Evaluating the ECONOMIC IMPACT of SHARED USE PATHS in North Carolina
Shared use paths (SUP), also known as greenways or trails, are unique facilities physically separated from motor vehicle traffic that allow a shared space in which bicyclists, pedestrians, and sometimes equestrian or other non-motorized users can travel.

While some research has been conducted in North Carolina to understand the economic contribution that specific facilities like SUPs may have in a community, North Carolina is lacking in a comprehensive approach to evaluate the economic returns currently being generated by existing trails of regional significance that may lead to economic benefits to the state.

The objective of this project was to design and test a methodology for consistently evaluating the economic contribution of shared use paths in North Carolina. Four SUPs were selected to test the methodology. The American Tobacco Trail (ATT) and the Brevard Greenway (BG) were studied iteratively for three years, while the Little Sugar Creek Greenway (LSC) and Duck Trail (DT) served as cross-sectional case studies. The iterative cases allowed for comparison of results across years to test the reliability of the methodology and potentially identify factors that may influence its application, such as seasonality. The additional cross-sectional cases provided a broader mix to test the methodology on different types of SUPs based on their land use contexts, user types, and expected trip purposes. This project structure allowed for eight separate studies to be conducted to test the methodology across three years.

The shared use paths studied were selected because they:

- Have a state or regional significance.
- Have good opportunities to capture economic revenue.
- Were not impacted by construction, significant maintenance, or detouring during the project period.
- Are relatively ‘established’ (i.e. at least 5 years old with minimal adjacent land use changes anticipated).
- Have the ability to demonstrate a transportation function.
- Are geographically dispersed across North Carolina.
- Are a good mix between urban and rural areas.
Menu of factors contributing to the overall economic benefit of a SUP

SUP Benefits

Business Benefits
- Trail Use Contributions
- Traditional Economic Contributions
- Trip Expenditures
- O & M Expenditures
- Capital Expenditures

Community Benefits
- Property Values
- Property Taxes
- Environment

Trail User Benefits
- Leisure Time
- Health

Jobs
Wages
Business Output
Value Added/Gross State Product
FIELD DATA COLLECTION

For each SUP case, field data were collected primarily through two sources: intercept surveys and manual counts. The research team administered the survey to trail users. In order to ensure surveyors were consistent in technique, each person was trained in how to intercept a trail user and administer the survey.

Multiple data collection stations were used along each SUP to understand overall trail usage. Survey and count data were collected at each station on each trail. The number of stations varied by trail length and frequency of access points. Spacing of stations was driven by the desire to potentially count each pedestrian on the SUP. This required spacing stations typically no more than 2 miles apart (the average distance a pedestrian travels). Generally, three people worked each station – two surveyors and one counter (see Example Data Collection Station on opposite page).

THIS STUDY BY THE NUMBERS:

8,349 Total # of surveys collected across all trails and study years

54,532 Total # of counts collected across all trails and study years

187 The total number of “bodies” or “manpower” needed to gather all the data across this 3-year study.

The actual number of unique individuals that collected data was much lower (108), since some people collected every year and at each SUP.
### DATA COLLECTION SCHEDULE & TOTAL NUMBER OF RECORDS COLLECTED

<table>
<thead>
<tr>
<th>SHARE PATH</th>
<th># OF STATIONS</th>
<th>YEAR</th>
<th>DAY OF WEEK</th>
<th>TOTAL # OF COUNTS</th>
<th>TOTAL # OF SURVEYS</th>
<th>EST. # OF UNIQUE USERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Tobacco Trail</td>
<td></td>
<td>2015</td>
<td>Thurs, Oct 8</td>
<td>4,434</td>
<td>905</td>
<td>1,472</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sun, Oct 11</td>
<td>11,788</td>
<td>1,496</td>
<td>3,539</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2016</td>
<td>Sat, May 14</td>
<td>8,954</td>
<td>1,230</td>
<td>2,525</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mon, May 16</td>
<td>4,141</td>
<td>766</td>
<td>1,354</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2017</td>
<td>Tues, May 16</td>
<td>4,165</td>
<td>757</td>
<td>1,328</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sat, May 20</td>
<td>7,745</td>
<td>911</td>
<td>2,274</td>
</tr>
<tr>
<td>Brevard Greenway</td>
<td></td>
<td>2015</td>
<td>Wed, Oct 14</td>
<td>505</td>
<td>137</td>
<td>240</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sat, Oct 17</td>
<td>523</td>
<td>133</td>
<td>273</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2016</td>
<td>Thurs, May 19</td>
<td>307</td>
<td>93</td>
<td>135</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sat, May 21</td>
<td>546</td>
<td>147</td>
<td>261</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2017</td>
<td>Sun, Aug 13</td>
<td>539</td>
<td>131</td>
<td>237</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mon, Aug 14</td>
<td>411</td>
<td>99</td>
<td>191</td>
</tr>
<tr>
<td>Duck Trail</td>
<td></td>
<td>2016</td>
<td>Mon, Jun 20</td>
<td>2,127</td>
<td>211</td>
<td>1,009</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Tues, Jun 21</td>
<td>2,212</td>
<td>313</td>
<td>1,020</td>
</tr>
<tr>
<td>Little Sugar Creek Greenway</td>
<td></td>
<td>2016</td>
<td>Tues, Oct 18</td>
<td>2,521</td>
<td>543</td>
<td>1,188</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sat, Oct 22</td>
<td>3,614</td>
<td>477</td>
<td>1,768</td>
</tr>
</tbody>
</table>

### EXAMPLE DATA COLLECTION STATION

**KEY DATA POINTS**

- Trip origin and destination or turnaround points on the trail
- Trip purpose
- Mode of travel
- Physical activity indicators
- Economic activity indicators
- Demographic information
- Residential or visitor status

**KEY DATA POINTS**

- Mode of travel
- Direction of travel
- Age category
- Gender
- Group size

For more on this topic, see the Field Data Collection section of the Final Report, starting on page 55.
STUDY RESULTS

BUSINESS AND EMPLOYEE BENEFITS

Findings from this project demonstrated that SUPs support substantial economic benefits to businesses and their employees. Bicyclists and pedestrians who used the American Tobacco Trail, the Brevard Greenway, the Little Sugar Creek Greenway, and the Duck Trail made purchases at businesses along these trails, which increased the productivity of these regions and contributed to the state's overall economy. For example, trail users made purchases that supported jobs, wage income, and business output in the grocery, retail, bike rental, real estate, restaurant, and entertainment industrial sectors in North Carolina. The economic activity that arose from trip expenditures captured via the intercept surveys includes direct, indirect, and induced/multiplier impacts. These benefits are highlighted for each SUP, on pages 12-19 of this summary brochure.

Typically, data were collected on one weekday and one weekend day during daylight hours. The exact days and collection period time was informed by the season and travel patterns seen in volume data collected on each SUP using automated technology (pneumatic tubes, infrared, and/or inductive loops.) Since survey data are extrapolated to understand annual usage of the SUP and its annual economic contributions, understanding how volume fluctuates on a given trail ensures that survey data are collected during peak use, thereby maximizing staff time on the trail collecting the data. It also ensures that the full range of typical trail users are intercepted so that the data are more likely to be representative of the population of trail users.

All completed survey and count forms were manually reviewed for errors, omissions, and quality control prior to entering the data into spreadsheets.

ESTIMATING UNIQUE USERS AND ANNUAL TRIPS

A simple summation of counts from each station would result in double or multi-counting people who passed more than one station during their trip. When combining raw counts from each station to develop a comprehensive estimate of trail usage, survey data were used to define where respondents entered, exited and/or turned around on the trail to reduce the raw count at each station by the people who would have been counted at another station. Using several calculations, the number of unique users on each SUP was determined.

Note that adjustments for users making roundtrips or those making longer distance trips (thereby passing more stations) does not result in a true count of individual persons using the trail. Some may have visited the SUP on more than one data collection day, or made more than one trip per day, or traced a unique travel pattern not otherwise captured in the survey responses. Unique users can only be understood on a per day basis. Count data from continuous count stations on each SUP were adjusted to convert unique users to an estimate of annual trips.
$19.4M
In total estimated annual business output resulting from sales revenue at businesses along all four SUPs in this study.

790 JOBS
Are supported annually through construction* of all four SUPs and direct expenditures of people using the trails in this study.

*530 construction jobs may be the labor equivalent to full-time employment over the course of one year; assumes different crews were utilized to build each trail.
RETAIL SALES TAX BENEFITS

When bicyclists and pedestrians make purchases at stores, restaurants, hotels, or various other types of commercial establishments it also generates retail tax revenue for local and state governments. Sales tax impacts were estimated by considering expenditures on different types of goods and services, and modeling the tax revenue generated from these transactions using IMPLAN. The total annual estimated local and state tax collections resulting from trip expenditures for all four SUPs is $683,900.

TRAIL CONSTRUCTION BENEFITS

The construction of SUPs supports economic activities including preliminary engineering, design and environmental review, construction, inspection, and oversight. Expenditures made in each of these categories support jobs, wages, and business output. Of these categories, business output was most significant, with $48.7 million in total business output from construction for all four SUPs.

$684K
In total estimated annual local & state tax collections resulting from trip expenditures for all four SUPs in this study.

$48.7M
In total estimated business output resulting from construction of all four SUPs in this study.
PROPERTY VALUE IMPACTS

This project applied and examined two methods to explore the impact of SUPs on property values: 1) comparing property values for residential properties that are near to a SUP to those that are far from a SUP using a buffer analysis, and 2) using linear regression to determine the effect of SUP proximity on property sales prices by controlling for neighborhood characteristics, including proximity to other “property value boosters” (e.g. schools, parks, bodies of water, shopping, employment centers, and socioeconomic demographics).

While the results from the buffer analysis indicated that proximity to the SUP had a positive effect on assessed property values for the ATT and LSC, further hedonic price modeling showed that proximity to a SUP had no statistically significant effect on sales prices when controlling for factors such as other environmental and neighborhood features. These results underline how difficult it is to isolate the true effect of SUP proximity on property values, particularly given each SUP’s unique location and context. If a property values benefits analysis is desired for a trail, the effect of competing features must be considered when interpreting the results.

For more on these and other SUP economic benefit results, see Chapter 5: Study Results in the main report.

$25.7M

In total estimated savings associated with increased physical activity and reduction in congestion, traffic injuries, and air pollution from use of all four SUPs in this study.

HEALTH, CONGESTION, AND POLLUTION REDUCTION BENEFITS

Examples of benefits measured under this category include, but are not limited to:

- Annual Regional Cost Savings Attributable to Physical Activity
- Annual Regional Cost Savings Attributable to Decreased Risk of Road Traffic Injuries
- Reduced Household Vehicle Operation Costs
- Annual Reduced CO₂ Emissions (lbs)
**ECONOMIC VALUATION METHODOLOGIES**

This table represents the recommended approach to estimate economic contributions of SUPs based on testing these and other methods to derive specific types of benefits from each of the eight case studies conducted. The matrix allows one to select from a menu of benefit types and quickly see at a high-level the types of data sources and key steps it would take to implement the recommended method in order to calculate the value of the economic benefit of interest.

<table>
<thead>
<tr>
<th>Category to SUP-related businesses and employees</th>
<th>Sub-category</th>
<th>Data Required</th>
<th>Methodology or Value Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trail User Expenditures (includes special events and tourism expenditures that result from existence of trail)</td>
<td>Intercept Survey</td>
<td>• Expenditures by type and trail user</td>
<td>Step 1: Estimate average expenditures per user type from intercept survey</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Frequency of trips per user</td>
<td>Step 2: Evaluate sample of completed surveys with manual user counts for representativeness of the survey (further analysis if adjustments are needed)</td>
</tr>
<tr>
<td></td>
<td>Manual Count</td>
<td>• User count by mode, age, and gender</td>
<td>Step 3: Extrapolate average expenditures to an annual amount with automated counts and predictive model (if needed)</td>
</tr>
<tr>
<td></td>
<td>Automated Count</td>
<td>• Expanded count of users by mode for extrapolation</td>
<td>Step 4: Estimate multiplier effects of annual expenditures using IMPLAN</td>
</tr>
<tr>
<td>Retail Sales Tax Benefits (function of trail user expenditures)</td>
<td>Intercept Survey</td>
<td>• Expenditures by type</td>
<td>Step 1: Use estimated expenditures per user type derived from steps 1-3 above (Trail User Expenditures)</td>
</tr>
<tr>
<td></td>
<td>NC Department of Revenue</td>
<td>• State and local tax rates</td>
<td>Step 2: Estimate the local and state tax contribution resulting from these expenditures, based their respective tax rates</td>
</tr>
<tr>
<td></td>
<td>Municipal Real Estate Schedule of Values</td>
<td>• Regional average of competitive space</td>
<td>Step 3: Divide expenditures by regional average of competitive space to get retail square footage supported</td>
</tr>
</tbody>
</table>

| Impacts to NC’s Economy from SUP Investment | Capital Expenditure | NC Department of Transportation | Step 1: Obtain and summarize capital expenditures data |
| | | • SUP capital expenditures | Step 2: Normalize data to economic base year |
| | | Local Agency | Step 3: Estimate multiplier effects of capital expenditures using IMPLAN |
| | Operational Expenditure | NC Department of Transportation | Step 1: Obtain and summarize operational expenditures data |
| | | • SUP operational expenditures | Step 2: Normalize data to economic base year |
| | | Local Agency | Step 3: Estimate multiplier effects of operational expenditures using IMPLAN or TREDIS |

<p>| Impacts to Land Values for Properties within SUP Proximity | Property Value Impacts – Rough Assessment | County Parcel Data Records | Step 1: Evaluate property values in ½ mile proximity to SUP relative to similar property values ½-1 mile away from SUP |
| | | • Property assessed values in proximity to trail | Step 2: Use GIS to create a ½ mile buffer around SUPs (influence area). Create another ring buffer ½ -1 mile out (outside area). Compare the difference in values of the two areas. |
| | Property Value Impacts – Hedonic Pricing Method | Real Estate Sales Data | Step 1: Generate base linear model by regressing the sales price on the core predictors for properties within ½ mile of SUP |
| | | • Property neighborhood factors | Step 2: Evaluate geospatial residual pattern for under- or over-predicted areas to identify additional control variables based on SUP context |
| | | • Property structural factors (bedrooms, bathrooms, square footage) | Step 3: Iteratively refine and re-run model with customized variables to test their inclusion for best fit |
| | | • Property sales prices | Step 4: Test for statistical significance of effect on sales prices from proximity to SUP. |
| | | American Community Survey | • Block group demographics |
| | | | • Vacancy rate |
| | | Public Tax Records | • Assessed tax value |</p>
<table>
<thead>
<tr>
<th>Category</th>
<th>Sub-category</th>
<th>Data Required</th>
<th>Methodology or Value Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health Benefits</td>
<td>Intercept Survey</td>
<td>Federal Highway Administration • Statistical value of human life Centers for Disease Control and Prevention • Burden of Disease Intercept Survey • Average time spent on SUP (duration, trip frequency, and/or distance) • Average exercise met from SUP use</td>
<td><strong>Step 1:</strong> Estimate total number of SUP users and their average trip lengths from counts and intercept surveys. <strong>Step 2:</strong> Use number of users, their trip length, FHWA’s value of statistical life, and CDC’s mortality rates by cause as inputs into the Integrated Transport and Health Impact Modeling Tool (ITHIM) to derive the economic value of mortality rate improvements that result from SUP use.</td>
</tr>
<tr>
<td>Congestion Benefits</td>
<td>Intercept Survey</td>
<td>Federal Highway Administration • Mode to/from SUP • Trip purpose • Number of users who would make same trip by driving if SUP didn’t exist Tiger Benefit-Cost Analysis Resource Guide • Congestion cost per vehicle mile</td>
<td><strong>Step 1:</strong> Survey trail users about travel mode, trip purpose, and whether they would have made that trip if the SUP did not exist. <strong>Step 2:</strong> Calculate vehicle miles traveled from origin to destination for users who would have made trip with another mode. <strong>Step 3:</strong> Use info from steps 1-2 to estimate societal benefits that arise from avoided motorized transport external costs.</td>
</tr>
<tr>
<td>Air Pollution Reduction Benefits</td>
<td>Intercept Survey</td>
<td>Federal Highway Administration • Mode to/from SUP • Number of users who would make same trip by driving if SUP didn’t exist Environmental Protection Agency • Exposure to fine particulate matter</td>
<td><strong>Step 1:</strong> Survey trail users about travel mode and whether they would have made that trip if the SUP did not exist. <strong>Step 2:</strong> Use info from step 1 to estimate societal benefits that arise from avoided motorized transport external costs.</td>
</tr>
<tr>
<td>Safety Benefits</td>
<td>Intercept Survey</td>
<td>Federal Highway Administration • Statistical value of human life NC Division of Motor Vehicles • Serious and fatal collisions</td>
<td><strong>Step 1:</strong> Survey trail users about trip duration, frequency, and distance. <strong>Step 2:</strong> Collect collision data for the study area and parallel paths. <strong>Step 3:</strong> Use info from steps 1-2 to estimate societal benefits that arise from avoided motorized transport collision costs</td>
</tr>
</tbody>
</table>
Approximately 480,800 annual ATT trips* made by bicyclists and pedestrians were estimated to contribute to the following economic activity in North Carolina on an annual basis:

**$5,668,000**
GENERATED IN BUSINESS OUTPUT (SALES REVENUE).

**$2,211,000**
GENERATED IN LABOR INCOME

**78**
JOBS SUPPORTED THROUGH TRAIL USER EXPENDITURES

**$3,000,000**
DIRECT IMPACT

**$1,202,000**
INDIRECT IMPACT

**$1,466,000**
INDUCED IMPACT

**59**
DIRECT JOBS SUPPORTED

**8**
INDIRECT JOBS SUPPORTED

**11**
INDUCED JOBS SUPPORTED

**$1,370,000**
DIRECT EARNINGS SUPPORTED

**$375,000**
INDIRECT EARNINGS SUPPORTED

**$465,000**
INDUCED EARNINGS SUPPORTED

*Annual trips reported here are an average for the three-year study of the ATT.
The average number of people needed across 10 stations to collect ATT data:

44

$27.2M
Total estimated business output resulting from ATT construction

$220K
Total estimated annual local and state tax collections resulting from ATT trip expenditures

$1.4M
Total estimated healthcare cost savings associated with increased physical activity from use of the ATT

For more on these and other ATT economic benefit results, see Chapter 5: Study Results in the main report.
BREVARD GREENWAY (BG)

Approximately 76,000 annual Brevard Greenway trips* made by bicyclists and pedestrians were estimated to contribute to the following economic activity in North Carolina on an annual basis:

$1,566,000
GENERATED IN BUSINESS OUTPUT (SALES REVENUE).

$614,000
GENERATED IN LABOR INCOME

21
JOBS SUPPORTED THROUGH TRAIL USER EXPENDITURES

*Annual trips reported here are an average for the three-year study of the BG.
The average number of people needed across 3 stations to collect BG data:

9

$7.5M
Total estimated business output resulting from BG construction

$53K
Total estimated annual local and state tax collections resulting from BG trip expenditures

$51K
Total estimated healthcare cost savings associated with increased physical activity from use of the BG

For more on these and other BG economic benefit results, see Chapter 5: Study Results in the main report.
Approximately **382,600** annual LSG trips made by bicyclists and pedestrians were estimated to contribute to the following economic activity in North Carolina on an annual basis:

**$5,261,000**

Generated in **business output** (sales revenue).

**$2,059,000**

Generated in **labor income**.

**73**

Jobs supported through trail user expenditures.

**$2,783,000**

Direct impact.

**$1,112,000**

Indirect impact.

**$1,366,000**

Induced impact.

**56**

Direct jobs supported.

**7**

Indirect jobs supported.

**10**

Induced jobs supported.

**$1,280,000**

Direct earnings supported.

**$345,000**

Indirect earnings supported.

**$433,000**

Induced earnings supported.
For more on these and other LSG economic benefit results, see Chapter 5: Study Results in the main report.
DUCK TRAIL (DT)

Approximately 145,700 annual Duck Trail trips made by bicyclists and pedestrians were estimated to contribute to the following economic activity in North Carolina on an annual basis:

$6,931,000
GENERATED IN BUSINESS OUTPUT (SALES REVENUE).

89
JOBS SUPPORTED THROUGH TRAIL USER EXPENDITURES

$2,668,000
GENERATED IN LABOR INCOME

$3,643,000
DIRECT IMPACT

$1,518,000
INDIRECT IMPACT

$1,770,000
INDUCED IMPACT

66
DIRECT JOBS SUPPORTED

10
INDIRECT JOBS SUPPORTED

13
INDUCED JOBS SUPPORTED

$1,614,000
DIRECT EARNINGS SUPPORTED

$492,000
INDIRECT EARNINGS SUPPORTED

$562,000
INDUCED EARNINGS SUPPORTED

Bicycle shop along the Duck Trail in Duck, NC.
For more on these and other DT economic benefit results, see Chapter 5: Study Results in the main report.

- $232K: Total estimated annual local and state tax collections resulting from DT trip expenditures
- $9.3M: Total estimated business output resulting from DT construction
- $2K: Total estimated healthcare cost savings associated with increased physical activity from use of the DT

**Map of Duck Trail Survey Stations**

Legend:
- Survey Station
- Continuous Counter
- Shared Use Path

**Land Use Category**
- Commercial
- Institutional
- Recreational

The average number of people needed across 2 stations to collect Duck Trail data: 8
For more details on the methods tested to evaluate the economic contribution of shared use paths and all the study results, please visit the full report at https://itre.ncsu.edu/focus/bike-ped/SUP-Economic-Impacts/