do you spend on the trail per visit?

Less than 30 minutes	6%
30 min. – 1 hour	33%
1 – 2 hours	34%
2+ hours	27%

6. Generally, where do you access the trail?

Lewisburg Trailhead	49%
Mifflinburg Park Trailhead	23%
Other	28%

7. Do you typically exit at the same place that you access the trail?

Yes	91%
No	9%

8. How did you get to the trail today?

Car (drove)	52%
Bike	30%
Walk	15%

9. [Discussed in economics section]

10. What is the primary purpose of your visit to the area?

School	0
Work	8%
Shopping	3%
Trail	67%
Visiting friends/family	22%
Other	0

11. Does your visit to the area involve an overnight stay?

No	79%
Yes	
Hotel	8%
Bed & Breakfast	0
Friend/family	13%
Campground	0
Other	0

12. [Discussed in economics section]

13. [Discussed in economics section]

14. How did you find out about the trail?

Internet	2%
Friend/family	23%
Advertisement	2%
Road signs	1%
Newspaper	21%
Tourist/visitor information	2%
Saw it	7%
Local (don't remember)	37%
Other	5%

15. Has the use and/or existence of the trail influenced your spending on any recreational goods in the Susquehanna Valley Area?

No	58%
Yes	
Clothing	7%
Footwear	1%
Bike purchase/rental	24%
Bike accessories	11%
Car accessories (bike rack, etc.)	3%

16. [Discussed in economics section]

17. During your most recent use of the trail, or past use, did you make any stops to establishments near the trail?

No	45%
Yes	
Community pool/park	4%
Farmers Market	5%
Purple Cow	12%
Amy's Tasty Freeze	11%
Health Food Store	4%
Mifflinburg Sheetz	8%
Mifflinburg Weis	7%
Vargo	5%
Other	24%

18. [Discussed in economics section]

19. [Discussed in economics section]

20. Any other comments or suggestions?

Some common suggestions:

Control Weeds	3%
Pick up after dogs	3%
Pick up litter	4%
More benches	5%

A full list of zip codes, establishments visited while using the trail, and other comments and suggestions from the surveys can be found in Appendix B.

VI. Trail Demand and Usage

Trail demand and usage was determined by analyzing the results from all three components of the data collection process: automatic counts, manual counts, and surveys.

Automatic and Manual Count Results

The TRAFx infrared automatic counters were placed along the trail from June 1, 2012 to July 11, 2012. At the end of this period, the data was downloaded and analyzed using TRAFx's DataNet software program [4]. In order to improve accuracy of the automatic results, three adjustments were applied to the raw data. These three adjustments correct for automatic counter error, two-way trips, and seasonal changes in trail use.

Correcting for Automatic Infrared Counter Error

The data collected during the manual counts was used to correct for error in the automatic counters. The main cause of discrepancy between the number of users recorded by the automatic counters and the actual number of users is due to people traveling side-by-side or in groups. When users travel close together, the infrared sensors count only one user as opposed to many individual travelers. The error determined during the manual counts was calculated and then applied to all of the automatic count data. The calculations for this adjustment factor can be found in Appendix C.

Adjusting Data for Two-way Trips

The two-way trip adjustment factor accounts for trail users who pass the same counter twice in one trip; once heading to their destination and once coming back. This is accounted for simply by dividing the automatic counts by two. This approximation is frustrated by the fact that some users take only one-way trips, an issue that is considered below.

The two-way trip adjustment factor and the error adjustment factor were applied to the automatic count data in DataNet before being analyzed. Figure 4 (on the next page) shows a graph of daily counts for each of the counters compared to a graph summarizing the weather that was recorded during the study. As shown, there is an inverse correlation between the graphs as the high temperature days/rain events resulted in lower daily counts.

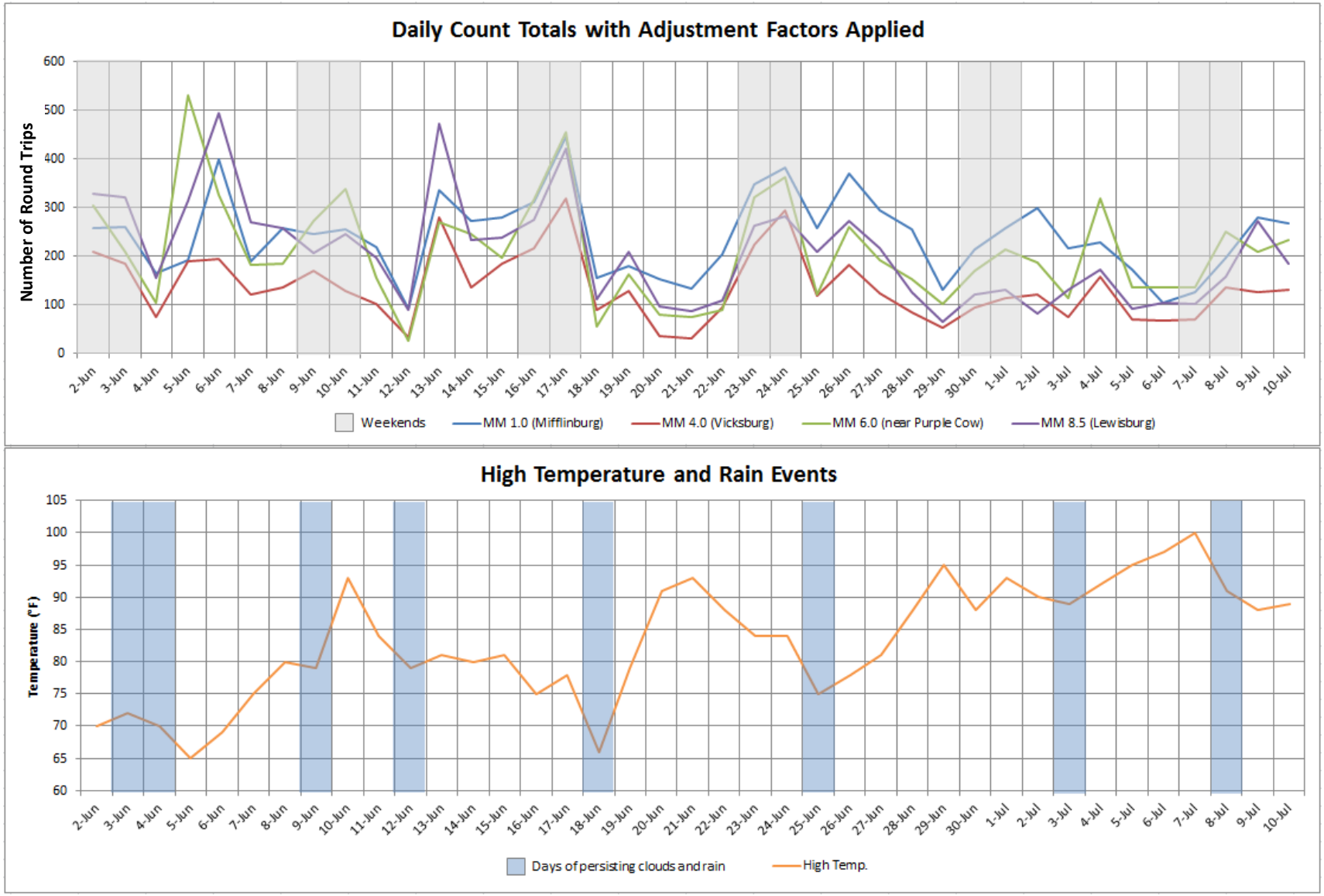

Figure 4: Daily counts for all four counters and summary of weather.

Figure 5 shows the average number of round trips for each day of the week during the time of the study. Wednesday, Saturday, and Sunday have the highest average number of trail users for all four counter locations.

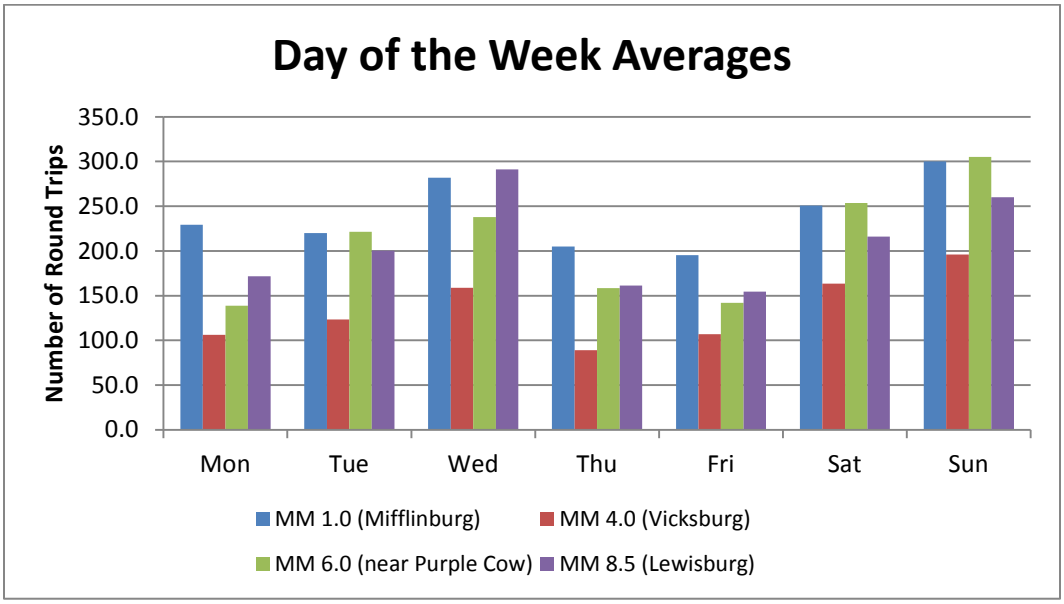

Figure 5: Averages for each day of the week for each counter.

Figure 6 shows the average number of round trips on the trail during each daylight hour at the four counter locations. The morning peak hour is about 10 AM for the MM 1.0 and MM 8.5 counters and 11 AM for the MM 4.0 and MM 6.0 counters. The afternoon peak hour is about 7 PM for all counters.

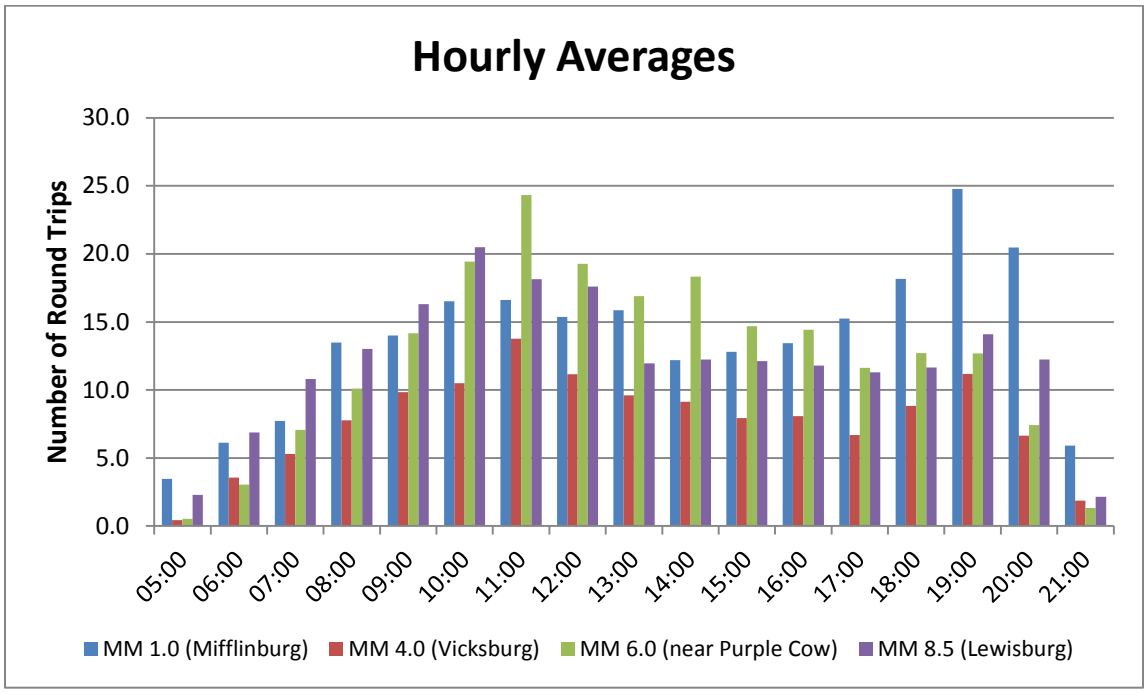

Figure 6: Averages for daylight hours for each counter.

Estimating Seasonal Changes in Use

Because this study spanned the months of June and July, the count data is only accurate for estimating the summer use of the trail. In order to estimate the total use of the trail in a year, seasonal forecasts need to be applied based upon the existing data. The seasonal forecasts used for this study are based on The National Bicycle and Pedestrian Documentation (NBPD) Project data [7]. The monthly adjustment factors for a region with a long winter and short summer were used to estimate the number of trail users each month based on the number of trail users in June.

The raw data (with two-way and error adjustments applied) is summarized by DataNet in Table 4 below. DataNet uses the existing data to estimate an Average Annual Daily Traffic (AADT) value [4]. However, this value does not account for seasonal changes over an entire year. Therefore, seasonal adjustment factors are applied.

Table 4: Automatic count data summary from DataNet

Site	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	AADT
MM 1.0	-	-	-	-	-	*7,508*	*6,671*	-	-	-	-	-	241.3
MM 4.0	-	-	-	-	-	*4,385*	*3,317*	-	-	-	-	-	136.1
MM 6.0	-	-	-	-	-	*6,484*	*5,999*	-	-	-	-	-	210.3
MM 8.5	-	-	-	-	-	*6,924*	*4,430*	-	-	-	-	-	208.3

Table 5 shows estimates of monthly trail usage based on June trail usage. These numbers were calculated using the NBPD Project's adjustments and account for changes in trail use from month to month. The calculations and detailed explanation for these adjustments can be found in Appendix C. It should be noted that these numbers do not account for the fact that some people pass more than one counter per trip and some people don't pass any of the counters.

Table 5: Estimates of monthly and yearly trail uses based on seasonal adjustments.

Site	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Yearly Total	AADT
MM 1.0	1877	1877	4380	6883	6883	7508	8134	8760	6883	3754	3754	1877	62570	171
MM 4.0	1096	1096	2558	4020	4020	4385	4751	5116	4020	2193	2193	1096	36544	100
MM 6.0	1621	1621	3782	5944	5944	6484	7024	7565	5944	3242	3242	1621	54034	148
MM 8.5	1731	1731	4039	6347	6347	6924	7501	8078	6347	3462	3462	1731	57700	158

User Demand Based on Survey Results

Visits to the four mile posts were estimated above, to estimate the number of visits to the trail as a whole, the raw counts must be adjusted to reflect both round-trip users and the possibility that users may pass more than one counter during their trip. Above, the raw counts from each sensor were simply divided by two to estimate the number of visits to each section of the trail. Of course, some users could have passed more than

one sensor. In this section, survey responses are used to estimate the number of total visits to the trail as a whole.

Assume first that every visitor passes the sensor at either the mile marker at 1.0 or mile marker 8.5 at least once. Surveys identify the method of trail use (biking, walking, or jogging), and the average time spent on the trail. Using plausible assumptions about the number of miles each visitor can cover with each mode of transportation, it is estimated that the visitor passed the sensor at either mile marker 1.0 or 8.5 an average of 2.4 times. Thus, the sum of the count data at these two sensors for the month of June (without the two-way factor) can be divided by 2.4 to estimate that a total of 12,026.7 distinct trips were made to the trail during the month of June 2012. On average, slightly over 400 trips were made per day or 2,800 trips per week. Trail visitors entering the trail at some mid-point and never passing one of these two mile markers are not included in this estimation. A detailed explanation of these calculations appears in Appendix C.

Using the National Bike and Pedestrian Documentation Project's seasonal count adjustment factors described above [7], annual usage can be forecasted based on the estimated June visits. Annually, it is estimated that approximately 100,000 trips will be taken on the BVRT. For comparison, the Virginia Creeper Rail Trail, a 34 mile rail trail located in Southwestern Virginia, has just over 130,000 visitors annually [6]. The 26 mile Heritage Trail in Eastern Iowa attracts 134,000 users annually [8].

To determine the number of distinct individual visitors to the trail, 12,026.7 (the total number of visits) was divided by 10.59 (the average number of times a user visits the trail each month as identified by Question #2 the survey). Results suggest approximately 1,136 distinct users visited the trail during the month of June. This figure is the estimated monthly population of trail users.

VII. Economic Impact

Direct Impacts

Economic impacts can be estimated by determining how much trail users spent on trail related expenditures. This total spending was divided into two categories, recreational spending and trail spending.

Recreational spending is defined as spending on any recreational goods influenced by the existence of the trail (bikes, bike accessories, clothing, etc.). In the survey, the user was asked to give an approximation of their trail-influenced recreational spending in the past year. Results suggest the average user spent approximately $238.61 on recreational goods in the past year. As derived in Appendix D, all trail users are estimated to have spent $214,765 per year on recreational goods.

Trail spending is considered any spending made on stops along the trail. Users reported accessing supermarkets, fast food restaurants, bars, ice cream shops, parks, pools and many other locations during their visit to the BVRT. Like recreational spending, the survey asked the respondent to approximate the amount spent on stops made along the trail in the past year. The average user reported $93.30 of trail influenced spending in the past year. Using calculations detailed in Appendix D, the average user is estimated to have spent approximately $0.66 along the trail per trip to the BVRT. Given the number of trail users, an estimated $66,149 is spent annually on stops along the BVRT, bringing the total direct economic impact to $280,635. Calculations for these figures can be found in Appendix D.

Indirect Impacts

Indirect economic impacts can be calculated using known multipliers. The concept behind indirect impacts is that any initial spending has a ripple effect throughout the broad economy. In the 2010 paper, “The Economic Impact of Bucknell University on the State of Pennsylvania and the Six-County Region”, Dr. Matthew C. Rousu suggests that the economic benefit multipliers for the area and state are 1.7 and 2.1, respectively [9].

Using these multipliers, it can be estimated that the BVRT stimulates the economy of the Six-County region (Union, Columbia, Lycoming, Montour, Northumberland, and Snyder) by adding an additional $477,080 of spending. It can also be estimated that the BVRT adds $589,334 of spending to the state of Pennsylvania.

VIII. Economic Benefits

Benefits to Trail Users – Demand Estimation

The survey indicates that non first-use visitors enjoy the trail 11.77 times each month. Of interest is determining what factors might cause some experienced users to spend more time on the trail than other experienced users – essentially estimating the demand for the trail. Using linear regression techniques, the visits per month was regressed on several other variables. The full regression results are available in Appendix C.

The gender of the user, the age of the user, the number of children with the user, and the fact that a user was on a bike rather than on foot had no statistical effect on trail demand. The only statistically significant variable in the regression was the distance traveled to access the trail. As expected, the further someone needs to travel to reach the trail, the fewer total visits are made to the trail. Specifically, each mile of distance causes the number of monthly visits to decrease by 0.22. A user traveling 50 miles to access the trail is estimated to make 1.10 fewer visits per month than a user living adjacent to the trail. Distance, though statistically significant, does not appreciably affect trail use. Demand is therefore price inelastic. Since travel cost is the only cost incurred by users of the BVRT, and by assuming travel costs amount to 50 cents per mile, then this result suggests that a $1 increase in the cost of accessing the trail reduces visits by 0.44 per month.

Consumer surplus accrues to users of the trail that do not need to travel far distances to access the trail. These benefits to users can be calculated by estimating the difference between the maximum amount a typical user would be willing to pay to access the trail and the actual amount paid by a local user. Using the demand parameters estimated above, the consumer surplus accruing to the trail user traveling 5 miles to access the trail (the sample average) are estimated at $1,357.81 per year. This estimate, detailed in Appendix C, assumes that the maximum willingness to pay by users to access the trail is $15. In other words, the trail does not provide benefits to potential users located more than 30 miles from the trail – the maximum distance observed in the survey sample.

Benefits to Trail Users – Willingness-to-Pay

The benefits to the users of the BVRT can also be estimated using the Contingent Valuation Method (CVM). Use benefits are estimated using a survey question that asks the user whether they would be willing to pay a hypothetical amount to access the trail. Since the practical implantation of an access fee to a bike trail is impossible, this question is phrased as a proposed annual tax increase of varying amounts ($1, $10, $100, $1,000). The user is given the option to either accept or reject each value. The one downfall of this method is that some users may be willing to pay these access fees, but are not in favor of tax increases of any kind.

Using econometric calculations that can be seen in more detail in Appendix E, the willingness-to-pay annually for this access is $849.49 per user. By multiplying this by the number of distinct users estimated above, the willingness-to-pay for an access fee to the BVRT is estimated to be $965,870. It is assumed that non-users of the trail place no value on access to the trail. This estimate is derived in Appendix E.

Willingness-to-Pay for a Proposed Trail Extension

To determine the willingness-to-pay by users for a proposed trail extension, the survey contained a question of a proposed hypothetical tax increase to fund the extension. Increase values of $1, $10, $100 and $1,000 were provided, and users were asked to either accept or reject each value. Again, there is some bias shown in that some users may be willing to pay these amounts, but are against any tax increase.

Using econometric calculations that can be seen in more detail in Appendix E, the willingness-to-pay for this extension is $815.29 per user. By multiplying this by the number of distinct users, the willingness-to-pay for the extension of the BVRT is $926,984. This amounts to the total willingness-to-pay for the extension. It is assumed that all non-users would not be willing to pay anything for the extension. This may lead to undervaluation of the extension because those living in the areas where the extension is located may become new users of the trail.

IX. Conclusion

The Buffalo Valley Rail Trail study was conducted between June and July 2012 with the purpose of identifying information and trends on travel demand and economic impact. The study included automatic infrared counts, manual counts and survey/interviews to gather data during the first summer of the trail being accessible to the public.

Travel demand results showed that in the month of June 2012, an estimated 12,026.7 visits were taken to the trail, by approximately 1,136 distinct visitors. This averages just over 400 visits a day. Annually, it can be estimated that just over 100,000 trips will be made on the BVRT. Based on the survey results, the average trail user is approximately 48.8 years old, and visits the trail about 10.59 times per month. The average distance traveled to the trail is about 5 miles, and the average time spent on the trail per visit is about 86.85 minutes.

In terms of economic impacts, the direct economic impact of the trail, including recreational purchases is $280,635 annually. Indirectly, it can be estimated that the trail adds $477,080 of economic output to the Six-County Region and $589,334 to the state of Pennsylvania annually. The economic benefit, or value, to users of the current trail is estimated at $1,357.81 (consumer surplus method based on demand analysis) or $965,870 (Contingent Valuation Method). In terms of the proposed trail extension, the willingness-to-pay by total users is $926,984.

Overall, this study provides insight into the BVRT demand as well as support for future funding. The BVRT will be monitored in order to determine trends and projections annually as well as to make comparisons over time.

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Appendix A - Survey

Part I: Screener

A. Gender
    a. Male
    b. Female
B. Activity
    a. Biking
    b. Walking
    c. Jogging
    d. Other _____
C. Age Range
    a. 18-30
    b. 31-60
    c. 61+
D. Traveling with Children?
    a. No
    b. If yes, how many?
        i. 1
        ii. 2
        iii. 3
        iv. 4+

Part II: Survey

1. What is your zip code?
    a. 17883 (Vicksburg)
    b. 17844 (Mifflinburg)
    c. 17837 (Lewisburg)
    d. Other _____
2. On average, how often do you use the trail?
    a. Daily or almost daily
    b. 3-5 Times a week
    c. 1-2 Times a week
    d. 2-4 Times a month
    e. Once a month
    f. A few times a year
    g. First time user
3. Is {user's current activity} your usual activity on the trail?
    a. Yes

   b. If no, what is?
      i. Biking
      ii. Walking
      iii. Jogging
      iv. Other _____
4. Generally, when during the week do you use the trail?
   a. Weekdays
   b. Weekends
   c. Both
5. Generally, how long do you spend on the trail per visit?
   a. Less than 30 minutes
   b. 30 minutes – 1 hour
   c. 1-2 hours
   d. 2+ hours
6. Generally, where do you access the trail? _____
7. Do you typically exit the trail at the same place you access it?
   a. Yes
   b. If no, where? _____
8. How did you get to the trail today?
   a. Car
   b. Bike
   c. Walk
9. Maintaining the trail for future users will require effort from local authorities. To help finance these efforts, would you be in favor of an annual tax increase of $_____ per year?
   a. Yes
   b. No

******If resident, skip to question 14******

10. What is the primary purpose of your visit to the Lewisburg/Mifflinburg Area?
    a. School
    b. Work
    c. Shopping
    d. Trail
    e. Visiting friends/family
    f. Other _____
11. Does your visit to the Lewisburg/Mifflinburg Area involve an overnight stay?
    a. No
    b. If yes, where are you staying?
       i. Hotel/Motel

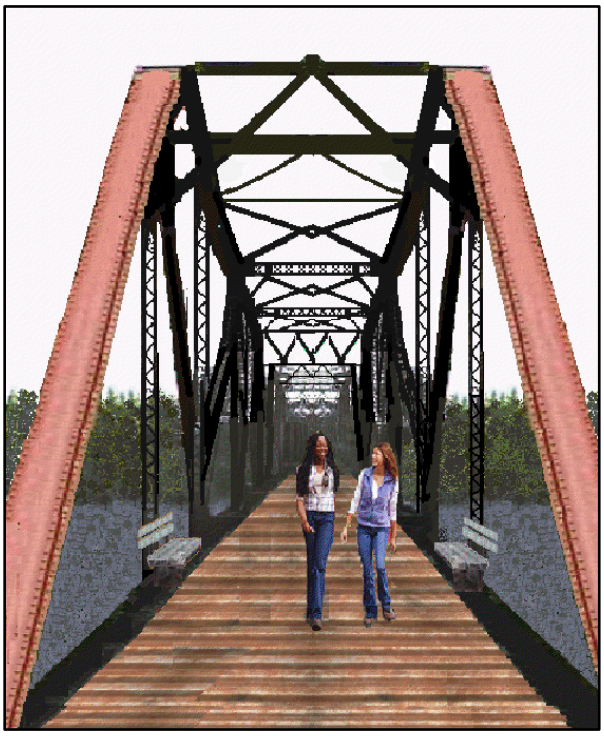
   ii. Bed and Breakfast
   iii. Friend or relative
   iv. Campground
   v. Other _____

12. **If yes to question 11:* How many nights are you staying in the area? _____
13. **If yes to question 11:* Approximately how much are you spending per night? $_____
14. How did you find out about the trail?
    a. Internet
    b. Friend or family member
    c. Public advertisement
    d. Roadside signage
    e. Newspaper
    f. Tourist/visitor info
    g. Saw it while driving/walking/biking
    h. Local (don't remember)
    i. Other _____
15. Has the use or existence of the trail influenced your spending on any recreational goods in the Susquehanna Valley area?
    a. No
    b. Yes
       i. Clothing
       ii. Footwear
       iii. Bicycle rental/purchase
       iv. Bicycle accessories
       v. Car accessories to transport bikes
       vi. Other _____
16. **If yes to question 15:* Approximately how much did you spend on the recreational goods? $_____
17. During your most recent use of the trail, or past use, did you make any stops to establishments near the trail?
    a. No
    b. Yes
       i. Downtown Lewisburg _____
       ii. Community Pool/Park _____
       iii. Union County Library
       iv. Lewisburg Farmers Market
       v. Purple Cow
       vi. Ards Farm

vii. Mifflinburg Sheetz
viii. Mifflinburg Weis
ix. Vargo
x. Other _____

18. **If yes to question 17:* Approximately, how much did you spend on any purchases made during these stops along the trail? $_____
19. Local authorities are currently considering extending the trail east, across Route 15, and through downtown Lewisburg to Northumberland County using the old railroad trestle bridge to cross the Susquehanna River. Here are some pictures that give an idea of how this extension may look:

Route of proposed extension.



Artist's rendering of revamped railroad bridge.

Crossing similar to idea for crossing Route 15.

After seeing these pictures, would be willing to pay an increase of $_____ in your annual property tax in order to pay for this extension?

a. Yes
b. No

20. Do you have any other suggestions or comments about the trail that have not already been addressed?

Appendix B – Additional Survey Responses

Question 1: What is your zip code?

Other – 43%

02472 Watertown, MA (1 response)
16038 Harrisville, PA (1)
16127 Grove City, PA (1)
17603 Lancaster, PA (1)
17701 Williamsport, PA (2)
17745 Lock Haven, PA (1)
17754 Montoursville, PA (1)
17756 Muncy, PA (2)
17777 Watsontown, PA (1)
17801 Sunbury, PA (1)
17821 Danville, PA (3)
17824 Elysburg, PA (3)
17827 Freeburg, PA (1)
17839 Lightstreet, PA (1)
17841 McClure, PA (1)
17842 Middleburg, PA (1)
17843 Beaver Springs, PA (1)
17847 Milton, PA (1)
17853 Mount Pleasant Mills, PA (1)
17855 Weikert, PA (1)
17856 New Columbia, PA (1)
17857 Northumberland, PA (4)
17870 Selinsgrove, PA (4)
17886 West Milton, PA (1)
17887 White Deer, PA (1)
17889 Winfield, PA (3)
17957 Muir, PA (1)
20685 Saint Leonard, MD (1)
21703 Frederick, MD (1)
72714 Bella Vista, AR (1)

Question 17: During your most recent use of the trail, or past use, did you make any stops to establishments near the trail?

Other – 24%

Mifflinburg CVS (4 responses)
Natural Food & Garden Store (4)
Downtown Lewisburg (3)
Union County Library (3)
Mifflinburg McDonald's (3)
Ard's Farm (2)
Various Mifflinburg restaurants (2)
Fogle Forest Products (1)
Sunoco (1)
Mifflinburg sub shop (1)
Twisted Bull (1)
Vicksburg Coffeehouse (1)
Yard sales (1)
Wenger's Grocery Outlet (1)

Question 20: Any other comments or suggestions?

"There are a lot of users, and it's safe recreation for biking."
"Motorists often stop when they don't have to, causing confusion and dangerous situations."
"Should hold volunteer cleanup events. Get local students and organizations involved like the Boy Scouts and Girl Scouts."
"I would love to the see the trail go longer."
"Great for the community."
"Great trail! I love it!"
"Needs better policing. Cars drive the wrong way and too fast through the Lewisburg trailhead parking lot."
"Great trail!"
"Wonderful trail!"
"Needs more benches. Possibly allow people to donate benches in memory of loved ones."
"Great addition to the community!"
"More maintenance is needed in the Mifflinburg bathrooms."
"It's really nice! Excellent trail."
"By far, best recreational thing in the area."
"I want to see the trail go as long as possible."
"More bathrooms and water fountains would be nice."
"It's a much safer option than using the road."
"There should be a white line down the middle of the trail."
"I occasionally see horses on the trail. They should put up more signs showing the rules."
"It's a huge draw to the area. We're strongly considering moving closer to the trail for our kids."
"I've been on a lot of different trails and this one really stands out. It's very nice."
"Using the trail has greatly enhanced my running ability!"
"Should hold fundraisers and community cleanups and get Bucknell and local schools involved in projects, maintenance, and cleanup."

Appendix C – Travel Demand Calculations

Calculating the infrared sensor error adjustment factor:

The infrared sensor error adjustment factor was calculated by dividing the actual number of people to pass the counter by the number recorded by the automatic counter. This was done for each manual count time and averaged for both locations as shown in Table C1. The average for the 8.5 location was applied to the data from the 8.5 automatic counter and the 1.0 average was applied to the 1.0 automatic counter. Because manual counts were not done at the other two counter locations, the total average factor was applied to the data from the 4.0 and 6.0 automatic counters. When entered into DataNet, these factors are multiplied by the existing raw data. The two-way trip adjustment factor was also applied, which divides the data by two.

Table C1 Adjustment factors to account for infrared sensor error.

Location	Time	Actual Count	Recorded Count	Factor
8.5	Morning	78	61	1.27869
8.5	Afternoon	79	47	1.68085
8.5	Evening	38	12	3.16667
			8.5 Average:	2.04207
1.0	Morning	56	24	2.33333
1.0	Afternoon	109	91	1.19780
1.0	Evening	33	19	1.73684
			1.0 Average:	1.75599
			Total Average:	1.89903

Applying seasonal adjustments:

The seasonal adjustment factors come directly from the National Bicycle and Pedestrian Documentation Project's extrapolation workbook [7]. The adjustment factors for a region with a long winter and short summer were used and are shown in Table C2 below.

Table C2 NBPD Monthly Adjustment Factors

Month	Factor	Month	Factor	Month	Factor
Jan	3%	*May*	11%	*Sep*	11%
Feb	3%	*Jun*	12%	*Oct*	6%
Mar	7%	*Jul*	13%	*Nov*	6%
Apr	11%	*Aug*	14%	*Dec*	3%

The June count data was used to determine the yearly usage for each automatic counter location because data was collected for the entire month. To determine the yearly usage, the June usage was divided by the June adjustment factor of 0.12. For example, for the 1.0 counter, 7,508 was divided by 0.12 to get a yearly usage of approximately

62,570 for that location. Then, to determine the approximate usage for each of the other months, the yearly usage was multiplied by the adjustment factor for each month. For example, to estimate the count for January for the 1.0 counter, 62,570 was multiplied by 0.03 to get a usage of 1,877 for that month.

Using survey responses to account for people passing more than one counter:

Based on survey responses location/duration-based questions, the number of times a person passed the 1.0 and 8.5 counters was estimated as shown in Table C3 below. Due to logistical reasons in setting up a survey station, surveying was only conducted at the Lewisburg and Mifflinburg Community Park trailheads. Because of this, it is not possible to make assumptions about those users making shorter trips in the middle sections of the trail, and therefore, they may not be included in this sample. It is assumed that the vast majority of trail visits result in passing either the 1.0 or 8.5 mile markers.

Table C3 Estimated 1.0 and 8.5 counter hits.

Trip Type	Duration	Estimated Counter Hits	% of Users
Round Trip on Bike	2+ Hours	4	24
Round Trip on Bike	Less Than 2 Hours	2	42
One Way Trip on Bike	1-2 Hours	2	2
One Way Trip on Bike	Less Than 1 Hour	1	3
Any Trip on Foot	2+ Hours	2	4
Round Trip on Foot	1-2 Hours	2	20
Round Trip on Foot	Less Than 1 Hour	1	5

I. To determine the average number of hits per trip, the estimated counter hits for each trip type/duration combination was multiplied by its percentage of users for each trip type (based on survey results) and then added together as shown below:

$$4(0.24) + 2(0.42) + 2(0.02) + 1(0.03) + 2(0.04) + 2(0.2) + 1(0.05)$$
$$= \mathbf{2.4\ estimated\ counter\ hits\ per\ trip}$$

II. To determine the estimated total number of trips taken in June, the number of counts for June at the 1.0 and 8.5 mile marker locations was divided by 2.4. Because the 2.4 factor already accounts for two-way trips, the June count numbers only had the infrared sensor error adjustment factor applied to them. To find these values, the 1.0 and 8.5 June counts from Table 4 were multiplied by 2. The calculation for this entire step is shown below:

$$\frac{[7508(2) + 6924(2)]}{2.4}$$

$$= \mathbf{12,026.7\ estimated\ trips\ taken\ to\ the\ BVRT\ in\ June\ 2012}$$

III. Next, the seasonal adjustments were applied to estimate the total annual trips to the BVRT. The total estimated annual counter hits (raw number based on counts and survey results) at the 1.0 and 8.5 mile markers using the NBPD seasonal adjustments (Table C2) is (62570+57700)*2 =240540. This number was calculated by applying the seasonal adjustment factors to the total estimated trips in June (12,026.7 x 2.4 = 28,864 hits in June). The same method used in "Applying Seasonal Adjustments" for calculating usage was applied to calculate the total estimated annual counter hits. Refer to page 33 for this method. The total estimated annual counter hits was then divided by 2.4 to determine the annual number of trips to the BVRT.

$$\frac{240{,}540}{2.4}$$

$$= \mathbf{100{,}225\ estimated\ annual\ trips\ to\ the\ BVRT}$$

Definition of Variable and Linear Regression

The following definitions (Table C4) are used for the travel demand calculations. A linear regression model was applied to determine the 95% confidence interval associated with each variable (Table C5).

Table C4 Definition of Variables

Variable	Definition
Use	Number of trips to trail per month (mean = 11.77)
Age	Age (in years) of respondent (mean = 48.8)
Children	Number of children in respondent's traveling party (mean = .18)
Female	Gender variable (female = 1, male = 0)
Biking	Activity variable (biking =1, all other activities = 0)
Distance	Distance (miles) traveled to trail (mean = 24.87)

Table C5 Linear Regression

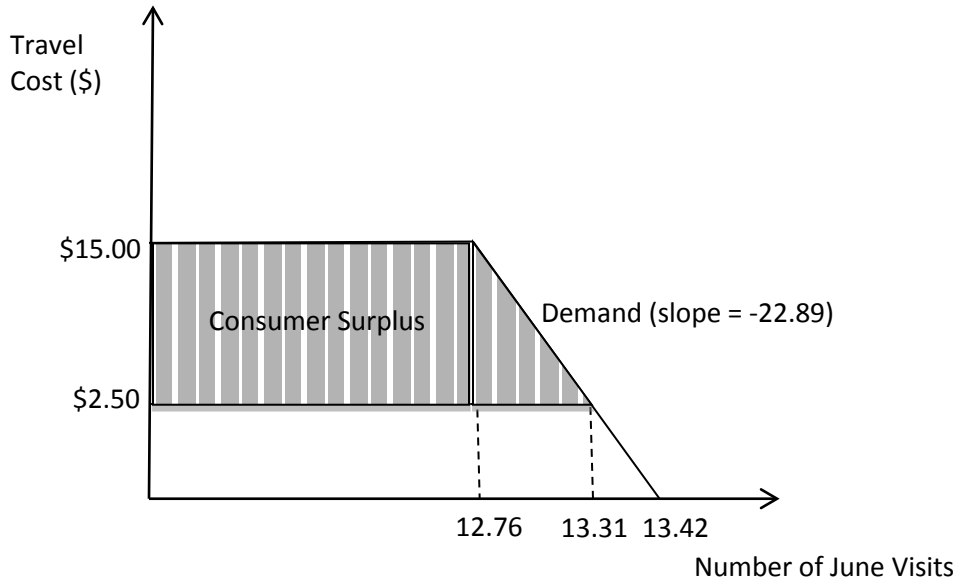
Variable	Coefficient	Standard Error	Significance
Constant	13.424	5.262	5%
Age	0.026	0.094	-
Children	-0.815	2.324	-
Female	-0.273	2.458	-
Biking	-3.042	2.571	-
Distance	-0.022	0.010	3.5%
N = 90; R squared = 0.071			

Estimating Consumer Surplus to Users Based Upon Demand Analysis

Assume travel costs of $0.50 per mile. Assume the demand for trail use is a linear function of price with slope -22.89 (based on regression coefficient – the inverse of the coefficient on price times two to reflect costs rather than miles). The number of theoretical trail visits with a price of zero – estimated by the constant in the linear regression above, is equal to 13.42. Assume finally that the demand curve is horizontal at a price of $15 to reflect the fact that no user in the sample traveled more than 30 miles. Thus the trail provides no surplus to users living further than 30 miles from the trail.

Under these assumptions, the consumer surplus to a trail users located 5 miles from the trail (the sample average) is illustrated in the Figure C1. The area of the shaded region of consumer surplus is estimated at $162.94 for the month of June. The NBPD seasonal adjustments in Table C2 above suggest that 12% of annual use occurs during the month of June. Dividing $162.94 by 0.12 yields annual consumer surplus to trail users of an estimated $1,357.81.

Figure C1 Consumer Surplus to Trail Users



Appendix D – Economic Impact Calculations

Economic impacts, both direct and indirect, were estimated by examining responses to certain survey questions. Spending on overnight accommodations, as per survey question 13 (How much do you spend per night?), was not included because no primary purpose users reported any expenditure on overnight accommodations. All users spending any money on overnight accommodations were in the region for reasons other than the BVRT, therefore their expenditures on these accommodations cannot be attributed to the BVRT.

Trail Spending Calculations

Definitions and Assumptions: Trail spending is defined as spending made on destinations along the trail. This data was obtained via survey question 18 (Approximately, how much did you spend on any purchases made during these stops along the trail?). In total, the surveyed user population spent an approximate **$8,427.00** on stops made along the trail in the past year. This divided by the total number of surveyed users (**100)** yields an approximate annual trail spending of **$84.27** per user. Due to the fact that ten first-time users do not have a known usage pattern at the time of the survey, they were removed from the sample to increase accuracy. By exclusively examining just non first time users, total trail spending decreased by only $30 to **$8,397.00** by 90 surveyed non-first time users, yielding a result of approximate annual trail spending of **$93.30** per experienced user.

I) Determine estimated trail spending per month per user

- Divide approximate annual trail spending per user (**$93.30**) by number of months (**12**)
- **$7.78 estimated trail spending per user per month**

II) Determine estimated trail spending per user per trip

- Divide estimated trail spending per user per month (**$7.78**) by average number of trips taken to the BVRT by non-first time users as per survey question 2 and Definitions and Assumptions above (**11.77**)
- **$0.66 estimated trail spending per user per trip**

III) Determine estimated annual trail spending

- Multiply estimated trail spending per user per trip (**$0.66**) by estimated annual trips to BVRT as per appendix C calculations (**100,225**)
- **$66,148.5 estimated annual trail spending on BVRT**

IV) Six County multiplier

- Estimated amount by which each dollar spent along the BVRT increases total economic output for entire Six County Region (Union, Columbia, Lycoming, Montour, Northumberland, and Snyder)
- Determined to be **1.70** [9]

V) Apply Six County Multiplier

- Multiply estimated annual trail spending (**$66,148.5**) by Six-County multiplier (**1.70**) [9]
- **$112,452.45 increase of total economic output for Six-County region as a result of trail spending on BVRT**

VI) State Multiplier

- Estimated amount by which each dollar spent along the BVRT increases total economic output for the State of Pennsylvania
- Determined to be **2.10** [9]

VII) Apply State Multiplier

- Multiply estimated annual trail spending (**$66,148.5**) by State multiplier (**2.10**)[9]
- **$138,911.85 increase of total economic output for State of Pennsylvania as a result of trail spending on BVRT**

Recreational Spending

Definitions and Assumptions: Recreational spending is defined as spending on recreational goods influenced by the use and/or existence of the BVRT. This data was obtained via survey question 16 (Approximately how much did you spend on the recreational goods?). In total, the surveyed user population spent an approximate **$18,900.00** along the trail in the past year. This, divided by the total number of sampled users (**100**) yields an average **$189.00** of recreational spending in the past year. To increase accuracy, those surveyed indicating trail usage of less than once a month were removed from the sample because it can be assumed that the BVRT had little influence on recreational spending for these users. This changed the total approximate recreational spending in the past year by only $50 to **$18,850.00**. This, divided by the total number of those surveyed indicating trail usage of at least once a month, defined as regular users (**79**) yields an average of **$238.61** of recreational spending per user in the past year (obtained via survey question 2). Unlike trail spending, recreational spending is looked at on a per user basis, as opposed to a per trip basis. This is because recreational goods are durable goods. For example, a trail user does not purchase a helmet every time they visit the trail. Also, due to the fact that all users included in the sample indicated a usage of more than once a month, it can be assumed that the number of regular distinct users for June is also the number of annual regular distinct users, again based on the assumption that the BVRT only influences recreational spending for regular users.

I) Determine number of distinct regular users of BVRT

- Divide total number of trips to BVRT as per Appendix C (**12,026.7**) by average number of monthly trips taken by regular users as per question 2 and Definitions and Assumptions above (**13.38**).
- **898.9 distinct *regular* users of BVRT**

II) Determine annual recreational spending influenced by BVRT

- Multiply number of distinct regular users of BVRT (**898.9**) by per user average recreational spending in the past year (**$238.61**)
- **$214,486.5 estimated annual recreational spending influenced by BVRT**

III) Six-County Multiplier

- Estimated amount by which each dollar spent on BVRT-influenced recreational goods increases total economic output for entire Six County Region (Union, Columbia, Lycoming, Montour, Northumberland, and Snyder)
- Determined to be **1.70** [9]

IV) Apply Six-County Multiplier

- Multiply estimated annual recreational spending influenced by BVRT (**$214,486.5**) by Six-County multiplier (**1.70**) [9]
- **$364,627.1 increase of total economic output for Six-County Region as a result of BVRT-influenced recreational spending**

V) State Multiplier

- Estimated amount by which each dollar spent along the BVRT increases total economic output for the State of Pennsylvania
- Determined to be **2.10** [9]

VII) Apply State Multiplier

- Multiply estimated annual recreational spending influenced by BVRT (**$214,486.5**) by State Multiplier (**2.10**) [9]
- **$450,421.65 increase of total economic output for State of Pennsylvania as a result of BVRT-Influenced Recreational Spending**

Economic Net Impact

I) Determine direct net impacts of BVRT

- Add annual trail spending (**$66,148.5**) to annual recreational spending (**$214,486.5**)
- **$280,635 of direct net impact of BVRT**

II) Determine indirect net impacts of BVRT to Six-County Region and State of Pennsylvania

- Add Six-County increase of output for annual trail spending (**$112,452.45**) to annual recreational spending (**$364,627.1**)
- **$477,079.55 increase of total economic output for Six-County region as a result of BVRT**
- Add State of Pennsylvania increase of output for annual trail spending (**$138,911.85**) to annual recreational spending (**$450,421.65**)
- **$589,334 increase of total economic output for State of Pennsylvania as a result of BVRT**

Appendix E – Willingness-to-Pay Calculations

Willingness-To-Pay For Access to Trail

The equation used to determine willingness-to-pay is (variables defined below):

$WTP_{Access} = \alpha + (\beta_1 * X_1) + (\beta_2 * X_2) + (\beta_3 * X_3) + (\beta_4 * X_4) + (\beta_5 * X_5) + (\beta_6 * X_6) + (\beta_7 * X_7)$

I) Using a probit regression (regression where the dependent variable can only take on two values), a coefficient for all variables and constants must be found. See Appendix C-Table C4 for definitions of variables. Table E1 displays the probit regression results. Table E2 shows the definition of the variables as a result of the probit regression.

Table E1 Probit Regression: WTP Access

```
Probit regression                                 Number of obs   =        100
                                                  LR chi2(8)      =      12.96
                                                  Prob > chi2     =     0.1131
Log likelihood = -55.427941                       Pseudo R2       =     0.1047
```

accessresp~e	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
accessoffer	-.0010072	.0003245	-3.10	0.002	-.0016431	-.0003712
use	-.0072858	.0140894	-0.52	0.605	-.0349005	.020329
age	.0021839	.0115364	0.19	0.850	-.020427	.0247948
children	-.089246	.312938	-0.29	0.776	-.7025932	.5241012
distance	.0010849	.0021496	0.50	0.614	-.0031283	.0052981
duration	.002968	.0036326	0.82	0.414	-.0041517	.0100876
biking	-.2012438	.3363765	-0.60	0.550	-.8605297	.458042
female	.1508269	.3150957	0.48	0.632	-.4667494	.7684032
_cons	.6083441	.6867228	0.89	0.376	-.7376079	1.954296

II) Take coefficient on access offer

- Call it δ_1
- Solve: $\sigma = \frac{-1}{\delta 1}$
- $\sigma = 992.85$

III) Take coefficient on the constant

- Call it δ_2
- Solve: $\alpha = \delta_2 * \sigma$
- $\alpha = 604.00$

IV) Take coefficient on all other variables

- Call it δ_n
- Multiply by σ
- Call result β_n

Table E2 Definition of New Variables (WTP_{Access})

Variable	Name	Coefficient * σ = β_n	β_n	X_n (Mean from Table C4)
Use	δ_3	-.0072858 * 992.85	β_1 = -7.23	X_1 = 10.59
Age	δ_4	.0021839 * 992.85	β_2 = 2.17	X_2 = 48.8
Children	δ_5	-.089246 * 992.85	β_3 = -88.61	X_3 = .18
Distance	δ_6	.0010849 * 992.85	β_4 =1.08	X_4 = 24.87
Duration	δ_7	.002968 * 992.85	β_5 = 2.95	X_5 = 86.85
Biking	δ_8	-.212438 * 992.85	β_6 = -199.80	β_6 = .71
Female	δ_9	.1508269 * 992.85	β_7 = 149.75	β_7 = .4

V) WTP_{Access} = 604.00 + (-7.23 * 10.59) + (2.17 * 48.8) + (-88.61 * .18) + (1.08 * 24.87) + (2.95 * 86.85) + (-199.80 * .71) + (149.75 * .4)

WTP_{Access} = **$849.49 per user**

VI) Multiply by number of distinct users as per Appendix C (**1,137**)

- Total WTP_{Access} = **$965,870.13**

Willingness-To-Pay for the Trail Extension

The equation used to determine willingness-to-pay is (variables defined below):

$WTP_{Extension} = \alpha + (\beta_1 * X_1) + (\beta_2 * X_2) + (\beta_3 * X_3) + (\beta_4 * X_4) + (\beta_5 * X_5) + (\beta_6 * X_6) + (\beta_7 * X_7)$

I) Using a probit regression, a coefficient for all variables and constants must be found. See Appendix C-Table C4 for definitions of variables. Table E3 shows the WTP extension results and Table E4 shows the definition of each variable based on the WTP extension.

Table E3 Probit Regression: WTP Extension

```
Probit regression                                 Number of obs   =        100
                                                  LR chi2(8)      =      18.14
                                                  Prob > chi2     =     0.0202
Log likelihood = -52.017337                       Pseudo R2       =     0.1485

------------------------------------------------------------------------------
extensionr~e |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
extensiono~r |  -.0011542   .0003277    -3.52   0.000    -.0017965   -.0005119
         use |  -.0089483   .0145493    -0.62   0.539    -.0374643    .0195678
         age |  -.0092493   .0119839    -0.77   0.440    -.0327373    .0142388
    children |  -.6805531   .2976419    -2.29   0.022    -1.263921   -.0971857
    distance |    .000038   .0015761     0.02   0.981    -.0030511    .0031271
    duration |  -.0020309   .0036377    -0.56   0.577    -.0091607    .0050989
      biking |  -.0840404   .3504112    -0.24   0.810    -.7708337    .6027528
      female |   .1760412   .3271958     0.54   0.591    -.4652507    .8173332
       _cons |   1.753249   .7614653     2.30   0.021     .2608042    3.245693
------------------------------------------------------------------------------
```

II) Take coefficient on extension offer

- Call it δ_1
- Solve: $\sigma = \frac{-1}{\delta 1}$
- $\sigma = 886.40$

III) Take coefficient on the constant

- Call it δ_2
- Solve: $\alpha = \delta_2 * \sigma$
- α = 1,554.08

IV) Take coefficient on all other variables

- Call it δ_n
- Multiply by σ
- Call result β_n

Table E4 Definition of New Variables ($WTP_{Extension}$)

Variable	Name	Coefficient * $\sigma = \beta_n$	β_n	X_n (Mean from Table C4)
Use	δ_3	-.0089483 * 886.40	β_1 = -7.93	X_1 = 10.59
Age	δ_4	-.0092493 * 886.40	β_2 = -8.20	X_2 = 48.8
Children	δ_5	-.6805531 * 886.40	β_3 = -603.24	X_3 = .18
Distance	δ_6	.000038 * 886.40	β_4 =.03	X_4 = 24.87
Duration	δ_7	-.0020309 * 886.40	β_5 = -1.80	X_5 = 86.85
Biking	δ_8	-.084040 * 886.40	β_6 = -74.49	β_6 = .71
Female	δ_9	.1760412 * 886.40	β_7 = 156.04	β_7 = .4

V) $WTP_{Extension}$ = 1,554.08 + (-7.93 * 10.59) + (-8.20 * 48.8) + (-603.24 * .18) + (.03 * 24.87) + (-1.80 * 86.85) + (-74.49 * .71) + (156.04 * .4)

$WTP_{Extension}$ = **$815.29 per user**

VI) Multiply by number of distinct users as per Appendix C (**1,137**)

- Total $WTP_{Extension}$ = **$926,984.73**