Evaluating the **ECONOMIC IMPACT** *of* **SHARED USE PATHS** *in* North Carolina

2015 - 2017

FINAL REPORT

ITRE

alta PLANNING + DESIGN

STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

Division of Bicycle & Pedestrian Transportation

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INTRODUCTION

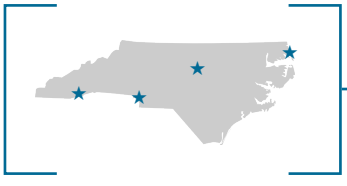
Shared use paths (SUPs), also known as greenways or trails, are unique facilities physically separated from motor vehicle traffic that allow a shared space in which bicyclists, pedestrians, and sometimes equestrian or other non-motorized users can travel. Often SUPs are constructed within an independent right-of-way and may follow a waterway, railroad, or utility corridor. Sidepaths are a specific type of SUP that are constructed within a roadway right-of-way but are physically separated from motor vehicle traffic by a positive barrier. While some research has been conducted in North Carolina to understand the economic contribution that specific facilities like SUPs may have in a community,[1,2,3,4] North Carolina is lacking in a comprehensive approach to evaluate the economic returns currently being generated by existing trails of regional significance. The first step toward the goal of evaluating the collective contribution of SUPs in North Carolina is to develop a way by which greenways across the state can be uniformly assessed.

PURPOSE OF PROJECT

The North Carolina Department of Transportation (NCDOT) has supported the construction of many SUPs, in coordination with local governments within the state, since the 1970's. With the creation of a data-driven process to prioritize transportation projects that began in 2013 and continues to evolve, independent bicycle and pedestrian projects such as SUPs are now evaluated, ranked, and compete with projects from all transportation modes. This objective, performance based prioritization process currently uses travel time savings and safety benefits based on crash history as the economic criteria, but these metrics fall short in fully accounting for the range of potential economic benefits of bicycle or pedestrian projects. This research lays a foundation toward a long-term goal of the NCDOT to create new metrics for economic-based performance that can ultimately aid non-motorized transportation projects to more fairly compete for funds.

OBJECTIVE

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. A comprehensive valuation framework was designed and tested based on a menu of economic impacts that were explored. These include considerations for understanding trail user and societal benefits (health, congestion reduction, pollution reduction, and safety benefits), business benefits (trip expenditures, retail sales tax benefits), and community benefits (capital expenditures, operational expenditures, property value impacts). Given that SUPs may have different characteristics, adjacent land uses, and local contexts, the methodology framework is flexible enough to allow one to measure different types of economic contributions as may be appropriate for the SUP under study. At the same time, the framework provides a standard for what and how data are collected and analyzed, given the specific economic benefit(s) of interest, so that, ultimately, datasets from different SUPs or regions can be compared or compiled to reflect a comprehensive understanding of the economic contributions of SUPs to the state of North Carolina.



PROJECT NEED

Historically, North Carolina has been known as the "Good Roads State," due to the high quality and connectivity of its state roads system. There is a movement stirring to add a new moniker to North Carolina's accolades by positioning itself as the "Great Trails State." This project seeks to begin to quantify the economic contribution that SUPs provide through outdoor recreation and transportation options and how these activities may impact local and state economies through tourism, events, urban redevelopment, community improvement, property values, health care savings, jobs, investment, and general consumer spending.

Currently, much of North Carolina's overall mileage of SUPs remains in the planning phase. While construction is occurring, the information gleaned through this project's case studies will assist in understanding how these expenditures can lead to future economic growth in a community, and the findings may influence decisions for further investment in SUPs for the development of more extensive trails and networked systems across the state. Standard methods developed through this project will also assist in easier duplication of research efforts on economic contributions for other trails, trail segments, or networks. Additionally, as similar data are consistently collected and analyzed across the state, this project will allow NCDOT to ultimately pull datasets together to compare economic activity from SUPs across regions or understand statewide trends. For some of the SUPs studied through this project, the data collected and results compiled can now serve as "before data," so that as these trails expand or connect to a larger network, the economic impacts from these changes can be assessed via "after" studies comparisons.

OVERVIEW OF STUDY

Four SUPs were selected to test the methodology. The American Tobacco Trail (ATT) in Durham and the Brevard Greenway (BG) in Brevard were studied iteratively for three years, while the Little Sugar Creek Greenway (LSC) in Charlotte and Duck Trail (DT) in Duck 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, as shown in Table 1.

Table 1: Chronological Arrangement of Eight Case Studies across Four SUPs to Test Methodology

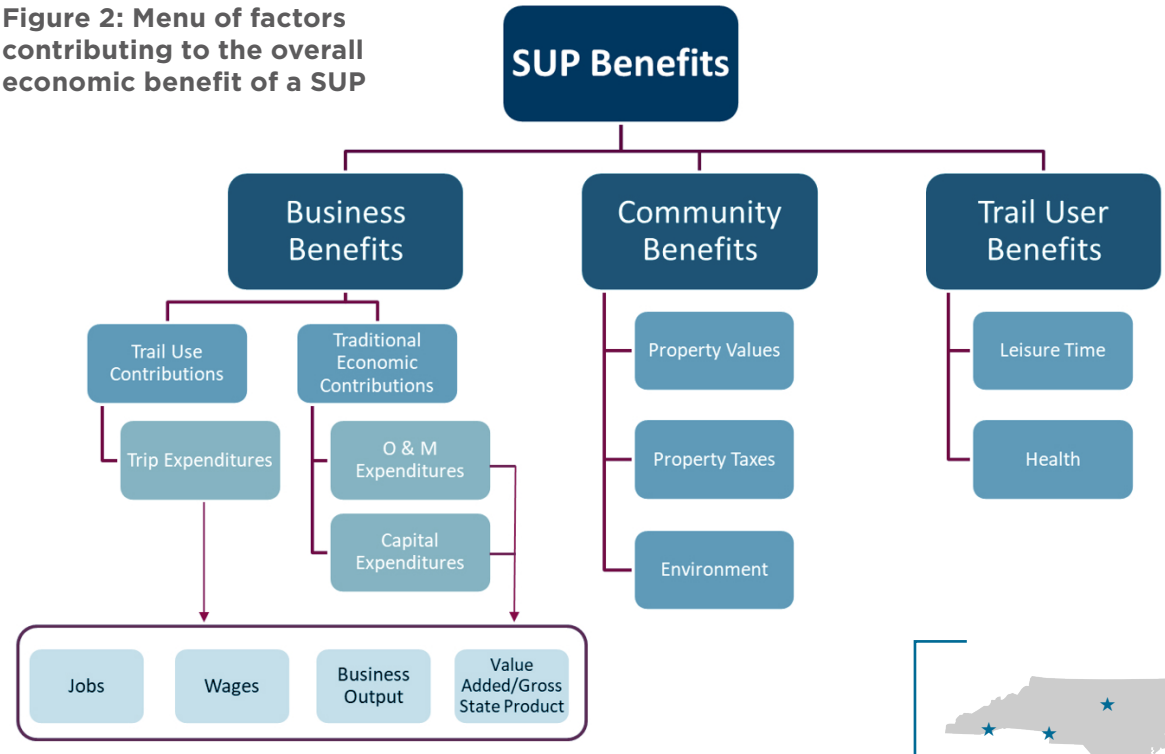
TRAIL NAME	2015	2016	2017
American Tobacco Trail (ATT)	Study 1 October	Study 3 May	Study 7 May
Brevard Greenway (BG)	Study 2 October	Study 4 May	Study 8 August
Duck Trail (DT)	N/A	Study 5 June	N/A
Little Sugar Creek Greenway (LSC)	N/A	Study 6 October	N/A

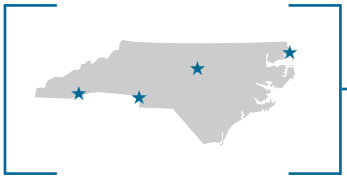
Figure 1: Location of SUPs studied in North Carolina

These four SUPs were identified through a selection process based on meeting a series of criteria. Besides reflecting a geographical spread across the state as shown in Figure 1, these trails vary in length, visitor usage, and rural or urban context, while having similar other characteristics as defined by the selection criteria, such as being well established SUPs that demonstrate an ability to have a transportation function.

The methodological framework allowed for an "a la carte" selection of types of economic impact to analyze for each study, given variation in the trails. For example, due to the narrow, barrier island geography of the Outer Banks, the prevalence of vacation home properties, and the trail's close proximity to the beach, the Duck Trail's economic impact on property values would be extremely difficult to tease out. Figure 2 shows the menu of economic benefits analyzed based on three primary categories of business, community, and user benefits.

Figure 2: Menu of factors contributing to the overall economic benefit of a SUP





ORGANIZATION OF REPORT

This report encapsulates the work done to develop and test the methodological framework, documents the analyses performed and results of those analyses, and offers discussion and recommendations for others interested in using the methods developed to study economic benefits of other SUPs. This information is laid out through the following chapters:

- Chapter 2 provides a summary of relevant literature reviewed. This collective body of knowledge is sectioned by type of economic benefit. Key findings from other studies are synthesized and the methods used in other studies are documented for each category.
- Chapter 3 describes an overview of SUPs in North Carolina in general, the criteria by which the four SUPs were selected, and the context and history of each studied trail as background.
- Chapter 4 lays out each method tested for each type of economic contribution studied. A list of data needed for each approach is offered along with the steps taken to conduct the analyses. Additional considerations provide useful information gleaned through the testing of these methods and offer insight on when it may be most appropriate to use (or not use) a particular method.
- Chapter 5 summarizes the results for each case study, compares key data points across years for the ATT and BG, and suggests explanations for differences in results due to seasonality, land use context, user type, trip purpose and other key variables.
- Appendices package up eight individual technical briefs – one for each case study conducted – that offer a snapshot of the summary results by trail by study, as well as the forms, templates, protocols, and training documents deployed to collect data in the field.

Chapter Notes:

1. *M.P. Meletiou et al., 'Economic Impact of Investments in Bicycle Facilities: a Case Study of North Carolina's Northern Outer Banks', Transportation Research Record: Journal of the Transportation Research Board, vol. 1939, 2005, pp 15-21.*
2. *T.J. Cook et al., Behavioral Effects of Completing a Critical Link in the American Tobacco Trail: A look at Impacts on Health, Transportation, and the Economy, 2014, https://itre.ncsu.edu/wp-content/uploads/2016/03/American-Tobacco-Trail-FinalReport-ITR-2014.pdf (accessed 1 June 2017).*
3. *Catawba Lands Conservancy, The Potential Economic Impacts of The Proposed Carolina Thread Trail, 2007, http://www.carolinathreadtrail.org/assets/files/CTT_Economic_Study.pdf (accessed 13 September 2016).*
4. *North Carolina Department of Transportation, 'Economic Impact Analysis', in WalkBikeNC: North Carolina Statewide Pedestrian and Bicycle Plan, 2013, http://www.walkbikenc.com/wp-content/uploads/2014/12/EconomyImpact-Analysis.pdf, (accessed 13 September 2016) pp. 9.5-1-9.5-34.*

Chapter Two
LITERATURE REVIEW

Trail counts along the Little Sugar Creek Greenway

INTRODUCTION

This chapter focuses on the economic contribution and benefits that SUPs provide based on a review of the existing literature on this topic. After a thorough review of journal articles, industry papers, reports, web documents, surveys, and other research, the project team summarized four broad categories that can be subdivided into distinct SUP impacts and benefits:

Direct, indirect, and induced impacts to SUP-related businesses

- SUP user expenditure impacts
- Retail sales tax impacts

Direct, indirect, and induced impacts to North Carolina's economy from SUP investment

- Capital expenditure impacts
- Operational expenditure impacts

Land and structure values for properties within SUP proximity

- Property value impacts
- Property tax impacts

Individual and societal cost savings associated with health and environmental benefits

- Health benefits
- Congestion benefits
- Pollution reduction benefits (air and noise)
- Safety benefits

The literature review is organized by each SUP impact/benefit category and includes: (1) an overview of the category, (2) key findings in the literature, and (3) methods for deriving each category.

SUPs are becoming more regularly used for special events, such as races or fundraising rides. While economic impacts and benefits of special events are well documented and can be in any of the four categories above, special event contributions are outside the scope of this project, given that these events can be routed on other facilities besides SUPs and their impacts relate to the event itself more so than the trail on which it may be routed.

TERMINOLOGY

Economic terminology can be burdensome or confusing, so before delving into the findings from the literature review, a primer is offered for the economic terms used in this report to describe the economic impacts and benefits (i.e. the economic contribution) of shared use paths.

Economic Impacts. Economic impacts are effects on the level of economic activity in a given area.[1] They may be viewed in terms of the following:[2]

- Business output (sales volume)
- Value added (gross regional product)
- Wealth (including property values)
- Personal income (including wages)
- Jobs

Any of these measures can be used as an indicator of change in the economic well-being of area residents.[3]

User and Social Benefits. User or social benefits of a particular facility or service are different from economic impacts.[4] User and social benefits do not necessarily result in an expansion or contraction of a region's economy, though they can be valued in economic terms (i.e. monetarily).[5] User benefits capture changes in quality of life and may affect an area's level of economic activity,[6] thus they are important values to include when conducting economic research. As such, user and social benefits include the valuation of changes in amenity or quality of life factors such as health, safety, recreation, air or noise quality.[7]

Input/Output Models. Input/Output (I-O) models can be used to estimate multiplier effects – the economy-wide effects that an initial change in economic activity has on a regional economy.[8] The initial change involves a change in final demand[9] such as a new construction project of a SUP or new consumption patterns that result from the existence of a SUP. Construction or new spending behavior creates changes in economic activity that results in diminishing rounds of new spending as leakages occur (through saving or spending) outside the local economy.[10] Due to the complexity and interconnectedness of economic activity (how expenditures give rise to a host of other economic activities), an I-O model is an appropriate tool to estimate how economic impacts circulate through the economy.

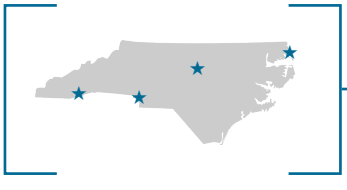
There are various software platforms or tools that use or incorporate I-O models; however the following models are most widely used:

- RIMS-II (Regional Input-Output Modeling System)
- IMPLAN (IMpact Analysis for PLANing)
- TREDIS (Transportation Economic Development Impact System)
- REMI (Regional Economic Models, Inc.)

Each of these models uses the US Department of Commerce I-O tables as a primary foundation. The simplest model is RIMS and the most complex is REMI;[11] however, each model has its advantages and disadvantages, which are outlined in Table 2 and synthesized from the work of AKRF, Inc[12] and the Connecticut Academy of Science and Engineering.[13]

Table 2: Advantages and Disadvantages of Commonly Used Economic Models

Economic Model	Advantages	Disadvantages
RIMS-II	• Transparent • Inexpensive	• User cannot modify industry production functions or trade flow assumptions • Static - does not account for time required for an impact to be realized • Does not show a breakdown of impacts (jobs, wages, GRP) by industry
IMPLAN	• Easier to use than RIMS-II • Can modify production functions and trade flows • Can estimate impacts down to zip code level • Readily demonstrates direct, indirect, and induced effects • Moderately priced	• Less transparent to reviewers who are not experienced with IMPLAN • Static - does not account for time required for an impact to be realized
TREDIS	• IMPLAN is the base model • Moderately priced	• Static - does not account for time required for an impact to be realized • More difficult to access the I/O tables for economic modeling • Aggregates direct, indirect, and induced effects
REMI	• All impacts and benefits of TREDIS plus some additional	• Very complex and difficult to use • Difficult to explain and share results • Expensive



Deciding an appropriate tool requires careful deliberation; however, the research team decided to use IMPLAN as the economic modeling platform for this research. Though REMI has slightly more capabilities than IMPLAN and TREDIS, these additional features "amount to overkill for most non-academic and non-policy-oriented analyses,"[14] and "the complexity of the model makes it more difficult to explain the modeling process and outline basic assumptions."[15] IMPLAN, on the other hand, offers greater ease of access to the input/output tables for economic modeling, is more user-friendly, and demonstrates direct, indirect, and induced economic impacts. For more information about capabilities that each of these models provide see Table 3, which was extracted from research conducted for the Connecticut Department of Transportation.[16]

Table 3: Comparison of Economic Modeling Capabilities

Criteria/Software	REMI-TranSight	TREDIS	IMPLAN	RIMS II
Analysis Method Used				
Input - Output	X	X	X	X
General Equilibrium	X			
Benefits Costs	X	X		
Transport Project Types				
New Transportation Projects	X	X		X
Expanding Existing Projects	X	X		X
Maintenance and Operations	X	X		X
Transit Component	X	X	X	
Geographic Scale				
National Dimension	X	X	X	
State(s)	X	X	X	X
County(ies)	X	X	X	X
Sub-county - Corridor/Zip Codes	Possible	X	X	
Regional Geographic Interaction	X	Partial	X	
Economic Factors				
Output (Sales and inventory change)	X	X	X	X
Employment	X	X	X	X
Flow of Labor	X			
Income	X	X	X	X
Value Added	X	X	X	X
Productivity Change	X	X	X	
Fiscal Impacts	X	X	X	X
Tourism Spending	X			X
Flow of goods	X			
Population	X			
Social Benefits	X	X	X	

SHARED USE PATH USER EXPENDITURE IMPACTS

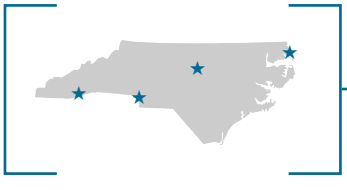
Retail shops, restaurants, accommodations, and other industries in local and regional economies can experience notable economic benefits when in proximity to shared use paths. SUPs may make a commercial corridor more accessible to foot traffic, increasing consumers' browsing opportunities and encouraging more access to local goods and services.[17] Additionally, SUPs enable individuals to walk or bicycle to reach their destinations instead of taking motorized transport. This in turn enables individuals to achieve savings on motorized transport costs. Thus, SUPs not only provide greater access to commercial locations; they also have the potential to reduce transport costs, therefore enabling individuals to spend more in local economies.

As SUP users spend money, their expenditures provide direct, indirect, and induced economic impacts on a region's jobs, wages, and output. For example, as an SUP user spends money in a commercial enterprise it directly supports jobs, wages, and the business output of that enterprise. Additionally, SUP user expenditures indirectly support jobs, wages, and the business output of firms that supply the commercial enterprise where the SUP user made his/her purchase. Finally, when the employees of the commercial enterprise and the firm receive their paychecks, the purchases they make support additional jobs, wages, and business output (induced effect).

KEY FINDINGS IN THE LITERATURE

A number of studies document the positive relationship between bicycle and pedestrian facility use and economic activity. Some of the well-established studies and their findings are included below:

- ***Vasa Pathway Study –*** Regular trail users provide $23.5 million of direct spending annually in Michigan, with 6,200 trail users spending approximately $3,700 on average for equipment, lodging, clothing, and other goods. Trail events contribute $2.6 million annually in direct spending, primarily in months outside of the peak travel season.[18]
- ***Ludlam Trail Study –*** Expenditures related to trail use are expected to be between $3.2 million and $8 million annually based on research of expenditures from fourteen comparable suburban and urban trails conducted by the Rails-to-Trails Conservancy in 2009.[19]
- ***American Tobacco Trail –*** After the construction of a pedestrian bridge, a critical link in the trail, the use of the ATT increased 133%, and direct expenditures related to trail use rose 154%, supporting an estimated increase of 43 jobs and $4.9 million in gross revenue annually. Annual direct expenditures on groceries, retail, and restaurants related to trips on the trail rose from approximately $2.4 million pre-bridge to $6.1 million post-bridge – an increase of $3.7 million.[20]
- ***Greater Allegheny Passage –*** On average, businesses in the proximity of the trail attributed one-quarter of gross revenue to trail users.[21]
- ***Three Rivers Heritage Trail -*** An estimated 622,873 trail users in 2014 purchased $1,842,288 in "hard goods" (bikes, bike supplies, auto accessories, shoes, and clothing-purchases) and $5,866,660 in "soft goods" (drinks and food items) as a result of trail use.[22]
- ***Paved Trail Network in Ohio*** – 15% of the estimated 772,000 annual bicyclists, hikers, and equestrians who used the trails came from other parts of Ohio, using the trail network as tourists. Their spending is estimated to be $13 million annually as a result of trail visits.[23]



- ***Oregon Non-motorized Trails*** - Statewide, non-motorized trail use by Oregon residents supports 21,730 jobs, $672 million in labor income, and $1.0 billion in value added. Inclusion of out-of-state trail users is estimated to add another 12%.[24]
- ***Yellowstone-Grand Teton Loop*** – Pathway users provide a direct impact of $84,412,406, create or sustain more than 1,540 jobs, and support more than $48 million in labor income.[25]
- ***Erie Canalway Trail -*** Visitor spending along the ECD resulted in approximately $253 million in sales, 3,440 jobs, $78 million in labor income, and $28.5 million in taxes in the local economy each year.[26]

METHOD FOR DERIVING SUP USER EXPENDITURES

When a SUP user makes an expenditure, it directly supports an incremental change in jobs, wages, and output in the economy. This incremental impact gives rise to indirect and induced impacts in the economy. An input/output model can be used to derive the incremental changes that occur as a result of expenditures, because it models the linkages between the sales and purchases of goods and services between all sectors of the economy for a given period of time. In each of the above studies of user expenditures on trails, similar methods were used to capture expenditure data.

Table 4: Method and Outcome for Evaluating SUP User Expenditure Impacts

Method	Outcome	Study
Survey SUP users for expenditures and input these into I-O model	Effect on jobs, wages, and gross regional product	Input/output method used in multiple studies

CAPITAL AND OPERATIONAL EXPENDITURE IMPACTS

The process of building and maintaining shared use paths has an impact on the economy. The construction of the path (capital expenditures) and the ongoing operations and maintenance activities associated with an SUP's upkeep (operational expenditures) support jobs, wages, and output. For example, capital expenditures used to pay for the construction of a SUP support project engineers, construction workers, and manufacturers of SUP construction inputs. Meanwhile, operational expenditures support maintenance workers, planners, and other workers that maintain SUPs. After these workers collect their paychecks, they may spend their income at restaurants, grocery stores, or other commercial outlets creating further support for a region's economy.

KEY FINDINGS IN THE LITERATURE

A number of studies document the positive relationship between expenditures and economic activity. A North Carolina transit system study highlighted below specifically looks at the economic impact of capital and operational expenditures:

- ***Economic Benefits of Transit –*** Capital and operational expenditures of transit systems in North Carolina support an estimated 9,340 jobs, $350 million in wages, and $230 million in gross state product.[27]
- ***Pedestrian and Bicycle Infrastructure: A National Study of Employment Impacts*** – Bicycling infrastructure is estimated to create the most jobs of any modal infrastructure development based on a given level of spending. For every $1 million spent on multi-use trails it is estimated that 9.6 jobs are created. This compares to an estimated 7.8 jobs created for every $1 million in road infrastructure only (with no bicycle or pedestrian components).[28]

- ***Economic Impact Analysis: Trans Canada Trail in Ontario*** **–** A range of 11 trail development types and per unit prices of trail inputs were used to derive construction cost estimates. Over 42,000 jobs, $2.4 billion in value added, and $1.04 billion in tax revenue can be attributed each year to capital and operational expenditures for the Trans Canada Trail.[29]
- ***Economic Impact of San Gabriel River Trail*** **–** The County of Los Angeles Department of Parks and Recreation supported approximately $630,688 in economic activity, $250,935 in labor income, and 5 jobs as a result of its expenditures for trail operations and maintenance.[30]

METHOD FOR DERIVING SUP CAPITAL AND OPERATIONAL EXPENDITURE IMPACTS

Capital and operational expenditures directly support incremental changes in jobs, wages, and output in the economy. These incremental impacts give rise to indirect and induced impacts in the economy. An input/output model can be used to derive the incremental changes that occur as a result of expenditures, because it models the linkages between the sales and purchases of goods and services between all sectors of the economy for a given period of time.

Table 5: Methods and Outcomes for Evaluating Capital and Operational Expenditure Impacts

Method	Outcome	Study
• Determine annual average capital and operational expenditures • Model economic effects of capital and operational expenditures with an I-O model	Effect on jobs, wages, and gross regional product	Economic Benefits of Transit

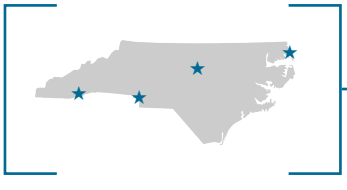
PROPERTY VALUE IMPACTS

Properties in many cities and counties around the United States have experienced notable economic benefits when in proximity to shared use paths. Properties near SUPs often experience both higher real estate values and higher rates of value increases, when compared to similar properties that are not close to an SUP. In addition, properties located by SUPs have been shown to sell faster than those of similar size and character that are not by SUPs. Furthermore, recreational, health, aesthetic, and transportation benefits that SUPs provide are promoted by real estate agents and advertisements to signal a higher market value for properties near SUPs.

KEY FINDINGS IN THE LITERATURE

A number of studies document the positive relationship between SUPs and property values. Some of the well-established studies and their findings are included below:

- ***Eastern Trail Study*** **-** Property values within one-half mile of the Eastern Trail are conservatively valued five percent higher than similar properties outside of trail proximity.[31]
- ***Ludlam Trail Study*** **-** The presence of the Ludlam Trail is expected to increase property values within one-half mile of a proposed public access point, at an annual pace of 0.32 percent to 0.73 percent faster than other properties throughout Miami-Dade County.[32]
- ***Mountain Bay Trail Study*** **-** Properties located immediately adjacent to the Mountain Bay Trail were sold at values that were nine percent higher on average than those of similar size and character.[33] In addition, the lots along the trail sold faster than those outside of trail proximity.[34]



- ***Burke-Gilman Trail Study -*** Property near but not immediately adjacent to the Burke-Gilman Trail is significantly easier to sell and, according to real estate agents, sells for an average of six percent more as a result of proximity to the trail.[35] Property immediately adjacent to the trail, however, is only slightly easier to sell than property not in proximity of the trail.[36]
- ***Indianapolis Cultural Trail -*** The change in total assessed property value, from 2008 to 2014 was an increase of $1,013,544,460 for properties within 500 feet of the entire Cultural Trail.[37]
- ***Chattanooga Parks –*** As a result of cleaning the air, acquiring open space, and creating parks and trails, property values rose more than $11 million, an increase of 127.5 percent.[38]
- ***Little Miami Scenic Trail -*** In southwestern Ohio, property values in urban, suburban, and rural settings increased by about $7 for every foot closer it was to the trail, up to a mile away. A home a half mile from the trail would sell for approximately nine percent less than a home adjacent to the trail.[39]
- ***Trail in Austin, Texas –*** Views of a greenbelt in Austin's trail system and direct neighborhood access to the trail provided homeowners with property value premiums ranging from 6 to 20 percent. The price premiums generated approximately $59,000 per year in additional property tax revenue or five percent of the annual cost of trail construction and maintenance.[40]

METHODS FOR DERIVING SUP IMPACTS ON PROPERTY VALUES

Property value assessments, real estate advertisements, property owner surveys, and interviews with real estate professionals provide quantitative and qualitative measures to ascertain the effects SUPs have on property values. Table 6 describes the outcomes of these methods. Perhaps the most relevant and data-driven approach involves comparing property values within a given proximity to an SUP with those outside of an SUP's influence. To do this, GIS applications can be used to evaluate land parcels within an SUP's proximity and those outside an SUP's influence. Assessor's data or sales prices can be evaluated over time to see how property values and their rates of increase compare within and outside an SUP's proximity (if SUP construction and operation dates are available).

Table 6: Methods and Outcomes for Evaluating SUP Impacts on Property Values

Method	Outcome	Study
Assess land parcels within and outside SUP proximity with GIS	Quantitative measures for property value impacts of SUPs	Eastern Trail, Ludlam Trail, Mountain Bay
Mail survey to residents within SUP area of influence	Qualitative measures for how residents value SUPs	Burke-Gilman, Impact of Rails-to-Trails, Indiana Trails Study
Interviews with real estate professionals	Qualitative measures for how real estate agents value SUPs	Burke-Gilman, Impact of Rails-to-Trails, Indiana Trails Study
Bi-weekly review of newspaper real-estate ads and magazines	Quantitative measure for whether properties were being advertised as in proximity to SUPs	Burke-Gilman Trail

PROPERTY TAX IMPACTS

Properties in many cities and counties around the United States have experienced notable economic benefits when in proximity to shared use paths. Properties near SUPs often experience both higher real estate values and higher rates of value increases, when compared to similar properties that are not in range of an SUP. Increases in property value lead to larger revenue generated through property taxes, which benefits local jurisdictions and school districts.

Ludlum Trail (Credit: LudlumTrail.org)

KEY FINDINGS IN THE LITERATURE

There is a positive relationship between SUPs and property taxes. Below are two SUP-related studies and their findings regarding property tax impacts:

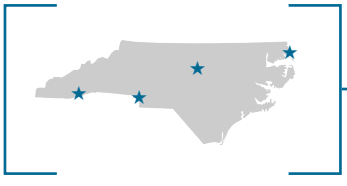
- ***Ludlam Trail*** **–** Based on increased property values, Miami-Dade County and other surrounding jurisdictions will receive between $98,000 and $229,000 annually in additional property tax revenues. Over a 25 year period, that amounts to between $2.47 million and $5.74 million.[41]
- ***Barton Creek Greenbelt*** **–** Austin received approximately $59,000 per year in taxes due to increased property values near this large public park with hiking trails in the Barton and Travis neighborhoods.[42]

METHODS FOR DERIVING SUP IMPACTS ON PROPERTY TAXES

In the Ludlam Trail study, property taxes were estimated based on varying millage rates for each taxing jurisdiction. In addition, property tax collections were also dependent on low and high estimates of property value outcomes that were likely to result from those properties that exist within the trail's walkable area (½ mile of public access point). Based on an analysis of comparable trails from across the country, the Ludlam Trail study estimated that property values within the trail's walkable area would increase at an annual rate of 0.32% to 0.73% higher than the rate of other properties throughout Miami-Dade County.[43] Table 7 demonstrates the formula used in this study. Commercial and residential properties were also taken into account when determining the property tax benefit.

Table 7: Method and Outcome for Evaluating SUP Impacts on Property Taxes

Method	Outcome	Study
[[Total Walkable Area Taxable Property Value Increase] / [1000] x [Jurisdictional millage rate]]	Estimate of annual property tax premium collected as a result of a property existing within a trail's walkable area	Ludlam Trail
[Number of properties] x [Assessed value of properties within trail proximity - Assessed value of similar properties outside trail proximity] x [Property tax millage rate] = Additional Property Tax Revenue	Estimate of annual property tax premium collected as result of property existing within a trail's proximity	Barton Creek Greenbelt



RETAIL SALES TAX IMPACTS

Businesses in many cities and counties around the United States have experienced notable economic benefits when in proximity to shared use paths. Commercial/retail establishments near SUPs often experience an increase in SUP related expenditures and retail productivity rate (sales per square foot) due to their proximity to an SUP. In addition, businesses located near SUPs have often been able to increase operations by hiring more staff due to increased business from the SUP. These increased business and operations leads to greater sales tax revenue which benefits the state and local jurisdiction.

KEY FINDINGS IN THE LITERATURE

A number of studies document the positive relationship between SUPs and retail sales tax. Some of the well-established studies and their findings are included below:

- ***Ludlam Trail –*** Retail expenditures related to the Ludlam Trail are expected to be between $3.19 and $8 million annually. Given the national average retail productivity rate (sales per square foot) of $300, these sales would support between 10,500 and 26,500 additional square feet and 27 to 68 new jobs. Miami-Dade County will receive between $31,900- $80,000 in sales tax from trail related expenditures while the State of Florida will receive between $191,400 - $484,000 annually in sales tax.[44]
- ***Great Alleghany Passage –*** On average, business owners within proximity to the Great Alleghany Passage attributed one-quarter of gross revenue to trail users, and two-thirds of business owners reported that they experienced at least some increase in revenue due to their proximity to the trail. One-quarter of the businesses have also expanded and/or hired additional staff due to the trail. $23.9 million worth of receipts (actual revenue) was attributed to the trail and $4.4 million worth of wages were paid to employees of those businesses.[45]
- ***Swamp Rabbit Trail –*** Surveys of nearby businesses indicate that sales/revenues have increased with a range of 10% to 85% and have amounted to as much as a $400,000 increase in annual revenue.[46]
- ***Orange County Trails (FL) –*** Surveys specifically looking at the West Orange Trail, surveyed 31 Downtown Winter Garden businesses. Average annual revenues were $470,000 and total business sales were $14.6 million. A REMI model then analyzed that data to determine that the West Orange Trail supported 61 jobs and represented a direct and indirect estimated positive economic impact of $5 million for Downtown Winter Garden.[47]

METHODS FOR DERIVING SUP IMPACTS ON RETAIL SALES TAXES

Based on a Rails-to-Trails Conservancy Study in 2009, the lowest per person trail expenditure documented was $3.71 while the average per person expenditure documented was $9.30. These expenditure values served as high and the low estimates for Ludlam Trail expenditures per user. Once these high and low values were established, they were used to estimate county and state retail sales tax collections.

Estimating county and state retail sales tax can be done with an economic model, as demonstrated in the West Orange Trail study. Business sales from trail expenditures are direct inputs into the model, and the sales tax revenue from direct, indirect, and induced business sales are modeled. Table 8 demonstrates the formulas used in Ludlam Trail and the West Orange Trail studies.

Table 8: Method and Outcome for Evaluating SUP Impacts on Retail Sales and Taxes

Method	Outcome	Study
[Retail Expenditures from Survey] / [$300 per square foot*]]	Retail Square Footage Supported	Ludlam Trail
[[Retail Expenditures from Survey] / [% Sales Tax in County]]	County Retail Sales Tax Collections Supported	Ludlam Trail
[[Retail Expenditures from Survey] / [4.75% Sales Tax in State**]]	North Carolina Retail Sales Tax Collections Supported	Ludlam Trail
Input retail expenditures from survey into I-O model	Retail Sales Tax collections Supported	West Orange Trail

***North Carolina Sales Tax Amount*

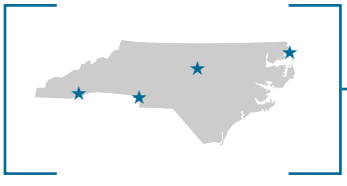
HEALTH BENEFITS

Using an SUP increases the physical activity level of bicyclists and pedestrians, which gives rise to reductions in health care costs due to decreases in mortality (rate of death) and morbidity (rate of disease) related to obesity and other health conditions.[48] Improvements in physical health not only benefit individuals, but also improve local, regional, and national economies by obviating health care expenditures and reducing absenteeism in the workplace.[49]

KEY FINDINGS IN THE LITERATURE

A number of studies document the positive relationship between increases in physical activity resulting from bicycle/pedestrian facilities and benefits to the overall economy. Some of the studies and their findings are included below:

- ***The Intertwine Trail*** **–** The trail provides its users $55.2 million (bicycling) and $26 million (pedestrian) in savings, for a total annual healthcare cost savings of $81.2 million.[50]
- ***Michigan Trails Statewide*** **–** Bike/ped facilities enabled their users to avoid $256 million in annual healthcare costs and contributed to $187 million of Michigan's gross state product as a result of reduced absenteeism associated with increased physical activity.[51]
- ***Jobs in Green and Healthy Transport*** **-** 9,400 premature deaths could be avoided each year if the 56 cities researched in this report had the same level of cycling as Copenhagen.[52]
- ***The Burden of Physical Activity-Related Ill Health in the UK*** **–** Physical inactivity is responsible for 1% of Disability Adjusted Life Years (DALYs) lost globally and for 3% of those lost in established market economies.[53]
- ***Lincoln, Nebraska*** **-** The annual direct health benefit of using a trail was $564.41 in 1998. Thus, the cost-benefit ratio was $564.41/$192.12 = 2.94, which means that every $1 investment in using trails led to $2.94 in direct medical benefit.[54]
- ***Health costs of motorized transport*** **–** A study on the costs of motorized transportation found obesity-related healthcare costs accounted for as much as 9.1 percent of the country's total health care spending in 2002. Meanwhile, the health costs associated with air pollution from transportation are estimated to range from $50 to $80 billion per year (2008) when accounting for healthcare costs and premature death.[55]
- ***Jackson Hole Trails*** **-** Thirty-six percent of respondents ride, hike or run for 3-5 miles on average and another 30% recreate for six to ten miles on average. A significant portion of trail users (54.5%) use the trail system more than twice a week, with 33% using it 2-4 times per week and 21.5% utilizing the trail 5-7 times per week.[56]



- ***Ludlam Trail -*** The development of Ludlam Trail will save the community between $1.68 million and $2.25 million annually in direct medical costs related to lack of physical exercise while leading to approximately 4,931 to 6,579 area residents becoming new exercisers. Based on the reduction of approximately 860,700 vehicle trips, the following vehicle emissions will be reduced annually:
    - 5,308 fewer lb. of hydrocarbons
    - 39,622 fewer lb. of carbon monoxide
    - 2,635 fewer lb. of oxides of nitrogen
    - 394 fewer tons of carbon dioxide[57]

METHODS FOR DERIVING HEALTH IMPACTS

The Michigan Department of Transportation (MDOT) implemented methodologies to derive health care costs that could be avoided in Michigan as a result of bicycling.[58] These costs included: strokes, heart disease, and absenteeism in the workplace.

- MDOT applied annual direct and indirect costs of stroke and heart attack, as well as the cases that occurred as a result of a lack of physical activity. MDOT then paired this information with the proportion of residents who reported riding their bicycle two or more days each week to derive the total avoided costs for strokes and heart disease throughout the state.
- MDOT implemented the London School of Economics' estimates stating that active bicyclists miss one less day of work per year than non-bicycling workers. MDOT paired this information with research published in the Journal of Occupational and Environmental Medicine to estimate the total value of added productivity that results from active cycling.

A United Kingdom study estimates the burden of ill health related to physical inactivity in terms of direct health care costs.[59] Similar to the MDOT study, it derives health care costs that arise from physical inactivity. It uses the following methods to derive health care costs:

- Identification of diseases where inactivity is a risk factor
- Calculation of the total number of deaths and DALYs lost for these diseases
- Identification of the population attributable fractions (PAFs) for each disease
- Application of PAFs to National Health Service (NHS) cost data, to calculate direct costs of physical inactivity to the NHS

The Centre for Diet and Activity Research (CEDAR), a partnership of researchers and medical professionals, developed the Integrated Transport & Healthy Impact Model (ITHIM) to compare the health effects of various transportation scenarios and interventions based on changes in levels of physical activity, road traffic injury risk, and exposure to fine particulate matter air pollution. ITHIM can be used to estimate the following:

- Reduced Burden of Disease - the reduced risk of various diseases associated with physical inactivity and exposure to air pollution and their associated economic value.
- Overall Mortality Rate - the number of attributable deaths from any cause and its associated economic value.
- Disability-adjusted Life Years - the number of lost years of living with an ideal health situation, free of disease of disability, and its associated economic value.

The Health Economic Assessment Tool (HEAT) for walking and for cycling is another tool that was developed to assist with conducting an economic assessment of the health benefits of walking or cycling by estimating the value of reduced mortality that results from specified amounts of walking or cycling. The tool seeks to answer the question, "if x number of people regularly walk or cycle for y amount of time, what is the economic value of the health

benefits that occur as a result of the reduction in mortality due to their physical activity?" The tool can also be used to determine the health effects of road crashes and air pollution as well as the effects on carbon emissions. The overall reduction in mortality is calculated as an aggregate of reduced mortality due to physical activity, air pollution risk, and crash risk in combination with reduced carbon emissions relative to bicycle and pedestrian travel volumes. Data inputs include the number of people affected, levels of walking/cycling, and the average duration or distance walked/cycled.

COMPARING METHODS

The MDOT study, UK study, and ITHIM methodologies focus on direct health care costs that arise from physical inactivity. The HEAT model is designed for assessing adult populations, not individuals, and for habitual (long-term average) walking or cycling behavior. Since the tool applies evidence from studies of the general population, it is not suitable for assessing populations with very high average levels of walking or cycling. Similarly, the HEAT air pollution assessment should not be applied to environments with very high levels of air pollution since the tool applies evidence from studies carried out in areas with low or medium levels of air pollution.

Since the most recently released version of the HEAT (2017) is designed for assessing health benefits for WHO European Region countries and limits the selection of geographic scale to these countries and their cities,[60] no further evaluation of this tool was pursued for this project. Previous versions of the tool applied background values derived from studies conducted outside of the United States,[61] and were deemed unsuitable for evaluation compared to the more customizable and directly applicable methods that were chosen to be investigated in this study.

MDOT's study estimates the health benefits that result from cycling in terms of avoided stroke and heart disease incidents. The UK study estimates the morbidity economic burden of heart disease, ischaemic stroke, breast cancer, colon cancer, and diabetes. HEAT, on the other hand, estimates the value of reduced mortality due to walking and cycling. ITHIM estimates the reduced risk of breast cancer, colon cancer, dementia, depression, diabetes, ischemic heart disease, lung cancer, respiratory diseases, and stroke associated with an increase in levels of physical activity. For example, ITHIM showed Portland planners that policies and investments to lower greenhouse gas emissions could save up to 133 lives each year.[62] ITHIM findings have also demonstrated that making walking and biking safe and convenient, and providing incentives to expand the use of travel options, could contribute to reducing health care costs by as much as $100 million by 2035.[63]

While all four approaches monetize the health benefits from changes in levels of physical activity, ITHIM captures both bicycling and walking and includes a more comprehensive list of associated diseases. However, the data requirements for ITHIM are more complex and time intensive to obtain, and the model must be re-calibrated for each new study region. HEAT is more user-friendly and can be tailored to account for benefits; however, the primary disadvantage of HEAT is that it is based on European data, so some of the model's underlying assumptions and formulas may not transfer accurately to reflect regions in the United States. According to a presentation by WHO Regional Office for Europe in 2010, the Center for Disease Control (CDC) is working on adapting the HEAT for use with data from the United States.[64]

One advantage of MDOT's methodology, however, is that it also considers the avoided costs of absenteeism in the workplace attributed to active cycling. In addition to HEAT and MDOT methodologies, the UK study provides a methodology to derive the direct costs of physical inactivity in terms of health care costs. It is similar to MDOT's methodology, but more complex.

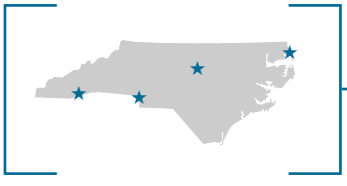


Table 9: Methods and Outcomes for Evaluating How Physical Activity of SUP Users Impact the Economy

Method	Outcome	Study
• Data on proportion of conditions caused by physical inactivity from WHO and number of cases of these conditions. • Data on number of cases of these conditions from CDC. • Data on annual direct and indirect costs per case. • Proportion of residents who report riding their bicycle two or more days each week in the household survey	Total avoided costs for stroke and heart disease	Michigan Trail Statewide, UK Study
Survey data about cycling frequency to be combined with daily value of productivity from the Journal of Occupational and Environmental Medicine	Estimate of the value of productivity gained from active cycling (can be tailored to specific path)	Michigan Trail Statewide
Survey data about travel mode, alternative modes available, trip purpose, distance, duration, and frequency can be combined with mortality rate, collision rates, and air pollution exposure as inputs into ITHIM	Will enable ITHIM to estimate health benefits	Centre for Diet and Activity Research's Home Page for Integrated Transport and Health Impact Modeling Tool

SOCIETAL BENEFITS

Motorized transport results in external costs such as congestion, pollution, and collisions that negatively impact society. Walking or biking, however, have much lower or even negligible external costs. Thus when individuals utilize shared use paths in lieu of motorized transport, congestion, pollution, and safety benefits result. The following benefits are described below:

- ***Congestion Benefits*** **–** Prolonged commutes resulting from traffic congestion have a negative effect on economic productivity and fuel usage. Switching from driving to walking or biking lowers the external costs on society related to congestion.
- ***Pollution Reduction*** **-** Motor vehicle use results in air and noise pollution. Switching from driving to walking or biking lowers the external costs of motor vehicles on society and creates a pollution reduction benefit.
- ***Enhanced Safety*** **-** Shifts from driving to active modes tend to reduce total per capita crash rates in an area, thus providing a safety benefit.[65]

KEY FINDINGS IN THE LITERATURE

A number of studies discuss the societal benefits that bike facilities provide, but do not provide an economic valuation for these benefits. The Congressional Budget Office (CBO) and the Victoria Transportation Policy Institute, however, monetize the external costs of automobile travel and thus provide a method to determine the benefits of active transport when compared to the automobile. The following valuation findings are provided below:

- ***Congestion Benefits*** **–** Congestion costs associated with driving are estimated to be 2 cents per vehicle mile in rural areas and 9 cents per vehicle mile in urban areas.[66]

- ***Pollution Reduction*** **–** Air pollution costs associated with driving are estimated to be approximately 2 cents per mile in rural areas and 2.5 cents per mile in urban areas.[67] Noise pollution costs from driving are estimated to be 0.25 cents per mile in rural areas and 0.5 cents per mile in urban areas.[68]
- ***Enhanced Safety*** **-** Net safety benefits provided by automobile to active travel shifts are estimated to average 5 cents per urban peak mile, 4 cents per urban off-peak mile, and 3 cents per rural mile.[69]

METHODS FOR DERIVING SOCIETAL BENEFITS

Surveys can be used to estimate the societal benefits that arise from the utilization of shared use paths when used in conjunction with the economic valuation of external costs. Knowing origins, destinations, and whether or not SUP users would have made the trip by another mode, if an SUP were not available, are key pieces of survey information. This information, when used in conjunction with the external costs of motorized transportation, provides an approach for deriving societal benefits. This approach is outlined below:

- If an individual would have made the trip with motorized transport if the SUP were not available, it would provide a Type A benefit:
  - Society benefits by not experiencing the external costs of motorized transport (congestion, pollution, safety).
- If an individual would not have made the trip if the SUP were not available it would provide a Type B benefit:
  - User benefits by gaining access to a leisure, commerce, school, work, or other destination.

Table 10: Method and Outcome for Evaluating Societal Benefits of Shared Use Paths

Method	Outcome	Study
Survey bike/ped commuters on SUPs about origin, destination, and whether or not they would have made that trip if the SUP did not exist	Will enable research team to estimate Type A societal benefits or Type B user benefits (see above)	CBO: Alternative Approaches to Funding Highways VTPI: Evaluating Active Transport Benefits and Costs

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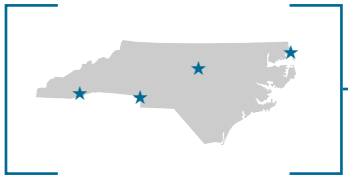
66. *"Alternative Approaches to Funding Highways," Congressional Budget Office, March 2011. https://www.cbo.gov/sites/default/files/03-23-highwayfunding.pdf*

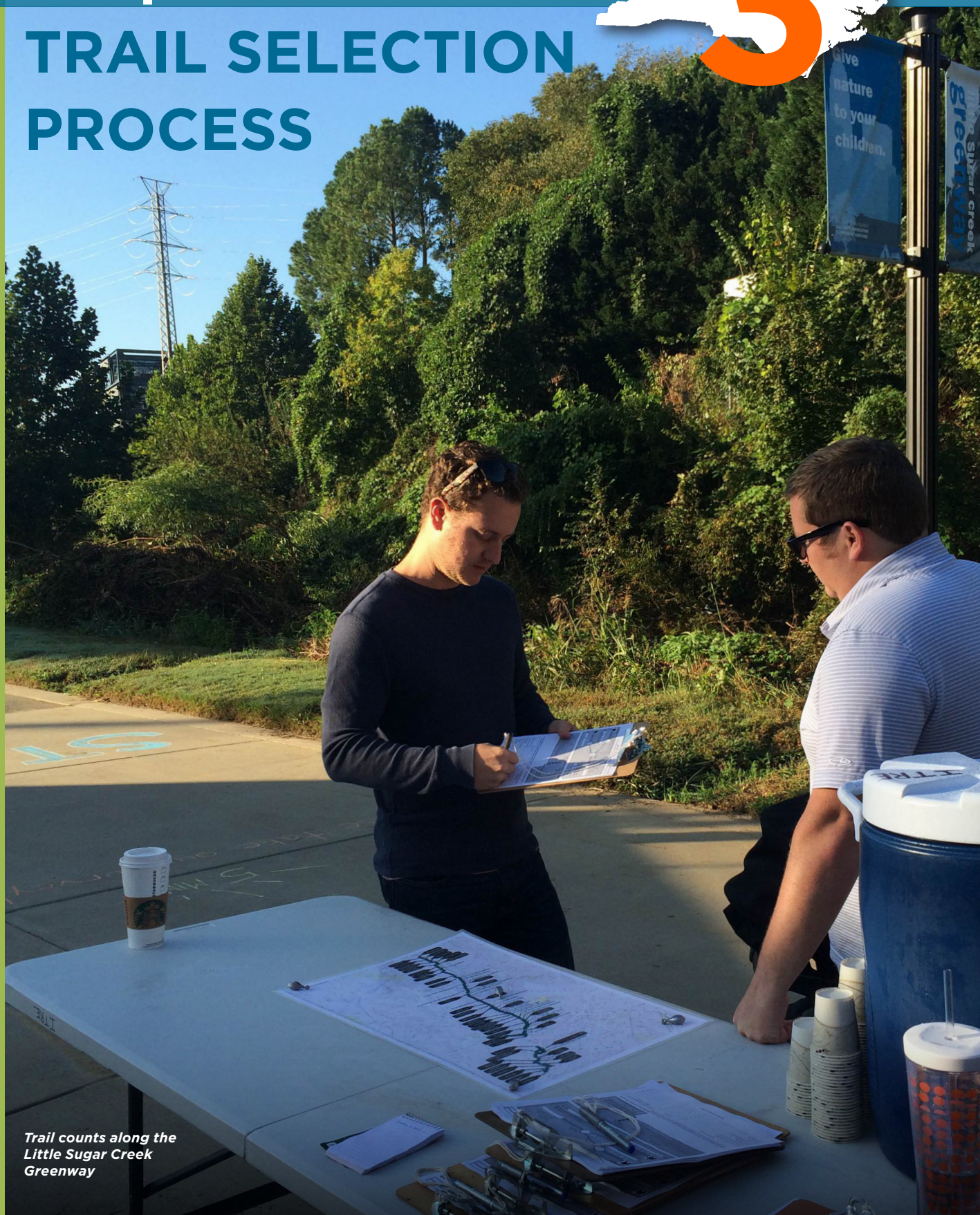
67. *Ibid*

68. *Ibid*

69. *"Evaluating Active Transport Benefits and Costs," Victoria Transport Policy Institute, February 2015. http://www.vtpi.org/nmt-tdm.pdf*



Chapter Three
TRAIL SELECTION PROCESS



Trail counts along the Little Sugar Creek Greenway

OVERVIEW

Four different SUPs were evaluated across the three-year project for a total of eight separate test cases of the methodological framework. These trails were selected through a series of objective criteria to provide a balance of different types of SUPs based on land use contexts, user types, trip purposes, and other characteristics. They were arranged into the eight cases as shown in Table 1 to explore the implications of temporal aspects on data collection and results and, ultimately, to test the reliability of the methodology designed.

CASE STUDY SELECTION CRITERIA

Selection criteria were established via discussion with the project's Steering and Implementation Committee, which was comprised of representatives from NCDOT Division of Bicycle and Pedestrian Transportation, NCDOT Strategic Planning, NC Department of Commerce, and NC Parks and Recreation, to identify candidate SUPs to be considered in the research. SUPs were screened to meet the following criteria:

- ***Have a state or regional significance.*** Defined as trails of approximately five 5 miles of ADA-accessible surface, such as asphalt, and those which have a greater ability to draw in visitors
- ***Have good opportunities to capture economic revenue.*** i.e. has commercial land uses adjacent or nearby
- ***Will not be impacted by new trail construction, significant maintenance, or be subject to detouring the trail due to intersecting road projects within the project period.*** The research was not intended to evaluate economic impacts from event changes or interventions, like a before-after study design.
- ***Be relatively 'established.'*** New paths that have been constructed within the last five years may not be as well established within the community to reap all the economic benefits that may occur from future development on and near the trail. Paths where much of the land use adjacent to and around the trail is already developed, or where no significant new development is expected within the project timeframe, were prioritized.
- ***Have the ability to demonstrate a transportation function.*** Loop paths that clearly do not serve a transportation function were not considered. Paved trails were prioritized, given that NCDOT will only assist in funding future trails that are paved. Hard-packed crush gravel paths, or paths of other surface material that are ADA-accessible, were considered. Single-track hiking trails were outside the scope and definition of a SUP.
- ***Have a good geographic dispersion across the state.***
- ***Have a good mix between urban and rural paths.*** Urban defined as being within an MPO, and rural defined as being within an RPO.

Using the Pedestrian and Bicycle Infrastructure Network,[1] GIS data were mined to identify candidate SUPs and narrow the list based on trail length and geographic dispersion across the state.

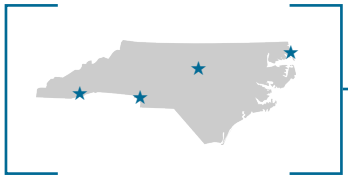


Table 11: Candidate SUPs as of 2015 Evaluated for Study Suitability

Trail Name	Primary SUP Type	Expected Usage Type	Apprx. Mileage	County	Cities	Region	MPO/RPO	NCDOT Div.
Neuse River Greenway	Riparian	Recreation	27.5	Wake / Johnson	multiple	Triangle	CAMPO	4 / 5
American Tobacco Trail	Rail Trail	Mixed	22	multiple	multiple	Triangle	DCHCMPO / CAMPO	5
Bicentennial Greenway	Riparian	Recreation	16.5	Guilford	Greensboro	Piedmont	GUAMPO	7
Walnut Creek Greenway	Riparian	Mixed	15.6	Wake	Raleigh	Triangle	CAMPO	5
Crabtree Creek Greenway	Riparian	Mixed	14.6	Wake	Raleigh	Triangle	CAMPO	5
Black Creek / White Oak Greenway	Riparian	Recreation	11.8	Wake	Cary	Triangle	CAMPO	5
Nags Head Path	Sidepath	Mixed	11.4	Dare	Nags Head	Coast	Albemarle RPO	1
Camp Lejeune Rails to Trails Greenway	Rail Trail	Mixed	9.8	Onslow	Jacksonville	Coast	Jacksonville MPO	3
Salem Creek Greenway	Riparian	Mixed	8	Forsyth	Winston-Salem	Piedmont	W-S Forsyth MPO	9
Atlantic & Yadkin Greenway	Rail Trail	Mixed	7.9	Guilford	Greensboro	Piedmont	Greensboro MPO	7
Duck Trail	Sidepath	Mixed	7.6	Dare	Duck	Coast	Albemarle RPO	1
Yadkin River Greenway	Riparian	Recreation	7.5	Wilkes	North Wilkesboro	Mountains	High Country RPO	11
Cross City Trail	Sidepath	Mixed	7.3	New Hanover	Wilmington	Coast	Wilmington MPO	3
Mallard / Clark's Creek Greenway	Riparian	Mixed	7	Mecklenburg	Charlotte	Charlotte Metro	Charlotte Regional TPO	10
Ararat / Taylor Greenway	Riparian	Recreation	6.6	Surry	Mt Airy	Mountains	Northwest Piedmont RPO	11
Little Sugar Creek Greenway	Riparian	Mixed	5	Mecklenburg	Charlotte	Charlotte Metro	Charlotte Regional TPO	10
Emerald Isle Bike Path	Sidepath	Mixed	5	Carteret	Emerald Isle	Coast	Down-East RPO	2
Brevard Greenway	Sidepath / Riparian	Mixed	4.8	Transylvania	Brevard	Mountains	Land of Sky RPO	14
Little Tennessee River Greenway	Riparian	Recreation	4.4	Macon	Franklin	Mountains	South-western RPO	14

The SUPs in Table 11 were further reviewed, and SUPs were dropped if significant portions of the trail were unpaved, were broken up by significant gaps in connectivity (i.e. were not continuous trails), or had pending construction projects. The list was re-evaluated to select the trails that ranked highly on being well-established trails capable of generating economic-related activity and could be considered of regional significance. Finally, the list was reviewed to ensure that a balance of rural and urban trails were selected that were dispersed across the state. This process resulted in the selection of the following four SUPs to be studied:

- American Tobacco Trail (ATT)
- Brevard Greenway (BG)
- Duck Trail (DT)
- Little Sugar Creek Greenway (LSC)

Substitutes were also identified in the event that one of the SUPs above needed to be removed due to very low volumes, natural disasters, unanticipated construction or maintenance issues at the time of study, or other unforeseen circumstances.

- Crabtree Creek Greenway
- Yadkin River Greenway
- Cross City Trail
- Camp Lejeune Rails to Trails Greenway

SCOUTING AND INITIAL DATA COLLECTION

Initial data were collected on the SUPs to gain familiarity with each trail and prepare for future field work. Access points, short duration counts, and survey location feasibility data were collected through scouting trips. For each SUP, the following data were collected through this reconnaissance:

- X,Y coordinates and photo log of each access point, landmark, and trail feature
    - Description of amenities at formal trailheads
    - Intersection/trail crossings (noted if grade-separated; if at-grade, noted any crossing treatments, such as crosswalks, signage, beacons, pushbuttons, etc.)
    - Informal access points
    - Mile marker locations and numbers
    - Landmarks or other trail features (e.g. bridges, water features, wayfinding signage, etc.)
- Observation of general trail use and evidence of possible trip purposes (i.e. people wearing athletic gear, holding bags or backpacks, wearing work clothes, carrying fishing gear or binoculars, etc.)
- Documentation of adjacent land uses, business/retail anchors, and neighborhoods connected to and/or accessible from the trail
- Segment terrain (e.g. flat, rolling hills, mountainous), pavement surface (e.g. asphalt, packed crush gravel, boardwalk) and conditions, and general environmental context (e.g. forest/woodland, grassland/savanna, wetland/marsh)
- Identification and feasibility of prospective station locations to conduct intercept surveys and counts:
    - Space for table and survey respondents to stand off the trail
    - Shade availability
    - Nearby parking and loading/unloading options
    - Nearby access to restroom, water, and food

In order to collect these data, researchers bicycled the full length of the trail to take photos, capture GPS points, and document key features on paper forms associated with each series of photos and points.

VOLUME DATA

In addition to scouting out each trail, preliminary short duration counts (SDC) were collected using infrared and pneumatic tube technology. This allowed for separate bicycle and pedestrian counts by direction to be collected for approximately one week at each location where the equipment was installed. SDC equipment was installed on the four primary candidate trails and on two of the back-up trails (Crabtree Creek Greenway and Yadkin River Greenway). These counts served two main purposes: 1) to determine sufficient trail activity to warrant investment in the installation of a permanent count station; and 2) to provide insight in hourly and daily travel patterns.

Mobile count equipment was installed during the scouting trips at prospective survey and continuous count station (CCS) sites. Therefore, these sites were also assessed by criteria established through North Carolina's Non-Motorized Volume Data Program.[2]

Continuous counters were installed on two of the trails – Brevard Greenway and Duck Trail. The American Tobacco Trail and Little Sugar Creek Greenway already had CCS's in operation. These data allowed for full temporal coverage of counts on each SUP, which was used when annualizing trip data. The Brevard and Duck counters were incorporated into the Non-Motorized Volume Data Program[3] under the second phase of the program via agreements between the NCDOT and each local agency. As such, they are a part of the counter maintenance and data monitoring, management, and access elements established through that program, which includes postings of annual data reports.

AMERICAN TOBACCO TRAIL

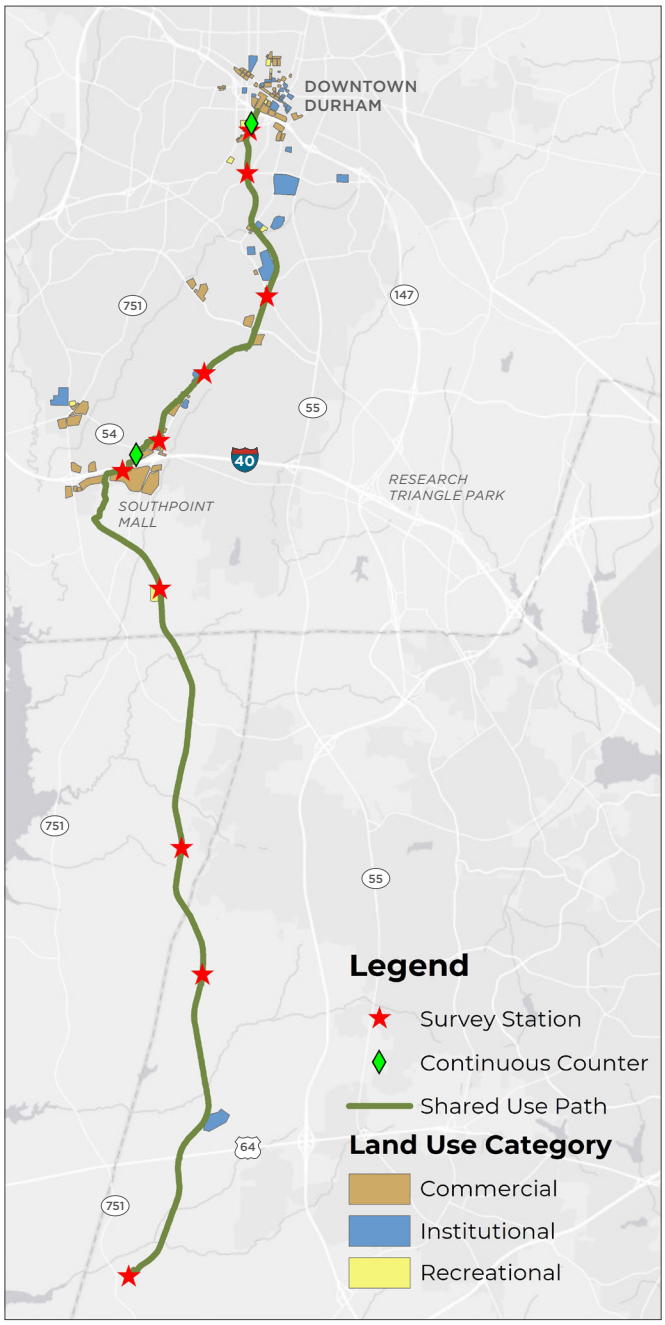
The American Tobacco Trail (ATT) is a 22-mile rail-to-trail conversion that extends through downtown Durham, several large commercial centers, and suburban and rural residential areas in Durham, Wake, and Chatham counties in North Carolina. Prior to February 2013, the trail was divided into two distinct segments by Interstate 40 at the Streets at Southpoint shopping complex. With the addition of a bicyclist and pedestrian overpass over I-40, it is now possible to travel from downtown Durham to the town of Apex on one continuous SUP.

The ATT is paved except for approximately 7 miles of compacted screenings beginning at the New Hope Church Road trail crossing and extending south to the trail terminus at New Hill Olive Church Road in Apex. The trail's northernmost terminus is located at Jackie Robinson Road in downtown Durham adjacent to the Durham Bulls Athletic Park and the American Tobacco Campus and near the Durham Performing Arts Center (DPAC). Compact urban land uses surround the northern terminus at the American Tobacco District. Retail, office and residential space are all present in a dense development pattern at this urban center.

Section Notes:

1. *North Carolina Department of Transportation. "Pedestrian and Bicycle Infrastructure Network." https://connect.ncdot.gov/projects/bikeped/pages/pbin.aspx*
2. *Jackson, K.N., E. Stolz, and C.M. Cunningham. Nonmotorized Site Selection Methods for Continuous and Short-Duration Volume Counting. In Transportation Research Record: Journal of the Transportation Research Board, No. 2527, Transportation Research Board of the National Academies, Washington, DC, 2015, pp. 49-57.*
3. *North Carolina Non-Motorized Volume Data Program. https://itre.ncsu.edu/focus/bike-ped/nc-nmvdp/*

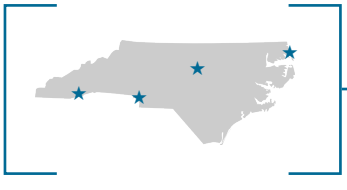
Figure 3: Map of American Tobacco Trail



Going south, the trail runs primarily through several large residential communities, neighborhoods, and townhome developments with access to the trail, including Forest Hills, Hillside, Hope Valley Farms North, Woodlake, and Woodcroft, a planned community with approximately 2,000 dwelling units. Several schools and parks are accessible from the trail including Fayetteville Street Elementary, Hillside High, and Southwest Elementary Schools and Forest Hills, Elmira, and Solite Parks. Prior to reaching I-40, the trail travels through the Southpoint Crossing area - a suburban area consisting of apartments, townhomes and two strip-developed shopping centers anchored with grocery stores – after running behind Sutton Station, a mixed use development containing retail, office, apartments, and medical services.

After crossing I-40 via a pedestrian and bicyclist overpass, the ATT goes across Renaissance Parkway and continues south approximately 14.5 miles through Durham and Chatham Counties, ending in Wake County. The large Streets at Southpoint shopping area is located just south of I-40 and can be accessed directly from the trail. The Streets at Southpoint area includes a regional mall with a movie theater, several adjacent strip shopping centers that include two hotels, and a large apartment complex off of Renaissance Parkway.

The ATT extends south through several residential communities including Huntington Ridge, Eagle's Point, Chancellor's Ridge, and The Hills at Southpoint. Many of these communities are comprised of large, single family homes. As the trail leaves Durham County, the surrounding landscape becomes more rural, and it passes through largely undeveloped land in Chatham and Wake Counties. There are no schools with access to this portion of the trail. Two parks, CM Herndon Park in Durham, and Raferty Park in Cary are accessible from the trail. The trail passes behind the Old Chatham Golf Club in Chatham County and runs adjacent to the Amberly, Georgian Village, Montvale, Weldon Ridge, and Copperleaf neighborhoods in Cary within Wake County. The trail ends at the southern terminus parking lot on New Hill Olive Chapel Road in Apex in Wake County.



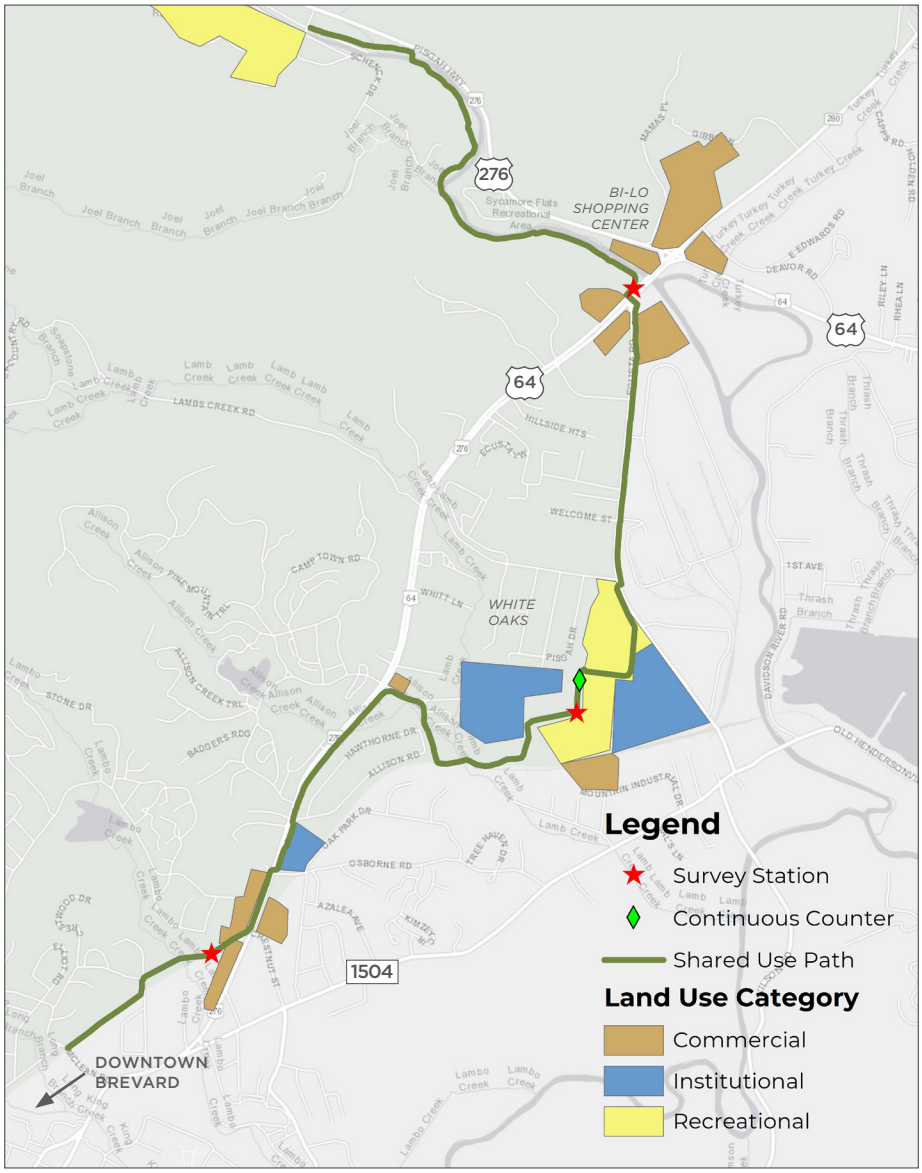
BREVARD GREENWAY

The Brevard Greenway is a 5-mile SUP that joins Pisgah National Forest to the town of Brevard, North Carolina. Beginning at the Davidson River Campground, an approximately one-mile portion of the trail follows the old Carr Lumber Company railway corridor as it parallels the Davidson River and connects to North Carolina's Mountains-To-Sea Trail. In total, the Brevard Greenway traverses a national forest, a campground, commercial areas, parkland, sporting fields, a community college, and residential neighborhoods. The path provides a link to forest trails and is popular with mountain bicyclists as well as birdwatchers.

A new connection constructed in Spring 2015 now links a regional brewery and a residential neighborhood to the trail. There is a plan to connect the path to the downtown business district, Brevard Music Center, and Bracken Mountain trail system. The Ecusta Trail is also planned to connect with the Brevard Greenway once complete.

The trail is relatively flat and has signage to indicate non-motorized travelers are present. A large portion of the trail also features high visibility crosswalks. The trail is paved with the exception of one mile of crushed gravel on the northwest section that connects to Pisgah National Forest.

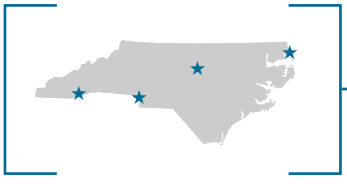
Figure 4: Map of Brevard Greenway



DUCK TRAIL

The Duck Trail is a 6-mile SUP that traverses the entire length of the Town of Duck. It connects to Southern Shores to the south. Due to the geographical constraints of the barrier island, the trail is primarily located on the east side of Duck Road as a sidepath. When traveling through the commercial Village of Duck located between Four Seasons Lane and the Duck Post Office, the trail continues on both sides of Duck Road as part of the wide shoulder. Pedestrians, bicyclists, and in-line skaters share the Duck Trail. Besides the retail center of the Village and the Four Seasons Resort, much of the trail runs through residential communities consisting of vacation rentals and second homes. North of the village, the trail runs along US Army Corps of Engineers land, smaller pockets of commercial property primarily on the west, and the Sanderling Resort before continuing into Corolla.

Figure 5: Map of Duck Trail



LITTLE SUGAR CREEK GREENWAY

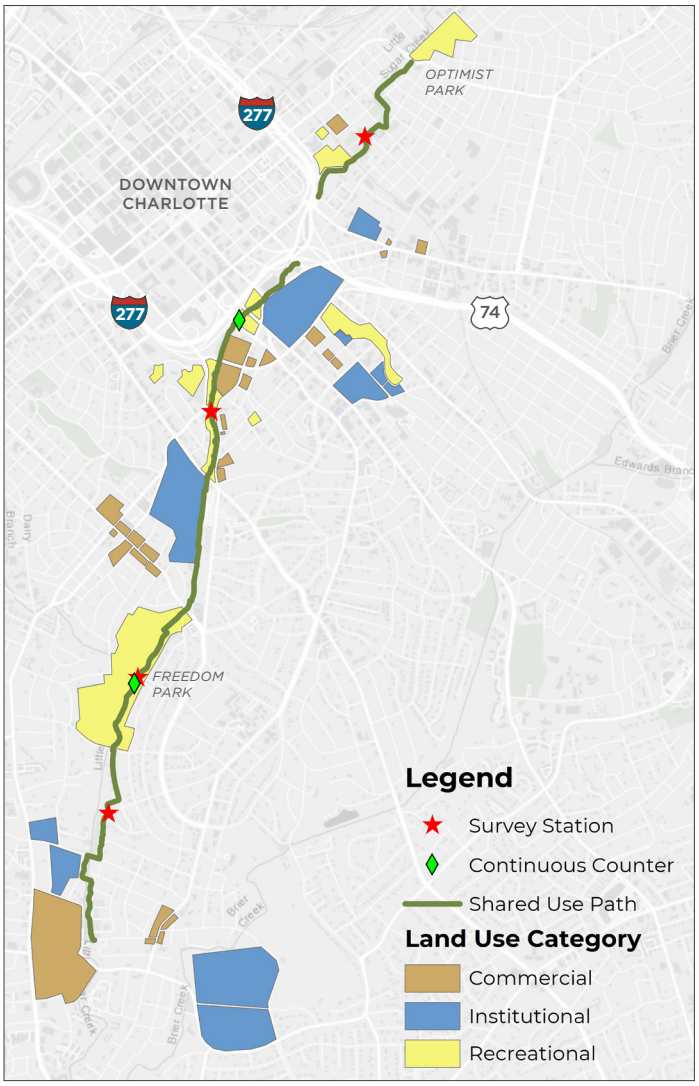
The Little Sugar Creek Greenway was conceived over 30 years ago, and planning began in earnest in 2003 with the adoption of a Master Plan for the greenway. Phase 1a of the greenway was constructed in 2002 and began in Cordelia Park. Currently, six miles of greenway exist as three unconnected segments. The northernmost segment, from Cordelia Park to Alexander Street Park on East 12th Street, is approximately one mile and primarily runs through the residential community of Belmont. The northernmost segment is fragmented from the middle segment by the urban interstate loops of I-277.

The middle segment runs approximately 3.8 miles from East 7th Street to Brandywine Road. The middle segment is anchored in Uptown near Charlotte Piedmont Community College, runs through several pocket and linear parks, and continues past the Carolinas Medical Center to Freedom Park. This segment has a short signed on-street connection before continuing as an off-road path through residential communities and ending at the back of the Park Road Shopping Center.

The southernmost existing segment traverses Huntingtowne Farms Park from Burnt Mill Road to Ramblewood Lane and is approximately 0.8 miles. Given the large distance between the Huntingtowne Farms Park segment and the southern terminus of the northern segments (approximately 2.6 miles as the crow flies), this study only considered behaviors and trail usage on the five miles of the northern and middle segments of the SUP.

When complete, the shared use path (SUP) will include over 19 miles of spine from Cordelia Park to the South Carolina state line, and connector spurs. The greenway will tie together the cultural, social, environmental, and economic history and future opportunities of the towns and neighborhoods through which it runs and is considered a crown jewel of the Charlotte area. A 2016 study identified how to connect segments of the Little Sugar Creek Greenway across the urban interstate loops, and construction is expected to begin in 2020 to make this connection.

Figure 6: Map of Little Sugar Creek Greenway



Chapter Four
METHODOLOGIES TESTED AND COMPARED

Trail counts along the Duck Trail

OVERVIEW

This chapter provides details on the approaches taken for each methodology used to understand the economic contribution of each SUP under study. Three primary types of economic benefits were valued, each using a discrete method to capture the benefits of interest:

- Impacts to businesses and employees from trail user expenditures, retail sales tax benefits, and from capital investments to build a SUP
- Impacts to land values for properties within proximity to a SUP
- User and societal health, congestion, pollution reduction, and safety benefits from the population of trail users based on how they use the SUP

The next five sections lay out the methods used for the range of economic benefits compiled. For some benefits, more than one method was tested; for each method tested the data needs and approach are described, and a discussion of considerations and lessons learned are provided. The sixth section describes the approach for collecting field data through intercept surveys and manual counts, which serve as the foundation for data needed for several of the methodologies to estimate impacts to businesses, employees, or user and societal benefits. Finally, the culmination of recommended methods based on this research project's process are displayed in a matrix table for quick reference for others interested in replicating any of these applications for estimating economic impacts of other SUPs in North Carolina.

ASSESSING USER EXPENDITURE IMPACTS ON BUSINESSES AND EMPLOYEES

Over the last decade, a number of businesses have deliberately chosen to locate near bicycle and pedestrian paths because of their draw for repeat customers and increased foot-traffic.[1, 2, 3, 4] As bicyclists and pedestrians make purchases at stores, restaurants, hotels, or various other types of commercial establishments, it generates revenue for businesses and supports the region's economy. This traditional type of economic contribution can be understood by knowing direct trip expenditures on different types of goods and services and feeding that input into a model that applies multipliers to explain how those dollars contribute to indirect and induced values.

Trail user survey response data were used as inputs into an economic model that could estimate the effect shared use paths had on North Carolina's businesses and their employees.

Economic Input/Output Model

IMPLAN (IMpact Analysis for PLANning) is an input/output economic model that traces how monetary transactions circulate through the economy to support jobs, earned wages, and business outcome. It provides a snapshot of the economy, detailing the sales and purchases of goods and services between all sectors of the economy for a given period of time.[5] IMPLAN is one of the most widely used and accepted economic impact modeling systems in the U.S., has been accepted in the U.S. court system, and is used in many regulatory settings.[6]

Expenditure profile inputs into IMPLAN yielded model outputs which demonstrated the economic contribution of the American Tobacco Trail, Brevard Greenway, Little Sugar Creek Greenway, and Duck Trail to North Carolina's economy in terms of business output, jobs, and earned income supported. For the economic contribution results see Chapter 5: Study Results.

Data Needs

Survey responses provided the research team the following:

- The ***dollar value of expenditures*** a trail user made related to that day's trip on the SUP
- The ***type of business establishments*** where trail users made purchases. It was found that expenditures were being made at grocery, retail, bike rental, real estate, entertainment, and restaurant enterprises.

The research team calculated the ***average expenditure profile of a given trail user per trip***. The total number of dollars spent was divided it by the total number of trail users surveyed to determine ***average expenditure of each user per trip***. Additionally, the proportion of expenditures by type of business establishment was calculated to estimate the ***percentage of expenditures per business type*** by a typical trail user per trip.

The number of estimated annual trips were calculated using the Annual Trips Methodology described on page 61. The expenditure profiles proportions were then multiplied by the estimated annual trips of bicyclists, runners, and walkers to yield the total annual direct expenditures of trail users. Direct expenditures were then used as inputs into IMPLAN to estimate the indirect and induced impacts of trail users' purchases. Results were aggregated to demonstrate the economic contribution of shared use paths on an annual basis.

Section Notes:

1. *Badger, Emily. "Cyclists and Pedestrians Can End Up Spending More Each Month Than Drivers." CityLab. 05 December 2012.*
2. *Steiner, Cyndi and Mathew Meisel. "Hoboken's businesses stand to benefit financially from the proposed bike lane along Washington Street." New Jersey Bike & Walk Coalition. 12 November 2015.*
3. *Arora, Rosalia, Akhil Chhabra, Stu Lipkin, Toni Sargent. Atlana Beltline Report Closing the Gap: Connecting Through the Atlanta Beltline. December 2010.*
4. *Murphy, Michael. "East Village Bicyclists and Pedestrians Power Local Businesses." Transportation Alternatives. 1 October 2012.*
5. *Deller, Steven, Ann Hoyt, Brent Hueth, Reka Sundaram-Stukel. "IMPLAN Methodology" University of Wisconsin Center for Cooperatives. 19 June 2009.*
6. *Deller, Steven, Ann Hoyt, Brent Hueth, Reka Sundaram-Stukel. "IMPLAN Methodology" University of Wisconsin Center for Cooperatives. 19 June 2009.*

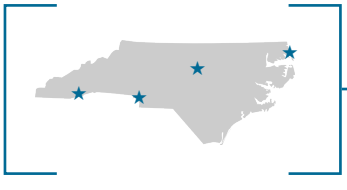
RETAIL SALES TAX METHODOLOGY

When bicyclists and pedestrians make purchases at stores, restaurants, hotels, or various other types of commercial establishments it generates retail tax revenue for local and state governments. Retail tax impacts can be estimated by considering expenditures on different types of goods and services, and modeling the tax revenue generated from these transactions. An input-output model can be used to estimate the tax dollars raised from a locality and throughout the state. In this study, IMPLAN was used. IMPLAN models tax collections in five categories (employee compensation, proprietor income, production and imports, households, and corporations) by local and state units of government in the study area (1). Expenditures documented from trail user survey data were aggregated based on the methodology previously discussed in the "Business and Employee Impacts Methodology" section of this chapter. For the retail sales tax collection results see page 71 of in the Study Results chapter.

Data Needs

Survey responses provided the research team the following:

- The ***dollar value of expenditures*** a trail user made related to that day's trip on the SUP
- The ***type of business establishments*** where trail users made purchases. This study found that expenditures were made at grocery, retail, bike rental, real estate, entertainment, and restaurant enterprises.



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CONSTRUCTION EXPENDITURE IMPACTS METHODOLOGY

The construction of shared use paths supports economic activities including preliminary engineering, design and environmental review, construction, inspection, and oversight.[1] Expenditures made in each of these categories support jobs, wages, and business output, which can be estimated using an input-output economic model. For the economic contribution results from applying the below methods, see the SUP Construction Benefits section in the Study Results chapter.

The cost of constructing a facility varies based on the type of bicycle and pedestrian facility and its location. The cost of construction activities for each type of facility such as type of pavement, striping (removing, changing or adding striping to provide additional space for bicycle lane and sidewalks), signage installation (along bicycle routes and at pedestrian crosswalks) and all other relevant elements are required to estimate construction cost. Additionally, construction cost also includes several types of equipment required for bicycle and pedestrian facilities and the cost for their installation. The installation cost may vary based on the type of signs and signals provided at the location. The equipment needed includes signs (guide, regulatory and warning signs), signals (pedestrian countdown signals and signals at mid-block, two-leg & four-leg intersections), barriers, bicycle parking (bicycle racks), need for any hard-wiring, etc. Operational / maintenance costs include the cost of maintenance of the facility, landscaping, security and safety, and supplies needed to conduct these activities.[1]

A facilities' cost study from May 2016 provided a database with the compilation of these cost details for a variety of bicycle and pedestrian facilities. The primary cost categories considered for the development of the tool are preliminary engineering, design and environmental review costs, right-of-way cost, construction cost (which typically includes overhead cost and mobilization cost), construction engineering and inspection costs, NCDOT oversight cost, and inflation rate.[1] This 2016 study also specifically evaluated the construction costs of 23 shared use paths and provided an average for each cost category.

SUP Construction Cost Methodology. Expenditure values used in this project were derived from the average estimates of SUP construction costs found in the NCDOT bicycle and pedestrian facilities cost study published in May 2016. That study evaluated the construction costs of 23 SUPs in North Carolina to derive a range of unit costs by item and the supplemental worksheet to calculate an estimated cost for construction (see Figure 7).

The average capital expenditure per mile was applied to the length of each of the four SUPs in this project. This estimated expenditure was stratified by shared use path cost categories (i.e. preliminary engineering, design, construction, engineering and inspection, contingency, and oversight), which yielded estimated expenditures by cost category. The economic impacts of these expenditures could then be estimated using IMPLAN.

ATT Bridge Construction Methodology. The American Tobacco Trail has a large bicycle and pedestrian bridge that crosses over Interstate-40 in Durham County, North Carolina. The construction of this bridge also has supported economic activity in North Carolina. The study, "Cost of Independent Bicycle and Pedestrian Facilities in North Carolina," enumerates pedestrian bridge costs per cost category (see Figure 8). To determine the economic impacts of bridge construction, the known total American Tobacco Trail bridge segment cost ($11.2 million) was broken down into cost components. Based on the cost categories and values provided in the 2016 study, the proportion of expenditures made in each cost category was determined. The $11.2 million bridge cost was then apportioned to each cost category to determine an estimate of bridge costs per category. This expenditure information could then be modeled in IMPLAN.

Data Needs

The "Cost of Independent Bicycle and Pedestrian Facilities in North Carolina," study provided the research team the following:

- ***Shared use path capital expenditures –*** average dollar value of construction costs per linear foot of path length
- ***Type of expenditures being made –*** categories of SUP capital expenditures
- ***Bridge capital cost expenditure categories***

Additional Considerations

An important caveat of this methodology is recognizing that impacts of capital expenditures are displayed as a one-time total benefit based on the entire construction of an SUP. For example, the American Tobacco Trail was constructed in segments over a long time horizon. For this trail, and the others, the economic impacts of capital expenditures are estimated to be the total economic impacts realized by completing the entire trail, with impacts estimated in 2017 dollars and job-years. A job year signifies the quantity of labor equivalent to full-time employment over the course of one year. Thus, if an IMPLAN job output were to equal 100 jobs this could be the equivalent of 100 jobs in 1 year or 10 jobs at full-time effort over the course of 10 years.

Estimated construction expenditures by cost category were used as inputs into IMPLAN, which modeled how SUP capital expenditures effect North Carolina's economy in terms of business output, jobs, and earned income supported. While an attempt was also made to use actual expenditure data, records on construction costs across the studied SUPs were spotty, and operational expenditures for upkeep and maintenance could not be obtained after several attempts to do so. SUPs, particularly longer ones, tend to be built in phases, and each phase may be paid for through a mix of federal, state, and local dollars. Without complete documentation, these expenditures over different years cannot be normalized to a base year with local funds separated from state funds.

Section Notes:

1. *"Cost of Independent Bicycle and Pedestrian Facilities in North Carolina," IDEAS Center. 31 May 2016. https://connect.ncdot.gov/projects/BikePed/Documents/Bicycle%20and%20Pedestrian%20Facility%20Cost%20Tool%20-%20Report.pdf*

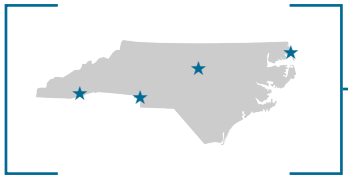


Figure 7. Image of "SUP Construction Cost Input Table" from *Cost of Independent Bicycle and Pedestrian Facilities in North Carolina.*

Shared Use Path Cost Estimator Tool

Name of Project:		**Current Date (mm/dd/yy)**	**Proposed Year of Construction**
Location/Description:			**2016**
Enter the Following Information for Cost Estimate			
Length of Shared Use Path / Greenway (Feet)	**1320**		
Width of Shared Use Path / Greenway (Feet)	**8**		
Required Length of Curb & Gutter (Feet)	**1320**	Enter the required length of curb & gutter to be constructed	
No. of Intersections	**0**		
No. of Signal Heads	**0**	Enter the total number of signals required for the project	
No. of Pedestrian Signal Heads	**0**	Enter the total number of pedestrian signal heads required	
No. of Driveways	**0**		
Terrain	**Level**		
Crosswalk Thermoplastic Lines Length (Feet)	**0**	Enter either the length of crosswalk thermoplastic lines or no. of crosswalks, whichever value is known	
No. of Crosswalks	**0**		
Include Preliminary Eng., Design & Environmental Review	**YES**	Select 'NO' if these costs are internal	
Include Right-of-Way	**YES**		
Include Construction Engineering & Inspection	**YES**		
You are only required to enter data above this row. If you are not familiar with the tool framework, coding and possible changes to estimates, we recommend not making any changes below this row.			

Construction Costs Breakdown

Items	Units	Minimum Cost	Percentile (10)	Percentile (25)	Percentile (50)	Average Cost	Percentile (75)	Percentile (90)	Maximum Cost
Clearing and Grubbing	(AC/Ft)	$0.21	$0.61	$1.02	$2.05	$5.28	$3.63	$9.11	$48.86
Crosswalk	(EA)	$2,290.10	$2,432.24	$2,645.46	$3,000.81	$3,000.81	$3,356.17	$3,569.38	$3,711.52
Crosswalk Stripes	(Per Ft)	$4.30	$4.95	$5.48	$5.74	$6.21	$6.60	$7.83	$9.25
Curb and Gutter	(Per Ft)	$7.63	$14.96	$17.77	$21.14	$23.43	$28.84	$34.42	$45.80
Drainage (Per Ft)	(Per Ft)	$0.001	$0.01	$0.08	$0.47	$0.88	$1.07	$2.46	$4.51
Earthwork (grading) (CY/Ft)	(CY/Ft)	$1.05	$3.81	$8.98	$16.34	$17.89	$23.25	$35.98	$44.06
Erosion Control (AC/Ft)	(AC/Ft)	$0.12	$0.72	$1.44	$3.51	$6.33	$4.91	$8.23	$87.39
Pavement Marking	(LF/Ft)	$0.12	$0.27	$0.44	$1.21	$7.53	$4.82	$7.26	$100.42
Sidewalk Concrete	(SqYd)	$14.76	$27.79	$29.74	$35.65	$36.94	$40.72	$47.51	$84.87
Signal Heads (EA)	(EA)	$950.15	$1,069.03	$1,536.57	$1,852.40	$1,947.92	$2,170.96	$3,058.00	$3,175.17
Pedestrian Signal Heads (EA)	(EA)	$646.92	$883.59	$1,130.70	$2,528.30	$2,108.99	$2,806.60	$3,077.08	$4,004.16
Signing	(Per Ft)	$0.12	$0.14	$0.23	$0.49	$1.95	$1.50	$4.61	$19.38
Traffic Control	(Per Ft)	$0.00	$0.61	$1.02	$2.07	$2.85	$3.63	$6.62	$10.57
Utilities	(Per Ft)	$0.14	$0.31	$0.47	$1.14	$1.39	$2.17	$2.54	$3.87
Ashphalt Surface for Greenway (2")	SqYd	$36.63	$36.63	$36.63	$36.63	$36.63	$36.63	$36.63	$36.63
Pavement Widening	(SqYd)	$24.84	$33.31	$46.01	$67.18	$67.18	$88.35	$101.06	$109.53
Wheelchair Ramp	(EA)	$127.23	$264.00	$636.14	$974.69	$992.44	$1,183.39	$1,428.52	$2,375.37

COST CATEGORIES	Minimum Cost	Percentile (10)	Percentile (25)	Percentile (50)	Average Cost	Percentile (75)	Percentile (90)	Maximum Cost
Preliminary Engineering / Design Cost (Typically, 10% -20% of Construction Cost)	$8,393.27	$19,308.16	$30,617.27	$46,573.24	$62,150.35	$81,097.58	$144,936.00	$247,232.43
Right-of-Way Cost	$23,026.67	$23,026.67	$23,026.67	$23,026.67	$23,026.67	$23,026.67	$23,026.67	$23,026.67
Construction Cost	$12,393.29	$25,379.56	$32,236.27	$46,152.30	$70,263.93	$72,397.69	$108,478.67	$437,237.90
Construction Engineering & Inspection Cost (Typically, 10% -15% of Construction Cost)	$3,784.09	$3,396.67	$16,701.97	$22,318.65	$18,884.74	$44,110.31	$55,357.21	$31,017.00
Contingency (30%)	$3,717.99	$7,613.87	$9,670.88	$13,845.69	$21,079.18	$21,719.31	$32,543.60	$131,171.37
NCDOT Oversight Costs ($5000 or 5% whichever is greater)	$5,000.00	$5,000.00	$5,612.65	$7,595.83	$9,770.24	$12,117.58	$18,217.11	$43,484.27
TOTAL COST	$56,315.30	$83,724.92	$117,865.72	$159,512.37	$205,175.10	$254,469.14	$382,559.25	$913,169.64

Note 1: Percentile indicates value below which the given percentage of cost estimates fall. For example, the 50th percentile is the cost estimate below which 50% of the observed cost estimates may be found.

Note 2: "N/A" indicates data is not available from past project information obtained from various sources. Suggest including estimates based on local experience and adding it to the total cost.

Figure 8. Image of "Pedestrian Bridge Cost Estimator Table" from *Cost of Independent Bicycle and Pedestrian Facilities in North Carolina.*

Pedestrian Bridge Cost Estimator Tool

Name of Project:		**Current Date (mm/dd/yy)**	**Proposed Year of Construction**
Location/Description:			**2016**

Enter the Following Information for Cost Estimate

Length of Bridge (Feet)	**100**	
Width of Bridge (Feet)	**5**	
Depth of Bridge (Inches)	**4**	The default value is 4" based on the data obatained from municipalities
Required Length of Curb & Gutter (Feet)	**100**	Enter the required length of curb & gutter to be constructed
No. of Signal Heads	**0**	Enter the total number of signals required for the project
No. of Pedestrian Signal Heads	**0**	Enter the total number of pedestrian signal heads required
Crosswalk Thermoplastic Lines Length (Feet)	**0**	Enter either the length of crosswalk thermoplastic lines or no. of crosswalks, whichever value is known
No. of Crosswalks	**0**	
Include Preliminary Eng., Design & Environmental Review	**NO**	Select 'NO' if these costs are internal
Include Right-of-Way	**NO**	
Include Construction Engineering & Inspection	**NO**	

You are only required to enter data above this row. If you are not familiar with the tool framework, coding and possible changes to estimates, we recommend not making any changes below this row.

Construction Costs Breakdown

Items	Units	Minimum Cost	Percentile (10)	Percentile (25)	Percentile (50)	Average Cost	Percentile (75)	Percentile (90)	Maximum Cost
Clearing and Grubbing	(AC/Ft)	$0.21	$0.61	$1.02	$2.05	$5.28	$3.63	$9.11	$48.86
Crosswalk	(EA)	$2,290.10	$2,432.24	$2,645.46	$3,000.81	$3,000.81	$3,356.17	$3,569.38	$3,711.52
Crosswalk Stripes	(Per Ft)	$4.30	$4.95	$5.48	$5.74	$6.21	$6.60	$7.83	$9.25
Curb and Gutter	(Per Ft)	$7.63	$14.96	$17.77	$21.14	$23.43	$28.84	$34.42	$45.80
Drainage (Per Ft)	(Per Ft)	$0.001	$0.01	$0.08	$0.47	$0.88	$1.07	$2.46	$4.51
Earthwork (grading) (CY/Ft)	(CY/Ft)	$1.08	$3.95	$9.29	$16.91	$18.52	$24.07	$37.24	$45.61
Erosion Control (AC/Ft)	(AC/Ft)	$0.13	$0.75	$1.49	$3.64	$6.55	$5.08	$8.52	$90.45
Pavement Marking	(LF/Ft)	$0.12	$0.27	$0.44	$1.21	$7.53	$4.82	$7.26	$100.42
Sidewalk Concrete	(SqYd)	$14.76	$27.79	$29.74	$35.65	$36.94	$40.72	$47.51	$84.87
Signal Heads (EA)	(EA)	$950.15	$1,069.03	$1,536.57	$1,852.40	$1,947.92	$2,170.96	$3,058.00	$3,175.17
Pedestrian Signal Heads (EA)	(EA)	$646.92	$883.59	$1,130.70	$2,528.30	$2,108.99	$2,806.60	$3,077.08	$4,004.16
Signing	(Per Ft)	$0.12	$0.14	$0.23	$0.49	$1.95	$1.50	$4.61	$19.38
Traffic Control	(Per Ft)	$0.00	$0.61	$1.02	$2.07	$2.85	$3.63	$6.62	$10.57
Utilities	(Per Ft)	$0.14	$0.31	$0.47	$1.14	$1.39	$2.17	$2.54	$3.87
Reinforced Steel (Bridge)	(Per Ft)	$8.61	$8.61	$8.61	$8.61	$8.61	$8.61	$8.61	$8.61
Bar Metal Rail	(Per Ft)	$162.51	$162.51	$162.51	$162.51	$162.51	$162.51	$162.51	$162.51
Concrete Bridge	(Cubic Yard)	$1,377.03	$1,377.03	$1,377.03	$1,377.03	$1,377.03	$1,377.03	$1,377.03	$1,377.03
Chain Link Fence	(Per Ft)	$21.15	$21.15	$21.15	$21.15	$21.15	$21.15	$21.15	$21.15
Wheelchair Ramp	(EA)	$127.23	$264.00	$636.14	$974.69	$992.44	$1,183.39	$1,428.52	$2,375.37

COST CATEGORIES	Minimum Cost	Percentile (10)	Percentile (25)	Percentile (50)	Average Cost	Percentile (75)	Percentile (90)	Maximum Cost
Preliminary Engineering / Design Cost (Typically, 10% -20% of Construction Cost)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Right-of-Way Cost	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Construction Cost	$122,991.85	$124,933.80	$126,062.24	$128,121.06	$130,119.91	$130,971.95	$135,146.33	$162,890.07
Construction Engineering & Inspection Cost (Typically, 10% -15% of Construction Cost)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Contingency (30%)	$36,897.55	$37,480.14	$37,818.67	$38,436.32	$39,035.97	$39,291.59	$40,543.90	$48,867.02
NCDOT Oversight Costs ($5000 or 5% whichever is greater)	$7,994.47	$8,120.70	$8,194.05	$8,327.87	$8,457.79	$8,513.18	$8,784.51	$10,587.85
TOTAL COST	$167,883.87	$170,534.64	$172,074.96	$174,885.25	$177,613.68	$178,776.72	$184,474.74	$222,344.94

Note 1: Percentile indicates value below which the given percentage of cost estimates fall. For example, the 50th percentile is the cost estimate below which 50% of the observed cost estimates may be found.

Note 2: "N/A" indicates data is not available from past project information obtained from various sources. Suggest including estimates based on local experience and adding it to the total cost.

ASSESSING PROPERTY VALUES

Several studies have attempted to show that properties in cities and counties around the United States have experienced economic benefits when in proximity to SUPs. Many used surveying methods to determine whether SUPs affect property values by collecting the opinions of local realtors and residents adjacent to SUPs.[1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12] The data collected for these studies are based on respondents' perceptions, i.e., whether local realtors and residents believe that property values and salability are effected by closeness to a SUP, rather than measured market conditions or quantifiable changes in dollar amounts. Consequently, the results are anecdotal and largely inconsistent. In the cited studies, the majority of surveyed residents indicated that they believe the SUP had a positive or no impact on the value of their property. Survey information provided by local realtors in one of these studies suggests that properties located by SUPs tend to sell faster than those of similar size and character which are not by SUPs.[1] A few of the studies indicate that the recreational, health, aesthetic, and transportation benefits that SUPs provide are promoted by real estate agents and their advertisements to signal a higher market value for properties near shared use paths.[1, 3, 5]

Other studies have employed hedonic price modeling to estimate the impact of path proximity on property values.[13, 14, 15, 16, 17] Hedonic price modeling uses multiple linear regression to estimate property value as a function of various factors that are hypothesized to affect it. To estimate the impact of SUP proximity on property values, an independent variable representing SUP proximity is included in the model, e.g., network distance to a trail entrance,[13, 15] a dummy variable for properties within a half mile of a trail,[14] or straight-line distance to a trail.[16, 17] In general, the cited studies have suggested that property values decrease for every unit increase in their distance from a trail.

OVERALL LIMITATIONS

There are many factors that contribute to variation in property values. This makes it difficult to isolate the true effect of SUP proximity on property values. Some factors include: housing stock type, age of dwelling/development/neighborhood, lot size/dwelling square footage/building materials cost, proximity to other "property value boosters" (e.g. schools, parks, bodies of water, shopping, employment centers, and socioeconomic demographics), etc. The methods used to evaluate the relationship between property values and proximity to a SUP will, as a consequence, vary based on a SUP's unique location and context.

GENERAL DATA NEEDS AND SOURCES

Buffer Analysis

Certain residential and commercial characteristics such as proximity to a trail are neither bought nor sold; thus, they have no direct market value. If these characteristics affect human wellbeing, however, then they may increase property values.[18] Trail analyses from across the country have indicated that property values within one-half mile of a proposed trail achieve higher property values than similar properties that are not within a trail's walkable area.[19] Nationwide, housing values have been reported to increase from 5 to 10 percent when in proximity to a trail, and in some instances up to 25 percent (Boulder, Colorado and Hartford, Connecticut anecdotally report 25 percent).[20]

There are a number of methods that can be used to analyze the effect of SUPs on property values. For this research, the project team began a property value assessment by conducting a buffer analysis. Property values in proximity to SUPs were compared to the values of similar properties outside of the proximity of SUPs.

Data Needs and Approach

Assessed land values within proximity to the American Tobacco Trail, Little Sugar Creek Greenway, and the Brevard Greenway were compared to the values of similar properties outside of each trail's proximity. A Geographic Information System (GIS) buffer analysis was conducted to compare the property values. For this analysis, a buffer, or geographic area, was drawn around properties within 0 to 0.5 miles of a SUP. Similarly, a buffer was drawn around properties outside of the path's walkable area from 1.0 to 1.5 miles. The inner ring of values was then compared to the outer values for similar properties (i.e. single family homes).

The following parcel data was used in the analysis:

- American Tobacco Trail: Chatham County – January 2014; Durham County – December 2013; and Wake County – December 2013
- Little Sugar Creek Greenway: Mecklenburg County – January 2014
- Brevard Greenway: Transylvania County – January 2014

Each county classified its GIS property characteristics differently. Durham, Wake, Transylvania, and Mecklenburg Counties delineated property types into discrete categories, such as: residential by family size, commercial by type, and public by type. Chatham County, however, did not suballocate its property values by type; thus, the aggregate stock of residential and commercial properties were compared against each other in Chatham County.

Additional Considerations

Not all SUPs are good candidates for a property value analysis. Trails that are nearby prominent geographic features are likely to produce invalid results in a buffer analysis. This is because property values may not be substantially influenced by the trail, but rather, effected by features such as proximity to water, natural areas, or other geographic features. For instance, the project team did not include the Duck Trail in the property value analysis due to its close proximity to the beach along the North Carolina coast.

While conducting the analysis, it became apparent that a sufficient sample size of a given type of property would not necessarily exist within both the inner and outer buffers. For example, in Durham County there were 59 row houses within 0-0.5 miles of the American Tobacco Trail and only 14 row houses outside the trail's walkable area (1.0-1.5 miles). Thus assessing the trail's effect on the property value of row houses would likely lead to an inaccurate result, as small sample sizes are more likely to yield property values with large variances. Thus, to ensure meaningful and valid results, only property stock of a sufficient sample size ($n>250$) were evaluated. The following types of property stock, their sample sizes, and their values in relationship to trail proximity are shown in Table 12. These values were then aggregated to determine the average effect the SUP has on residential property values.

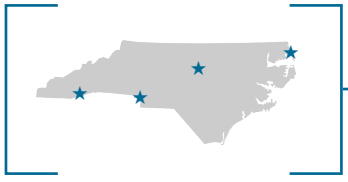


Table 12 shows the differences in assessed property values for the inner and outer buffers. Though sample sizes were sufficient for the analysis, it became apparent that properties even within the same type of classification possessed a wide variation of characteristics. For example, variations in number of bathrooms, bedrooms, square footage, and other key characteristics were not being modeled with precision.

In addition, assessed land values are an imperfect measure of property values. Land assessments occur infrequently and often lag behind the true value of a property. The assessed value may also fall out of alignment with the actual sales value of a piece of property.

In summary, the project team found the following limitations with the buffer analysis:

- Similar types of properties had large variations in square footage, number of bathrooms, and other key characteristics that could affect their value
- Assessed land values are less accurate than property sales values in the determination of property values.

The buffer analysis was the first step of an iterative process. To overcome the shortcomings of this approach, a hedonic price model was used to more accurately assess the characteristics of different types of property. A hedonic price model isolates the effects of relevant house and property characteristics, including proximity to the greenway, to measure what people would be willing to pay for them while holding other factors constant. This type of model is discussed further in the

Table 12: Differences in Assessed Property Values for the Inner and Outer Buffers

Trail	County	Property Type	Sample Size (Inner)	Sample Size (Outer)	Sample Size (Total)	Proportion (Weight)	Inner (0-0.5m)	Outer (1.0-1.5)	Inner minus Outer	I-O Percent Difference
ATT	Chatham	Residential	426	286	286	0.04	$570,400	$434,000	$136,400	23.90%
	Durham	Single Family & Town House	7,348	7,186	7186	0.91	$187,400	$182,300	$5,100	2.70%
	Wake	Single Family	399	3,488	399	0.05	$558,900	$369,000	$189,900	34.00%
	Combined	Combined & Apportioned	8173	10,960	7,871	1	$220,150	$200,910	$19,240	8.70%
BG	Transylvania	Single Family Residential	367	406	367	0.26	$93,200	$55,710	$37,490	40.20%
	Transylvania	Single Family Residential - Creek	1,103	1,058	1,058	0.74	$368,660	$368,370	$290	0.10%
	Transylvania	Combined & Apportioned	1,470	1,464	1,425	1	$297,720	$287,850	$37,770	12.70%
LSG	Mecklenburg	Attached Residential	2,727	4,093	2,727	1	$221,150	$200,210	$20,940	9.50%

next section. In conjunction with the hedonic price model, property sales values were used to provide a more accurate accounting of property values.

Hedonic Price Model

The hedonic pricing method measures the effect of a SUP against current or recent property values. This method rests on the assumption that the value of public assets like greenways and trails can be observed in values of nearby properties and that their marginal effects can be isolated and estimated through statistical models that control for other factors which affect property value and prices. These factors include neighborhood traits and structural details that differentiate each property. The model estimates the total effects of these factors by assuming that the average marginal effects apply to all properties near each trail. In other words, the models isolate the effects of relevant characteristics including proximity to a SUP to measure what people would be willing to pay for them while holding all else constant.

The research team analyzed data on neighborhood and structural factors for the properties in close proximity to the American Tobacco Trail in Durham, the Little Sugar Creek Trail in Charlotte, the Brevard Greenway in Brevard, and the Crabtree Creek Greenway in Raleigh. To collect structural variables and property values, a sample of home data was extracted from the RedFin property listings website to conduct analysis around each trail. The data set included sales within the previous six months of January 2017 for the zip code areas that the trails traverse. Multi-family, condo, and vacant properties were excluded from the analysis to focus only on single family residential properties. These data included variables such as the number of bedrooms, bathrooms, and house size in square feet. Public tax records and American Community Survey (ACS) data for the area surrounding each trail were analyzed to extract neighborhood variables, including neighborhood (block group) percent African American, neighborhood (block group) median household income, and neighborhood (block group) vacancy rate (see Table 13 for a comparison of the neighborhood variables). Lastly, a binary variable was constructed to isolate the properties within 0.5 miles of each greenway from the other properties observed in the dataset. By using a proximity measure to observe effects on property values, the research team observed a portion of people's marginal willingness to pay for accessibility to trails for either recreation or transportation and for amenity values experienced by owners of properties with views of trails and green space. The significance of this binary variable was used to convey the significance of each SUP with relation to property values.

A core set of predictor variables (Table 14) was used in each model, and additional control variables were selected relative to the context of each trail. GIS software was used to geographically display the properties, to define proximity variables, and to examine geospatial model residuals. Statistical software was used to develop regression models to estimate how the sales price of a property might change in relation to each SUP while holding all other variables constant.

For each trail analysis, the following steps were taken:

1. Generate a base linear model by regressing the sales price on the core predictors;
2. Create a geospatial residual plot by joining the model residuals with the property points in GIS and running an inverse distance weighted (IDW) analysis;
3. Examine the geospatial residual pattern to determine the geographic areas where sales prices are under- or over-predicted;
4. Refine model inputs based on geospatial analysis results;
5. Iteratively test the inclusion and exclusion of additional model predictors; and
6. Evaluate the results.

Table 13: Comparison of Trail Neighborhoods Based on 2010-2014 ACS Data*

Statistic*	Location*	American Tobacco Trail	Crabtree Creek Greenway	Little Sugar Creek Greenway	Brevard Greenway
Percentage African Americans in Neighborhood	Neighborhoods within one mile of trail	33%	29%	15%	8%
	Neighborhoods that trail traverses	29%	25%	10%	9%
Average Median Neighborhood Household Income	Neighborhoods within one mile of trail	$57,009	$69,124	$82,899	$40,930
	Neighborhoods that trail traverses	$73,018	$72,787	$89,474	$39,941
Neighborhood Vacancy Rate	Neighborhoods within one mile of trail	8%	10%	12%	15%
	Neighborhoods that trail traverses	7%	10%	8%	13%
Population Density (People per Square Mile)	Neighborhoods within one mile of trail	840	2,252	3,348	152
	Neighborhoods that trail traverses	701	2,117	3,501	270

**Neighborhoods are defined as U.S. Census Block Groups*

Table 14: Average Values for Core Predictors and Associated Sample Sizes by Trail

Core Predictor Variables	Description	American Tobacco Trail	Crabtree Creek Greenway	Little Sugar Creek Greenway	Brevard Greenway
		Mean (n)			
PRICE	Property sales price	$362,604 (n=1,592)	$276,116 (n=1,544)	$604,239 (n=385)	$250,361 (n=2,003)
SQFT	Total structural square footage	2,507 SF (n=1,569)	3,049 SF (n=1,542)	2,305 SF (n=359)	1,711 SF (n=2,003)
LOT_SIZE	Total lot size in square feet	16,136 SF (n=1,583)	18,336 SF (n=1,544)	12,116 SF (n=380)	88,924 SF (n=2,003)
YEARS	Age of structure in years	25 (n=1,592)	30 (n=1,544)	55 (n=385)	38 (n=2,003)
BEDS	Number of bedrooms	3.69 (n=1,507)	3.43 (n=1,302)	3.46 (n=360)	2.80 (n=2,003)
BATHS	Number of bathrooms	3.04 (n=1,565)	2.67 (n=1,524)	2.54 (n=372)	2.07 (n=2,003)

American Tobacco Trail, Durham, NC

The base model indicated that the sales prices for properties within a half mile of the trail were 8% lower on average than those further away from the trail (see beta result in Table 15). Since these results were not in line with previous research, the research team suspected possible omitted variable bias. The geospatial residual plot showed a clear pattern in the residuals. Sales prices for north-eastern properties were generally over-predicted while sales prices for southern properties tended to be under-predicted. The research team hypothesized that the model error was likely related to the omitted demographic variables since there is a distinct demographic difference between southeast Durham, Cary, and Apex. The population of southeast Durham is typically lower income with a greater minority population than the areas of Cary and Apex that are located near the trail. To account for this neighborhood variation, demographic variables were added to the base model in the form of Census block groups. The smallest geographic area for which demographic information is available from the ACS is the block group. The summation of all of the demographic variables that are affecting the areas around the trail can be included in the model using the block groups. To run a model with the 103 different block groups represented in the Redfin sales dataset, a fixed effect model was introduced that included the block groups as a fixed variable.

Looking at the output of the regression, the model seemed to be a better fit. While the R^2 was higher, the beta for the half-mile trail proximity dummy variable was positive but not statistically significant (p = 0.5886, as shown in Table 15). The updated geospatial residual plot showed that the majority of patterns within the geospatial residuals had disappeared. This result indicates that trail proximity does not have a statistically significant effect on sales prices when controlling for neighborhood variation.

Southern Section of the Trail: The area around the section of the ATT in Wake and Chatham counties has experienced high levels of residential growth since the trail was built. Newly developed neighborhoods surrounding the trail in this area advertise the trail as a selling feature. To test whether the trail has an impact on sales prices around this portion of the trail, a new data set was created for regression modeling that contains a subset of the sales price data and dummy variables for the neighborhoods that advertise the trail. Similar to the modeling results for the entire trail, testing of the southern section of the trail shows that the 0.7 to 2.6 percent increased effect on sales prices when controlling for neighborhood variation on trail proximity is not a statistically significant effect.

Northern Section of the Trail: The neighborhoods surrounding the section of the ATT north of the I-40 pedestrian overpass are different than those neighborhoods surrounding the southern portion of the ATT. North of the I-40 pedestrian overpass, the trail takes on the character of an urban greenway. This makes the property value effects of the SUP harder to separate from major roadways that parallel the trail, such as Fayetteville Road. Thus, in order to avoid any omitted variable bias between the ATT and Fayetteville Road that may be present in the base model, a subset of sales prices for properties along the northern section of the ATT was examined.

A regression model was created using this subset of sales prices for properties along the northern section of the ATT. The model is the base model with the block groups and a dummy variable for properties within a half mile of Fayetteville Road. While the results indicate that sale prices were 7.8 percent higher on average than those further away from the northern segment of the ATT, this outcome was found to be statistically insignificant when controlling for neighborhood variation and proximity to Fayetteville Road.

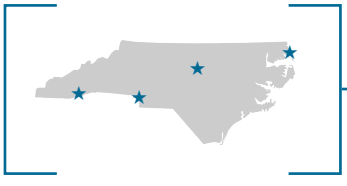


Table 15: Model Results for the American Tobacco Trail

Model	(n)	Beta*	t-value	Pr>[t]	R^2	F-value	Pr>F	DF
Base Model	1,503	-0.075	3.20	0.0014	0.715	626.18	<0.0001	1,502
Base Model with Block Groups	1,503	0.014	0.54	0.5886	0.868	84.98	<0.0001	1,502
Base Model with only Southern ATT (Block Groups Excluded)	574	-0.021	0.95	0.3406	0.768	312.32	<0.0001	573
Base Model with only Southern ATT (Block Groups Included)	574	0.003	0.12	0.9036	0.831	73.31	<0.0001	573
Base Model with only Southern ATT (Advertising Neighborhoods Included; Block Groups Excluded)	574	0.026	1.31	0.1905	0.768	268.29	<0.0001	573
Base Model with only Southern ATT (Advertising Neighborhoods Included; Block Groups Included)	574	0.007	0.26	0.7944	0.832	71.99	<0.0001	573
Base Model with only Northern ATT (Block Groups and Fayetteville Road Included)	569	0.078	1.32	0.1876	0.813	31.87	<0.0001	568

**Beta represents the trail proximity binary variable*

Table 16: Model Results for the Brevard Greenway

Model	(n)	Beta	t-value	Pr>[t]	R^2	F-value	Pr>F	DF
Base Model	2003	0.078	1.56	0.1196	0.461	284.70	<0.0001	2002
Base Model with Block Groups	1974	0.057	0.86	0.3910	0.667	12.61	<0.0001	1973

Conclusion: Overall, the models presented show that proximity to the ATT does not have a statistically significant effect on sales prices when controlling for neighborhood variation. Consistent and statistically significant results across all models were not found.

Near Durham's downtown core, it is difficult to isolate the true effect of SUP proximity on property values due to the development density. It is probable that proximity to commercial/employment centers and urban attractors, such as the DBAC, DPAC, shopping, and dining, has a greater effect on property values than the trail alone. However, the once rural areas surrounding the portion of the trail in Wake and Chatham counties has experienced rapid residential development since it was completed in 2007. Estate-style subdivisions with home prices in excess of $500,000 are common. Several subdivisions in this area advertise the trail as a neighborhood perk. In future years, it is possible that the proximity of the trail may have a more measureable effect in this area compared to the rest of the trail and other trails included in the study.

Brevard Greenway, Brevard, NC

Table 16 shows that the half-mile trail proximity dummy variable was statistically insignificant in the base model. The geospatial residual plot showed only a minor pattern in the residuals. Sales prices for properties in southwest Brevard near the downtown area were generally under-predicted.

Block groups were added to the base model. To run a model with the 265 different block groups represented in the Redfin sales dataset, a fixed effect model was introduced that included the block groups as a fixed variable.

The new model fit the data better than the base model. While the R^2 was higher, the beta for the half-mile trail proximity dummy variable was positive but not statistically significant. The updated geospatial residual plot showed that minor patterns within the geospatial residuals had been reduced. This result indicates that trail proximity does not have a statistically significant effect on sales prices when controlling for neighborhood variation.

Conclusion: Looking at the results of the two models tested for the Brevard Greenway, there is no clear impact on property sales prices resulting from trail proximity.

Little Sugar Creek Greenway, Charlotte, NC

The base model indicated that the sales prices for properties within a half mile of the trail were 16% higher on average than those further away from the trail (see Table 17). These results are much higher than those reported in comparable research. The research team suspected possible omitted variable bias was inflating the beta for the trail proximity variable.

The geospatial residual plot showed a clear pattern in the residuals. Sales prices for properties in certain neighborhoods surrounding the trail were generally under-predicted. According the ACS data, these neighborhoods are block groups with high median household incomes. To account for this neighborhood variation, block groups were added to the base model. To run a model with the 44 different block groups represented in the Redfin sales dataset, a fixed effect model was introduced that included the block groups as a fixed variable.

The new model fit the data better than the base model. While the R^2 was higher, the beta for the half-mile trail proximity dummy variable was negative but not statistically significant. The updated geospatial residual plot showed that the majority of patterns within the geospatial residuals had disappeared. This result indicates that trail proximity does not have a statistically significant effect on sales prices when controlling for neighborhood variation.

Conclusion: The results of the various models tested for the Little Sugar Creek Greenway show there is no clear impact on property prices being caused by the greenway. This result indicates that, for greenways built in areas that are already urban-dense, developed areas, it is very difficult to separate the effects of the greenway from the other environmental amenities that positively affect property sales prices.

Crabtree Creek Greenway, Raleigh, NC

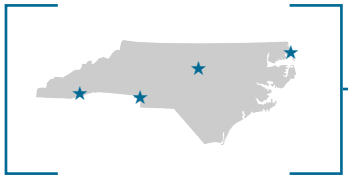
The base model indicated that the sales prices for properties within a half mile of the trail were 18% higher on average than those further away from the trail, as shown as the base model beta in Table 18. These results are much higher than those reported in comparable research. The research team suspected possible omitted variable bias was inflating the beta for the trail proximity variable.

Table 17: Model Results for the Little Sugar Creek Greenway

Model	(n)	Beta	t-value	Pr>[t]	R^2	F-value	Pr>F	DF
Base Model	345	0.161	4.12	<0.0001	0.728	150.70	<0.0001	344
Base Model with Block Groups	345	-0.042	0.68	0.4983	0.890	49.97	<0.0001	344

Table 18: Model Results for the Crabtree Creek Greenway

Model	(n)	Beta	t-value	Pr>[t]	R^2	F-value	Pr>F	DF
Base Model	1302	0.177	5.45	<0.0001	0.652	406.04	<0.0001	1301
Base Model with Block Groups	1302	0.007	0.25	0.8039	0.919	113.59	<0.0001	1301
Base Model with Block Groups and Golf Courses Added	1302	0.010	0.37	0.7149	0.919	113.37	<0.0001	1301
Base Model with Block Groups, Golf Courses, and Schools Added	1302	0.014	0.49	0.6224	0.919	112.38	<0.0001	1301



The geospatial residual plot showed a clear pattern in the residuals. Sales prices for properties in neighborhoods surrounding the western end of the trail were generally under-predicted. According the ACS data, these neighborhoods are block groups with high median household incomes. In addition, the homes in these neighborhoods have high square footages and are built on large lots. To account for this neighborhood variation, block groups were added to the base model. To run a model with the 116 different block groups represented in the Redfin sales dataset, a fixed effect model was introduced that included the block groups as a fixed variable.

The new model fit the data better than the base model. While the R^2 was higher, the beta for the half-mile trail proximity dummy variable was positive but not statistically significant (p = 0.8039). The updated geospatial residual plot showed that the majority of patterns within the geospatial residuals had disappeared. This result indicates that trail proximity does not have a statistically significant effect on sales prices when controlling for neighborhood variation.

The residual plot showed that the new model resolved most of the issues with residuals that were occurring around the western end of the greenway in the base model. However, there were still some areas with sales prices that the model appeared to be under-predicting.

After examining the under-predicted areas, it was determined that various environmental features had a positive impact on surrounding property sales prices. There are two local golf courses near to the trail and the properties surrounding these golf courses appeared to be under-predicted by the model. This indicated that there was a factor not included in the model which could account for increased sales prices. A dummy variable was added to the model to represent the properties located within the golf course neighborhoods in an attempt to refine the model.

A second geospatial feature that seemed to have an impact on the property sales prices are two private schools and a magnet school located on the eastern end of the greenway. After accounting for the private and magnet schools in the model as well as the Raleigh Country Club and the River Ridge Golf Course, the fit of the new model did not improve.

Conclusion: Across all the models that were tested for the Crabtree Creek Greenway, there is no clear property sales price effect resulting from proximity to the trail when controlling for neighborhood variation, including controlling for amenities such as private/magnet schools and golf courses. In the base model, proximity to the trail appeared to increase property sales prices by close to 20%, but when block groups were added to account for neighborhood variation, the effect was no longer statistically significant. Even as the model was refined with the inclusion of dummy variables for schools and golf courses, trail proximity remained statistically insignificant. Intuitively, it is believed that this is because of how urban and developed the Crabtree Creek area was prior to trail construction. Wealthy neighborhoods were already established with high quality schools, golf courses, a country club, and other local amenities that positively affected property values and sales prices. Trying to distinguish an impact caused by trail proximity from other local amenities is a difficult task. It is probable that neighborhood age and proximity to other "property value boosters" plays a larger role in property sales price variation than proximity to the SUP.

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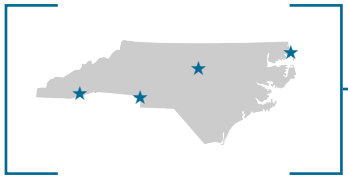


ASSESSING HEALTH, CONGESTION, AND POLLUTION REDUCTION

CEDAR'S ITHIM

Approach

The Integrated Transport & Health Impact Model (ITHIM) refers to a range of interrelated tools developed by the Centre for Diet and Activity Research (CEDAR), a partnership between the University of Cambridge, the University of East Anglia, and Medical Research Council units in Cambridge. ITHIM models and compares the health effects of various transportation scenarios and interventions based on estimated changes in physical activity, road traffic injury risk, and exposure to fine particulate matter (PM2.5) air pollution. It can be used as a standalone model or linked with larger economic models.

To measure the health impacts of changes in levels of transportation-related physical activity, ITHIM simplifies all physical activity into a single, comparative unit of energy consumption called the Metabolic Equivalent of Task (MET). This measurement allows for the cross comparison of different types of physical activity, such as walking and bicycling, by referencing all values to the average resting metabolic rate obtained during quiet sitting, or 1 MET. ITHIM's comparative risk assessment approach estimates health outcomes affected by changes in population-level MET rates, including various cardiovascular diseases, depression, dementia, diabetes, breast cancer, and colon cancer, which can be summarized collectively as increased or decreased risk of mortality.

Factors that influence the risk of road traffic injury within ITHIM include the study area's collision history, population characteristics (such as gender and age), and changes in travel distances and speeds by mode of transportation. Similar to the health impacts of changes in levels of physical activity, changes in risk of road traffic injury is summarized as increased or decreased risk of mortality.

The risk of exposure to fine particulate matter (PM2.5) air pollution is estimated within ITHIM based on locally generated emission estimates for the study area, population characteristics, and exposure to air pollution based on mode of transportation, such as walking or bicycling. Similar to the health impacts of changes in levels of physical activity and changes in risk of road traffic injury, changes in risk of exposure to fine particulate matter (PM2.5) air pollution is summarized as increased or decreased risk of mortality.

All-cause mortality, or death from any cause, is a common term used by health professionals for summarizing the level of risk that an individual within a given population faces of dying at any given time. Common metrics for expressing all-cause mortality include the number of attributable deaths (the overall mortality rate) and disability-adjusted life years (DALY). One DALY represents one lost year of "healthy life" and can be thought of as the gap between current health status and an ideal health situation where the entire population lives to an advanced age, free of disease and disability. By accounting for the number of years lost, DALYs can better express the difference between a youth dying from a road traffic injury and a senior citizen dying from cardiovascular disease.

CEDAR has developed multiple iterations of ITHIM to incorporate recently available research and to increase its applicability to a larger range of settings. The data needs listed below are for "ITHIM 1, California Version" developed by Dr. James Woodcock and Dr. Neil Maizlish.[1]

Data Needs

Compared to other health impact models for transportation applications, ITHIM requires a large number of data inputs for a given study area.[2] These inputs fall within six broad categories:

- Transportation
- Physical activity
- Health
- Population
- Traffic safety
- Emissions

The transportation inputs listed in Table 19 can generally be found in regional travel survey data. Transportation input data for a test application of ITHIM on the American Tobacco Trail was obtained through the Triangle Regional Model, Version 6.[3]

The physical activity and health inputs listed in Table 20 can generally be found in the Centers for Disease Control and Prevention's (CDC) Behavioral Risk Factor Surveillance System (BRFSS) annual survey data.[4] Physical activity data for a test application of ITHIM on the American Tobacco Trail was obtained through a trail intercept survey, and health data was obtained through BRFSS.

Population, traffic safety, and emissions data round out the remaining inputs into ITHIM in Table 21. Population distribution data can generally be found through the U.S. Census Bureau, and population forecasts can generally be found through individual state, regional, or county planning agencies. Data on serious and fatal collisions can generally be found through the National Highway Traffic Safety Administration's (NHTSA) Fatality Analysis Reporting System (FARS).[5] Emission data estimates can generally be found through regional planning organizations via the Environmental Protection Agency (EPA).[6] These were the data sources for a test application of ITHIM on the American Tobacco Trail.

Table 19: ITHIM Inputs - Transportation

Category	Variable	Stratum 1	Stratum 2	Stratum 3	Units
Transportation	Per capita mean daily travel time	Transportation Mode (Bicycle, Bus, Car, Motorcycle, Rail, Walk, Other)	N/A	N/A	Minutes/ Person/ Day
	Per capita mean daily travel distance	Transportation Mode (Bicycle, Bus, Car, Motorcycle, Rail, Walk, Other)	N/A	N/A	Miles/ Person/ Day
	Walk speed	N/A	N/A	N/A	Miles/ Hour
	Person miles traveled (PMT)	Auto Role (Driver, Passenger)	N/A	N/A	Miles/ Day
	Person hours traveled (PHT)	Auto Role (Driver, Passenger)	N/A	N/A	Hours/ Day
	Vehicle miles traveled	All Trucks	All Roadway Types	N/A	Miles/ Day
	Vehicle miles traveled by facility type	Vehicle Type (Bus, Cars/Light-Duty Trucks, Medium and Heavy Trucks)	Roadway (Arterial, Highway, Local)	N/A	Miles/ Day

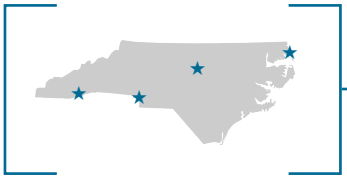


Table 20: ITHIM Inputs – Physical Activity and Health Characteristics

Category	Variable	Stratum 1	Stratum 2	Stratum 3	Units
Physical activity	Per capita weekly non-travel related physical activity	Quintile of travel related MET (1, 2, 3, 4, 5)	Age (All Ages, 00-04, 05-14, 15-29, 30-44, 45-59, 60-69, 70-79, 80+)	Gender (Female, Male)	MET-hours/ Week
	Ratio of per capita mean daily active travel time (relative to females aged 15-29 years old)	Transportation Mode (Bicycle, Walk)	Age (All Ages, 00-04, 05-14, 15-29, 30-44, 45-59, 60-69, 70-79, 80+)	Gender (Female, Male)	Dimensionless
	Standard deviation of mean daily active travel time	N/A	N/A	N/A	Minutes/ Person/ Day
Health	Age-sex specific ratio of disease-specific mortality rate between geographic area and United States	Cause (All Causes, Acute Respiratory Infections, Breast Cancer, Colon Cancer, Dementia, Depression, Diabetes, Hypertensive Heart Disease, Ischemic Heart Disease, Inflammatory Heart Disease, Lung Cancer, Respiratory Diseases, Respiratory Tract Infection, Stroke)	Age (15-29, 30-44, 45-59, 60-69, 70-79, 80+)	Gender (Female, Male)	Dimensionless
	Proportion of colon cancers from all colorectal cancers	Gender (Female, Male)	N/A	N/A	Percent

Table 21: ITHIM Inputs – Other Inputs

Category	Variable	Stratum 1	Stratum 2	Stratum 3	Units
Population	Population Distribution	Age (All Ages, 00-04, 05-14, 15-29, 30-44, 45-59, 60-69, 70-79, 80+)	Gender (Female, Male)	N/A	Percent
	Population forecasts (25-year gap)	Period (Current, Future)	N/A	N/A	Persons
Traffic Safety	Collisions	Striking Vehicle (None, Bicycle, Bus, Car/Pick-up, Motorcycle, Pedestrian, Train, Truck)	Victim Vehicle (None, Bicycle, Bus, Car/Pick-up, Motorcycle, Pedestrian, Train, Truck)	Severity (Fatal, Serious)	Collision
Emissions	Fine particulate matter emissions	N/A	N/A	N/A	µg/m3

Figure 9 visually displays how these many data inputs come together and interact with one another via the ITHIM to result in combined health impacts. Results of testing the ITHIM approach on the American Tobacco Trail are provide on page 74 in the Study Results chapter.

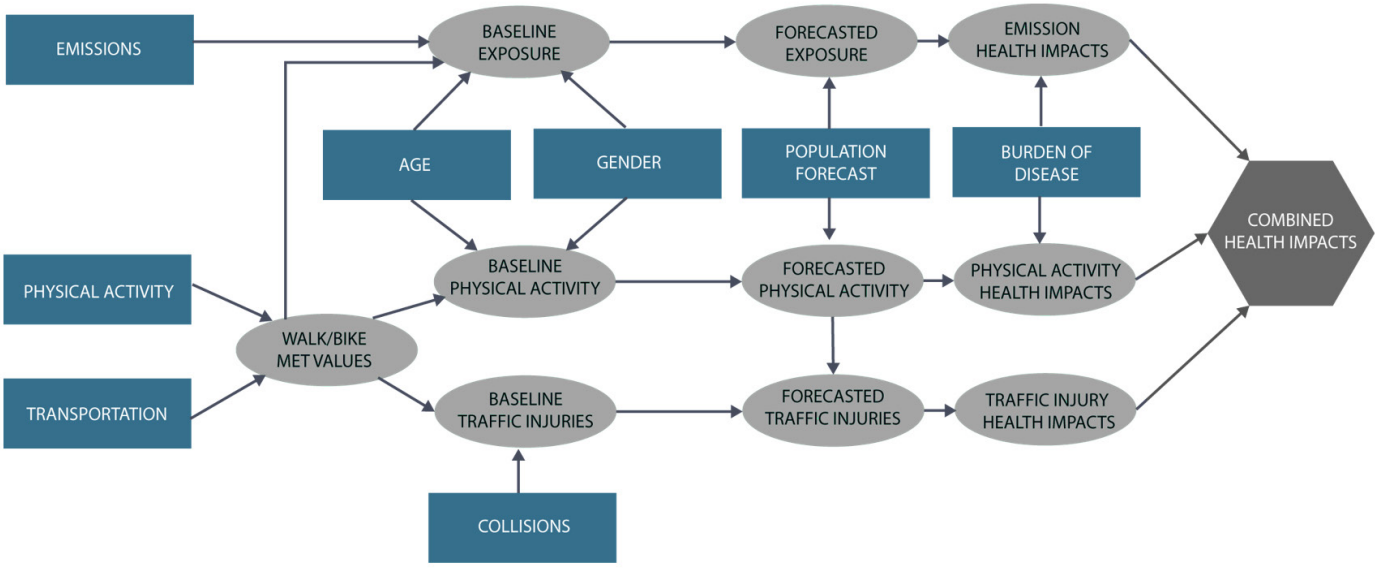
Additional Considerations

ITHIM outputs occur at a user-specified, steady-state time horizon. Assumptions include:

- Health co-benefits occur in a single "accounting year," although the changes in the physical activity distribution and low carbon driving are likely to gradually occur over time, and that these co-benefits will be maintained in subsequent years.
- Disease rates, physical activity rates, road traffic injury rates, and fine particulate matter emission estimates do not vary over time.
- The increase in physical activity is not compensated by a decrease in non-transport physical activity (no activity substitution).
- Other factors influencing physical activity, such as body weight distributions, are time invariant.

In addition to these assumptions, ITHIM has some limitations, as it does not include other forms of air pollution (i.e. Ozone, Carbon Dioxide, Nitrous Oxides, etc.) and the data inputs are less reliable for sub-county geographies, such as the area surrounding a trail network.

Figure 9: Flow of Inputs through ITHIM



Alta's Benefit Impact Model

Approach

An alternative to the data-intensive ITHIM approach is the use of a third-party proprietary model, such as Alta Planning + Design's Benefit Impact Model. Alta's model extrapolates from readily-available commute travel data from the U.S. Census Bureau and makes use of national and state-level datasets to estimate the impacts of a given trail or trail network. Similar to ITHIM, Alta's model allows the user to test various transportation investment scenarios to see how increased walking and bicycling rates may impact the overall community. While third-party models are less transparent than their open-source ITHIM counterpart, Alta's model requires fewer data inputs and allows the user to arrive at high-level transportation, environmental, and health benefit estimates quickly. To see results on a test application of this model on the Brevard Greenway, Duck Trail, and Little Sugar Creek Greenway, see page 75 of Chapter 5, Study Results.

Data Needs

The data inputs for Alta's Benefit Impact Model include study area population, employment, mode share and school enrollment values from the U.S. Census Bureau's American Community Survey (ACS), as shown in the table below. Values are collected at two geographic levels: a 0.5-mile buffer around the trail alignment to capture walking trips and 3.0-mile buffer to capture bicycling trips.

Table 22: Alta Benefit Impact Model Inputs – American Community Survey (ACS) 5-year Estimates

ACS Table ID	B08301	B01003	B14001
Table Name	Means of Transportation to Work (Employment and Commute Mode Share)	Total Population	School Enrollment for Population 3 Years and Older

Table 23: Alta Benefit Impact Model Inputs – Trail Intercept Survey Data

	Baseline Estimates		
	Brevard Greenway	Little Sugar Creek Greenway	Duck Trail
Average Miles Traveled (Bike)	5.3	3.8	5.2
Average Miles Traveled (Walk/Jog)	2.7	2.5	2.7
Trip Purpose (commute/ school)	2%	4%	2%
Average Exercise Met from Trail Use	42%	49%	46%

Alta's Benefit Impact Model was tested on the Brevard Greenway, Little Sugar Creek Greenway, and Duck Trail. In addition to the ACS input data, trail intercept surveys allowed for the substitution of national and state level data factors with localized factors. Localized variables included in each model are listed in Table 23 and include average trip distance by mode, trip purpose, and the average percent of exercise met through trail use. These localized variables were combined with the ACS data and built-in national and state-level multipliers to analyze estimated annual transportation, environmental, and health benefits of the SUPs.

The analysis starts by extrapolating from ACS commute mode share data to estimate the number of walk and bicycle trips on each trail each year. These values are the multiplied by the average trip distances gleaned from the intercept surveys and a national-level motor vehicle trip replacement factor to generate an annual vehicle-miles traveled (VMT) reduction estimate. This VMT reduction estimate serves as the foundation for transportation benefit estimates. Changes in VMT produce an associated change in motor vehicle emissions, which Alta's model expresses as CO_2 and other criteria pollutants.

Additional Considerations

The primary purpose of Alta's model is to enable a more informed policy discussion on whether and how best to invest in a given trail network. Even with extensive primary and secondary research incorporated into the

model, it is impossible to accurately predict the exact impacts of various factors. Accordingly, all estimated benefit values are rounded and should be considered order of magnitude estimates, rather than exact amounts.

Section Notes:

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3. *Triangle Regional Model. NC Capital Area Metropolitan Planning Organization. <http://www.campo-nc.us/mapsdata/triangle-regional-model>*
4. *Behavioral Risk Factor Surveillance System. Centers for Disease Control and Prevention. <https://www.cdc.gov/brfss/annual_data/annual_data.htm>*
5. *Fatality Analysis Reporting System. National Highway Traffic Safety Administration. <https://www.nhtsa.gov/research-data/fatality-analysis-reporting-system-fars>*
6. *United States Environmental Protection Agency. <https://www.epa.gov/>*

FIELD DATA COLLECTION

For each SUP case, field data were collected primarily through two sources: intercept surveys and manual counts. Information that was gathered included:

- Trail origin and destination points to derive distance and direction of travel on the trail
- Purpose of trip – exercise/recreation/sightseeing, work/school commute, dining/shopping/errands, cultural attraction/entertainment/leisure activity
- Trip mode – mode of arrival at the trail (e.g. auto, bike, foot, bus, other) and mode of travel on the trail (e.g. walk, run, bike, other)
- Physical activity indicators – duration of active travel, quantity of typical monthly active travel by trip purpose
- Economic activity indicators – amount spent on goods or services during trail trip
- Respondents' living status in the area and demographic information

Additionally, the team also recorded each person that went by the data collection station as well as their characteristics such as:

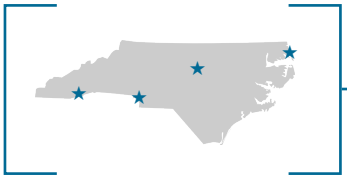
- Type of user – bicyclist, runner, walker, other mode
- Direction of travel – north or south
- Age – adult or child
- Gender
- Group size

Station Selection

From the reconnaissance field work conducted during the trail selection process (see Chapter 3), all key features (access points, landmarks, mile markers) of each trail were geocoded and mapped to visually select each data collection station. Stations were generally placed every two miles apart taking into account the density of access points along a trail and with closer spacing where more pedestrian activity was expected. Station locations were further prioritized for suitability based on:

- Adequate space for table and survey respondents to stand off the trail
- Nearby parking and loading/unloading options
- Nearby access to restroom / water / food
- Relatively flat terrain (avoid horizontal or vertical curves)
- Shade availability

Each station was manned by a minimum of three people – two survey administrators and one counter. Because the manual count form also captured age, travel mode, and gender, the survey response data set could be compared with the trail use population to determine its representativeness. To examine the manual count and survey forms used, see Appendix B and C, respectively.



Maps showing the location of each station along each SUP are shown in Figures 3-6 at the end of Chapter 3.

While screenline counts were collected manually at each station, a continuous counter (CCS) was also installed on each SUP near one key data collection station to permanently capture temporal fluctuations in volume. Time of day and day of week travel patterns from the CCS informed the schedule for field data collection to ensure peak days, hours, and seasons were covered, and that variations in weekday versus weekend usage were captured. Table 24 shows the data collection plan and resultant summary statistics. Dates were selected to avoid special events to remove the potential for variation in typical volumes of non-motorized traffic. Data collection was stopped, delayed, or rescheduled as required due to rain events.

Additional Considerations

Based on survey findings across each of the SUPs studied, a few characteristics were identified that may influence how to select stations for future data collection needs.

Mode of Interest

Bicyclists travel farther distances per trip than pedestrians or joggers, on average. Therefore, the spacing of stations was driven by the desire to potentially intercept each pedestrian. This required spacing stations roughly no more than 2 miles apart, which was found to be the average distance a pedestrian traveled. Should future studies focus specifically on intercepting bicyclists, data collection stations could be spread farther apart. Indeed, on the American Tobacco Trail, surveyors at one station would often hear from bicyclists passing by that they had "already taken it" at another station.

Table 24: Data Collection Schedule and Total Number of Records Collected

SUP	# of Stations	Year	Collection Period		Total # of Counts	Total # of Surveys	Est. # of Unique Users
			Hours	Day of Week			
ATT	10	2015	7AM – 7PM	Thurs, Oct. 8	4,434	905	1,472
				Sun, Oct 11	11,788	1,496	3,539
		2016	7AM – 7PM	Sat, May 14	8,954	1,230	2,525
				Mon, May 16	4,141	766	1,354
		2017	7AM – 7PM	Tues, May 16	4,165	757	1,328
				Sat, May 20	7,745	911	2,274
BG	3	2015	7AM – 7PM	Wed, Oct 14	505	137	240
				Sat, Oct 17	523	133	273
		2016	7AM – 7PM	Thurs, May 19	307	93	135
				Sat, May 21	546	147	261
		2017	7AM – 7PM	Sun, Aug 13	539	131	237
				Mon, Aug 14	411	99	191
DT	2	2016	6:30AM – 7:30PM	Mon, Jun 20	2,127	211	1,009
				Tues, Jun 21	2,212	313	1,020
LSC	4	2016	6:30AM – 7:30PM	Tues, Oct 18	2,521	543	1,188
				Sat, Oct 22	3,614	477	1,768

Prevalence of Access Points

Each SUP varied in terms of the number of access points and their proximity to one another along the trail. SUPs with many access points, like Little Sugar Creek Greenway, can therefore be used for short distances to make brief connections in one's trip where the trail itself is not the main destination but a means to an end. In other SUPs, the access points may primarily be trailheads to which users typically drive to use the trail, such as the southern segment of the American Tobacco Trail. The former type of SUP with "porous" access points that easily connect to a broader network of non-motorized infrastructure is more difficult to determine suitable placement for a data collection station that will optimally capture most users passing by within a 2-mile long segment, whereas for the latter SUP type, trailhead access points can doubly serve as ideal data collection stations.

Volume and Travel Patterns

Variations in usage by time of day, day of week, and month of year can occur on any SUP. While a typical recreational usage pattern may be expected (higher weekend usage, afternoon weekday peaking) for most trails, it is important to verify what the typical travel pattern is before collecting survey data. Since survey data are extrapolated to understand annual usage of the SUP and its annual economic contributions, understanding how volume fluctuates on the trail ensures that survey data are collected during peak usage, thereby maximizing the staff or volunteer time on the trail collecting the data, and that the full range of typical trail users are intercepted, so the data are more likely to be representative of the population of trail users.

a) Day of Week

For example, pedestrians on the Brevard Greenway tend to use the trail relatively consistently, regardless of day of week, as shown in Figure 10. Comparatively, Figure 11 shows a clear commute pattern at the American Tobacco Trail downtown CCS, where weekdays have morning and evening peaks, as well as a lunchtime peak, while weekends show a different recreational pattern.

Another day of week consideration was applied specifically to selecting data collection days in Duck. Typically, when weekend and weekday volumes and patterns differ, it is recommended that data collection is scheduled to be conducted on one of each type of day. However, in Duck, trail activity typically declines on Saturdays and Sundays due to turnover in the visitor population that is tied to the rental agreements for much of the vacation lodging in the area. Rentals tend to run from Saturday to Saturday, so many people are traveling to and from the area that day. Sundays tend to be "beach" days, so activity on the Duck Trail picks up starting Monday, when people are more interested in touring the Village. In order to optimize the number of surveys collected, the research team chose Monday and Tuesday as priority data collection days.

b) Time of Day

Generally, the research team collected data from dawn to dusk to ensure all trail activity occurring during daylight hours were captured. The specific number of hours of data collection and start and end times were then customized based on the time of year data collection was to occur and the daily travel pattern observed for the given day of the week. For example, on the Little Sugar Creek Trail, activity picks up between 5 AM and 6 AM and drops off for the evening

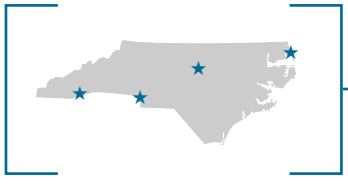


Figure 10: Average pedestrian volume by hour of day on the Brevard Greenway, 12/1/2015 - 11/30/2016

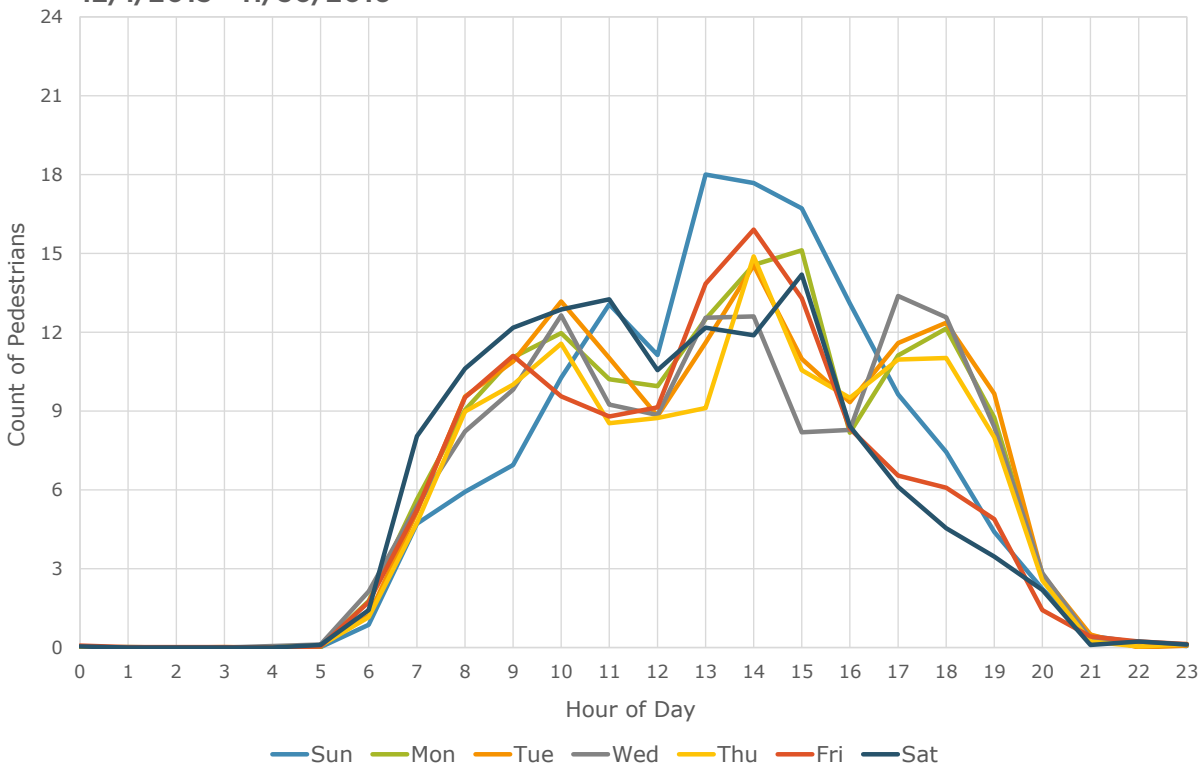
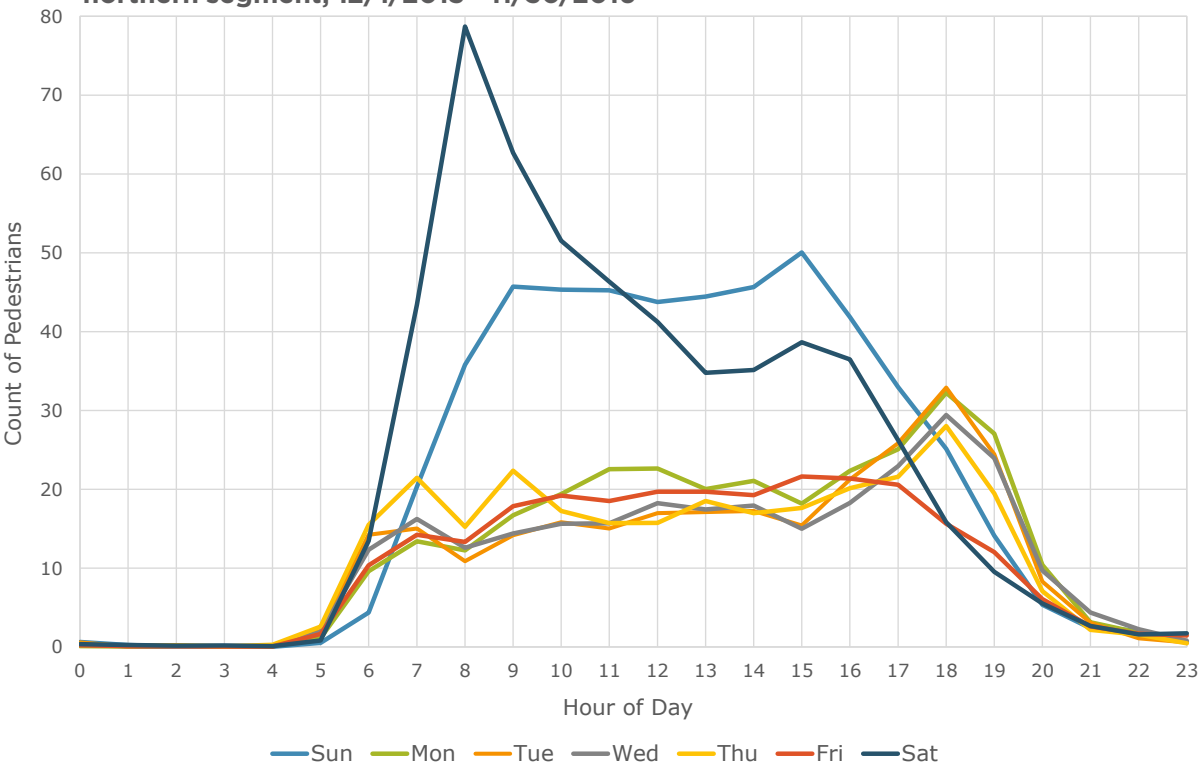


Figure 11: Pedestrian volume by hour of day on the American Tobacco Trail northern segment, 12/1/2015 - 11/30/2016



sharply between 7 PM and 8 PM. Similarly, Duck Trail shows early morning activity as well as late evening activity. In order to capture these trips, the research team extended data collection times beyond the typical 7 AM to 7 PM by 30 minutes at either end.

c) Time of Year

Travel patterns may vary by season. While the research team did not have a year's worth of continuous count data from Duck Trail before collecting survey and count data, it is well-known that tourist season in the summer would result in orders of magnitude higher traffic volumes for trail users than during the off-peak time of year. Given this variability, and our objective of understanding the economic contribution of the SUP, we deliberately chose to collect data during the peak season when the opportunity for economic impact is greatest.

A potentially unique consideration for future data collection in Duck was discovered while in the field. Because much of the vacation lodging consists of rental houses which typically rent by the week, the composition of visitors to Duck changes on a weekly basis. Further, many visitors are repeat tourists who annually go to Duck each summer for their weekly vacation, which coincides with when schools end in the districts from which they are visiting. Therefore, one week in Duck may contain visitors primarily from Virginia, Pennsylvania, Maryland, while in a subsequent week, the visitors may be primarily from New Jersey, Connecticut and West Virginia, and so forth. This phenomenon may not be unique only to Duck but could be a consideration for any high-tourist destination that relies heavily on seasonal, weekly rental turnover.

INTERCEPT SURVEY COLLECTION APPROACH

The research team intercepted people on the trail to solicit survey responses at the same locations along each SUP where manual screenline counts were collected. The survey form gathered information about the behavior and demographics of trail users. Data collection stations were outfitted with a water cooler and yard signs on each approach instructing trail users to "slow down" for the "survey ahead" as they approached the site. Only individuals aged 18 years and older were surveyed with one survey distributed per household for household members traveling together on the trail. Appendix B provides an example of the survey form used.

Testing the survey form in various settings improved the quality of the questions, the order in which questions were asked, and how the survey was administered to reduce error and improve data accuracy. Researchers found that the speed of completing a survey increased, while the likelihood of no or poor responses to individual questions decreased when the research team administered the survey to trail users. While the responses are still self-reported, trail users were able to more accurately answer questions when they were asked by a surveyor rather than when reading and filling them in directly. Further, the surveyor was able to probe or re-ask a question for clarification when answers within the response set appeared to conflict with one another, thereby serving as quality control. This also saved time in reviewing and cleaning surveys post-field collection, as fewer questions were missed; surveyors further coded responses in the field to appropriately demarcate non-responses (999) from those appropriately left blank and those where the response was zero.

In order to ensure surveyors were consistent in technique, each person was trained in how to intercept a trail user and administer the survey. Everyone collecting data at each station was trained as both a survey administrator as well as a manual counter, and they were rotated through these positions and to ensure sufficient breaks between each activity. The full data collection protocol for collecting both counts and survey response is provided in Appendix D, along with the training slides used (Appendix E) to ensure consistency in how the data were collected.

DATA CLEANING, STORAGE, MANIPULATION

All completed survey and count forms were manually reviewed for errors, omissions, and quality control prior to data entry using the instructions and coding provided in Appendix F. Time for data cleaning was significantly reduced after modifying the collection protocol to administer the surveys in full rather than introducing a respondent to the survey and passing the form over to the respondent to fill in.

Count data were stored separately from survey data by year. Within each workbook, datasets for each SUP were stored on separate spreadsheets. Additional tools were developed including a distance look-up table, which allowed travel distances on the trail to be calculated between any start, turnaround, and end point on the trail.

While each dataset contains a wealth of information that could be further analyzed, our objective called for summarizing the high-level findings of each data point with minimal subgroup analyses. Data for each study of each SUP were therefore compiled into the summary results provided in the eight technical memoranda available in Appendix A.

UNIQUE USERS ESTIMATION METHODOLOGY

Because the research team anticipated it would be uncommon for people to travel the entire length of each studied SUP in one trip, multiple count locations were used to understand overall trail usage. However, 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 count station to develop a comprehensive estimate of trail usage for each SUP, survey data were used to help define trip patterns (where respondents entered, exited, and/ or turned around on the trail) to reduce the raw count at each station by people who would have been counted at another station. The number of times a user is likely to be over counted increases as the number of survey-and-count stations increases. For example, on the Duck Trail, two survey-and-count stations were used in order to provide coverage for the six-mile length of the trail. This means that a single user could be counted up to four times for a roundtrip or two times for a one-way, throughtrip. The amount of times a user is over counted is directly related to trip distance, which is tied to a user's travel mode, i.e. bicyclists tend to travel further distances than joggers/runners and walkers, and joggers/runners tend to travel further distances than walkers.

Determining the number of unique users on a given SUP involves several calculations based on survey responses and manual count data. The following steps are required for each data collection day by travel mode on the trail to generate the number of unique users by mode for each data collection day:

1. Determine number of stations passed for each intercepted user based on the station where a user was intercepted.

2. Determine the number of users by number of stations passed based on the station where a user was intercepted.

3. Determine the number of and proportion of roundtrips and throughtrips intercepted at each station.

4. Determine the ratio of users by the number of stations passed to the total number of users intercepted at each station for roundtrips and for throughtrips.

5. Determine the number of roundtrip and throughtrip counts collected at each station by adjusting by the proportion of roundtrips and throughtrip surveys collected at each station.

6. Adjust the number of roundtrip and throughtrip counts collected at each station by the ratio of users by number of stations passed to the total number of users intercepted at each station to generate the number of unique users by number of stations passed.

Note that the adjustments for users making roundtrips or those making longer distance trips where they passed more than one data collection station does not result in a true count of individual persons using the trail during the total data collection period – some individuals may have visited the SUP on more than one data collection day, made more than one trip per day, or traced a unique travel pattern on the trail that was not otherwise captured in survey responses for traditional roundtrips or one-way, throughtrips. Unique users can be understood only on a per day basis. The unique users calculated on each trail for each data collection day it was studied are shown in Table 24.

ANNUAL TRIPS METHODOLOGY

Adjustment of count data from the continuous count stations (CCS) was required to convert unique users into an estimate of annual trips. Surveys and counts from the survey-and-count stations were used to adjust data from a continuous, 365-day count station to estimate the annual number of trips on the trail by mode.

One year's worth of (CCS) data was used in combination with the unique users derived from the survey and manual count data to generate an estimate of annual trips. Invalid days of CCS data were removed and correction factors were applied based on a standardized validation process.[1] Missing days of data that were removed after being deemed invalid due to equipment error were replaced with an average day-of-week count for the given month. Simply stated, the daily volumes from the CCS were normalized relative to the dates when the survey and manual counts were collected and then adjusted by the ratio of unique users to manual counts for the same dates. The daily unique users were then summed for the year to generate the estimated annual trips.

The following calculation steps are required to adjust the CCS data to annual trips using ratios generated from one weekday and one weekend day of survey and manual count data collected at each survey-and-count station on a trail:

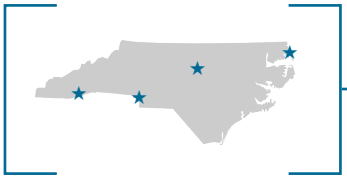
1. Determine the ratio of manual counts by mode collected at each station to the CCS counts by mode collected on the same data collection date.

2. Determine the ratio of unique users generated by mode for each station to the manual counts by mode collected at each station by each data collection date.

3. Adjust the CCS count by mode and station for all 365 days of CCS data collection by the ratio of manual counts to CCS counts on the two data collection dates – the weekday ratio is applied to weekday CCS counts and the weekend day ratio is applied to weekend day CCS counts.

4. Apply the ratio of unique users to manual counts by mode and data collection date to the adjusted CCS counts derived from 365 days of CCS data to determine daily unique users by mode for each station – the weekday ratio is applied to the adjusted weekday CCS counts and the weekend day ratio is applied to the adjusted weekend day CCS counts.

5. Sum the daily unique users by mode for all stations to determine the total annual trips.



For example, for the American Tobacco Trail, from December 1st 2014 to November 31st 2015, it is estimated that 558,200 trips were made on the ATT. This includes 195,300 bicyclist trips and 362,900 pedestrian trips on the trail, which represents an annualized estimate of the 4,977 unique users calculated as using the trail on the Thursday and Sunday in October when intercept surveys and manual counts were collected.

It is important to note that this method is heavily dependent on the completeness and accuracy of the daily counts collected by the CCS. There should be no missing daily counts; any missing data should be imputed using a reasonable method, such as average day-of-week count for the given month. In addition, this method produces results that are representative of the season in which the survey and manual count data are collected.

Section Notes:

1. *Jackson, K.N., S.W. O'Brien, S.E. Searcy, and S.E. Warchol. "Quality Assurance and Quality Control Processes for a Large-Scale Bicycle and Pedestrian Volume Data Program." Transportation Research Record: Journal of the Transportation Research Board, No. 2644, 2017, pp. 19–29. http://dx.doi.org/10.3141/2644-03*

RECOMMENDED METHODOLOGY MATRIX

Table 25 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 25: Recommended Shared Use Path Economic Valuation Methodologies

Category	Sub-category	Data Required	Methodology or Value Used
Impacts to SUP-related businesses and employees	***Trail User Expenditures*** *(includes special events and tourism expenditures that result from existence of trail)*	***Intercept Survey*** • Expenditures by type and trail user • Frequency of trips per user ***Manual Count*** • User count by mode, age, and gender ***Automated Count*** • Expanded count of users by mode for extrapolation	**Step 1:** Estimate average expenditures per user type from intercept survey **Step 2:** Evaluate sample of completed surveys with manual user counts for representativeness of the survey (further analysis if adjustments are needed) **Step 3:** Extrapolate average expenditures to an annual amount with automated counts and predictive model (if needed) **Step 4:** Estimate multiplier effects of annual expenditures using IMPLAN
	Retail Sales Tax Benefits *(function of trail user expenditures)*	***Intercept Survey*** • Expenditures by type ***NC Department of Revenue*** • State and local tax rates ***Municipal Real Estate Schedule of Values*** • Regional average of competitive space	**Step 1:** Use estimated expenditures per user type derived from steps 1-3 above (Trail User Expenditures) **Step 2:** Estimate the local and state tax contribution resulting from these expenditures, based their respective tax rates **Step 3:** Divide expenditures by regional average of competitive space to get retail square footage supported
Impacts to NC's Economy from SUP Investment	***Capital Expenditure***	***NC Department of Transportation*** • SUP capital expenditures ***Local Agency*** • SUP capital expenditures	**Step 1:** Obtain and summarize capital expenditures data **Step 2:** Normalize data to economic base year **Step 3:** Estimate multiplier effects of capital expenditures using IMPLAN
	Operational Expenditure	***NC Department of Transportation*** • SUP operational expenditures ***Local Agency*** • SUP operational expenditures	**Step 1:** Obtain and summarize operational expenditures data **Step 2:** Normalize data to economic base year **Step 3:** Estimate multiplier effects of operational expenditures using IMPLAN or TREDIS
Impacts to Land Values for Properties within SUP Proximity	***Property Value Impacts*** *– Rough Assessment*	***County Parcel Data Records*** • Property assessed values in proximity to trail • Assessed values of similar properties not in proximity to the trail	**Step 1:** Evaluate property values in ½ mile proximity to SUP relative to similar property values ½-1 mile away from SUP **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*** • Property neighborhood factors • Property structural factors (bedrooms, bathrooms, square footage) • Property sales prices ***American Community Survey*** • Block group demographics • Vacancy rate ***Public Tax Records*** • Assessed tax value	**Step 1:** Generate base linear model by regressing the sales price on the core predictors for properties within ½ mile of SUP **Step 2:** Evaluate geospatial residual pattern for under- or over-predicted areas to identify additional control variables based on SUP context **Step 3:** Iteratively refine and re-run model with customized variables to test their inclusion for best fit. **Step 4:** Test for statistical significance of effect on sales prices from proximity to SUP.

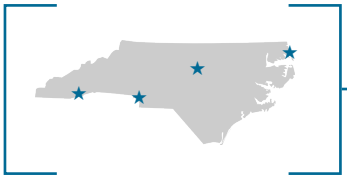


Table 25: (continued)

Category	Sub-category	Data Required	Methodology or Value Used
User and Societal Benefits	***Health Benefits***	***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	**Step 1:** Estimate total number of SUP users and their average trip lengths from counts and intercept surveys. **Step 2:** 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.
	Congestion Benefits	***Intercept Survey*** • 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	**Step 1:** Survey trail users about travel mode, trip purpose, and whether they would have made that trip if the SUP did not exist. **Step 2:** Calculate vehicle miles traveled from origin to destination for users who would have made trip with another mode. **Step 3:** Use info from steps 1-2 to estimate societal benefits that arise from avoided motorized transport external costs
	Air Pollution Reduction Benefits	***Intercept Survey*** • 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	**Step 1:** Survey trail users about travel mode and whether they would have made that trip if the SUP did not exist. **Step 2:** Use info from step 1 to estimate societal benefits that arise from avoided motorized transport external costs.
	Safety Benefits	***Intercept Survey*** • Average time spent on SUP (duration, trip frequency, and/or distance) ***NC Division of Motor Vehicles*** • Serious and fatal collisions ***Federal Highway Administration*** • Statistical value of human life	**Step 1:** Survey trail users about trip duration, frequency, and distance. **Step 2:** Collect collision data for the study area and parallel paths. **Step 3:** Use info from steps 1-2 to estimate societal benefits that arise from avoided motorized transport collision costs

Chapter Five
STUDY RESULTS

A 2017 bicycle tour of the American Tobacco Trail by planners from across the southeast. The tour featured a discussion of methodology for this study.

OVERVIEW

Just as the last chapter laid out the methods used to assess different types of economic contributions of SUPs, this chapter lays out the fundings from their applications. Results are organized in the following order:

- Business and Employee Benefits
- Retail Sales Tax Benefits
- Benefits from Capital Expenditure Investments
- Property Value Impacts
- Health, Congestion, and Pollution Reduction Benefits

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 following industrial sectors in North Carolina:

- Grocery
- Retail
- Bike Rental
- Real Estate
- Restaurant
- Entertainment

The economic activity that arose from trip expenditures captured via the intercept surveys includes direct, indirect, and induced/multiplier impacts.

- ***Direct impact.*** A trail user makes an expenditure at a local business. That local business is the direct beneficiary and experiences the direct impact of increased business revenue. That additional revenue is used to support jobs, employee earnings, and additional output for that local business.
- ***Indirect impact.*** An indirect impact is experienced by a supplier to a business that receives a direct impact. For example, a trail user purchases a bicycle at a local bike shop. In addition to directly impacting the bike shop, the purchase indirectly impacts the bicycle manufacturers who sell their bicycles to the bike shop. As the bike shop sells its bicycles, it will purchase more from a manufacturer, which will receive additional revenue – an indirect impact.
- ***Induced impact.*** Employees of businesses that have received direct and indirect impacts (as a result from a trail user's expenditure) will earn a paycheck. As those employee earnings are spent, they support North Carolina's economy. Employees who experience the direct or indirect effects of a trail user's purchases and spend their earnings in the economy create an induced impact for the state's economy.

The business and employee benefits of the SUPS studied are provided below and summarized in Table 26 at the end of this section. For the American Tobacco Trail and the Brevard Greenway, which were studied iteratively, the results shown are averaged across the three project years. Each trail's direct, indirect, and induced impacts are demonstrated.

American Tobacco Trail

Approximately 480,800 annual American Tobacco 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)
  - Direct impact: $3,000,000
  - Indirect impact: $1,202,000
  - Induced impact: $1,466,000

- 78 jobs supported through trail user expenditures
  - Direct jobs supported: 59
  - Indirect jobs supported: 8
  - Induced jobs supported: 11
- $2,211,000 generated in labor income
  - Direct earnings supported: $1,370,000
  - Indirect earnings supported: $375,000
  - Induced earnings supported: $465,000

Brevard Greenway

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)
  - Direct impact: $831,000
  - Indirect impact: $331,000
  - Induced impact: $404,000
- 21 jobs supported through trail user expenditures
  - Direct jobs supported: 16
  - Indirect jobs supported: 2
  - Induced jobs supported: 3
- $614,000 generated in labor income
  - Direct earnings supported: $380,000
  - Indirect earnings supported: $105,000
  - Induced earnings supported: $129,000

Little Sugar Creek Greenway

Approximately 382,600 annual Little Sugar Creek Greenway 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)
  - Direct impact: $2,783,000
  - Indirect impact: $1,112,000
  - Induced impact: $1,366,000
- 73 jobs supported through trail user expenditures
  - Direct jobs supported: 56
  - Indirect jobs supported: 7
  - Induced jobs supported: 10
- $2,059,000 generated in labor income
  - Direct earnings supported: $1,280,000
  - Indirect earnings supported: $345,000
  - Induced earnings supported: $433,000

Duck Trail

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)
  - Direct impact: $3,643,000
  - Indirect impact: $1,518,000
  - Induced impact: $1,770,000
- 89 jobs supported through trail user expenditures
  - Direct jobs supported: 66
  - Indirect jobs supported: 10
  - Induced jobs supported: 13
- $2,668,000 generated in labor income
  - Direct earnings supported: $1,614,000
  - Indirect earnings supported: $492,000
  - Induced earnings supported: $562,000

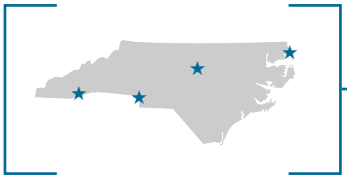


Table 26: Summary of Economic Contribution from Direct Expenditures of SUP Users

Shared Use Path	Year	Annual Number of Trips	Type of Business Benefit	Business Output	Employment (No. of Jobs)	Labor Income
American Tobacco Trail	3-Yr Ave*	480,800	Direct	$3,000,000	59	$1,370,000
			Indirect	$1,202,000	8	$375,000
			Induced	$1,466,000	11	$465,000
			Total	**$5,668,000**	**78**	**$2,211,000**
Brevard Greenway	3-Yr Ave*	76,000	Direct	$831,000	16	$380,000
			Indirect	$331,000	2	$105,000
			Induced	$404,000	3	$129,000
			Total	**$1,566,000**	**21**	**$614,000**
Little Sugar Creek Greenway	2016	382,600	Direct	$2,783,000	56	$1,280,000
			Indirect	$1,112,000	7	$345,000
			Induced	$1,366,000	10	$433,000
			Total	**$5,261,000**	**73**	**$2,059,000**
Duck Trail	2016	145,700	Direct	$3,643,000	66	$1,614,000
			Indirect	$1,518,000	10	$492,000
			Induced	$1,770,000	13	$562,000
			Total	**$6,931,000**	**89**	**$2,668,000**

**Variability in economic impacts existed in 2015, 2016, and 2017. A three-year average of annual economic activity is reported in the table.*

Trail users exhibited differences in their expenditure profiles across the four SUPs. For example, with the level of expenditures Duck Trail users made, they supported the highest levels of business output, employment, and labor income of all the four trails both overall, as shown in Table 26, and on a per-trip basis, as shown in Table 27. Meanwhile, the level of expenditures of Brevard Greenway trail users supported the second highest level of business output, jobs, and labor income on a per-trip basis, but supported the lowest levels of economic activity amongst trails overall. This can be explained as a function of the Brevard Greenway having the lowest volume of annual trips. Little Sugar Creek Greenway and American Tobacco Trail users exhibited similar expenditure behaviors supporting substantial economic activity overall, but supported less economic activity than Duck Trail and Brevard Greenway users on a per-trip basis.

Table 27: Business Benefits Supported per Trip by SUP

Shared Use Path	Output Supported per Trip	Employment Supported per Trip	Labor Income Supported per Trip
American Tobacco Trail	$12	0.0002	$5
Brevard Greenway	$21	0.0003	$8
Little Sugar Creek Greenway	$14	0.0002	$5
Duck Trail	$48	0.0006	$18

FACTORS THAT AFFECT THE BUSINESS BENEFITS – COMPARING THREE STUDY YEARS OF THE AMERICAN TOBACCO TRAIL

The research team collected three years of survey data for the American Tobacco Trail and found that a number of factors affected the economic contribution of SUPs throughout the course of the project. These factors include changes in expenditure behavior during survey periods, seasonality, and annual trip volumes.

Expenditure Behavior Variations

During the project period of the American Tobacco Trail, survey data illustrated that trail users changed their expenditure habits from year-to-year. For example, 40 percent of American Tobacco Trail trips resulted in trail users making purchases at local businesses as a result of trail use in 2015 as shown in Table 28. In comparison, 31 percent of trips in 2016 and 20 percent of trips in 2017 resulted in expenditures at local businesses. This variation in expenditure behavior had a noteworthy impact on the annual business benefits by study year as shown in Table 29. While the estimated number of annual trips increased in 2017 compared to 2016, the proportion of those who responded they made purchases while out on the trail was low enough in 2017 compared to 2016 to suppress the estimated total annual trip expenditures. This suggests that collecting one weekend and one weekday worth of survey data in any given year may not provide sufficient data to understand the typical annual economic contribution to business.

Seasonality

Though further study would be required to determine why changes in expenditure behavior were observed on a year-to-year basis, one strong possibility is seasonality. During the first year, American Tobacco Trail users were surveyed in the fall. In years two and three trail users were surveyed in the spring. Findings suggest that seasonality impacts should be accounted for when evaluating the economic impact of shared use paths. For instance, the American Tobacco Trail supported a higher level of economic activity on a per trip basis during the fall of the first year of analysis than it did in the spring of the second and third years of analysis (see Table 30). In the fall of 2015, each trip on the American Tobacco Trail supported approximately $16 of business output, 0.0002 full-time equivalent jobs, and

Table 28: American Tobacco Trail Expenditure Profiles by Study Year

Business Type	2015 (n=558,200); Fall			2016 (n=429,100); Spring			2017 (n=455,000); Spring		
	% of Trips with Expen-ditures	Average Expense	Total Est. Expenditure	% of Trips with Expen-ditures	Average Expense	Total Est. Expenditure	% of Trips with Expen-ditures	Average Expense	Total Est. Expenditure
Grocery	13%	$15	$1,609,000	8%	$25	$888,000	4%	$26	$429,000
Retail	5%	$41	$1,148,000	3%	$55	$608,000	2%	$55	$431,000
Bike Rental	0%	$39	$80,000	0%	$25	$54,000	0%	$30	-
Entertainment	1%	$27	$150,000	1%	$22	$61,000	0%	$13	-
Restaurant	20%	$15	$1,675,000	19%	$14	$1,048,000	14%	$14	$819,000
Totals	**40%**	**$27**	**$4,662,000**	**31%**	**$28**	**$2,659,000**	**20%**	**$28**	**$1,679,000**

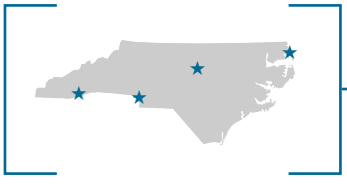


Table 29: American Tobacco Trail Annual Business and Employee Benefits by Study Year

Year	Business Output (in dollars)				Employment (No. of Jobs)				Labor Income (in dollars)			
	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total	Direct	Indirect	Induced	Total
2015	4,662,000	1,873,000	2,273,000	8,808,000	91	12	17	120	2,118,000	585,000	721,000	3,424,000
2016	2,659,000	1,065,000	1,298,000	5,022,000	53	7	10	69	1,214,000	333,000	412,000	1,959,000
2017	1,679,000	668,000	826,000	3,173,000	35	4	6	45	778,000	207,000	262,000	1,249,000
3-Yr Ave.	**3,000,000**	**1,202,000**	**1,466,000**	**5,668,000**	**59**	**8**	**11**	**78**	**1,370,000**	**375,000**	**465,000**	**2,211,000**

Table 30: American Tobacco Trail Business and Employee Benefits per Trip by Study Year

Year	Output Supported per Trip	Employment Supported per Trip	Labor Income Supported per Trip
2015	$16	0.0002	$6
2016	$12	0.0002	$5
2017	$7	0.0001	$3
3-Yr Ave.	**$12**	**0.0002**	**$5**

$6 in earned income as a result of the direct, indirect and induced impacts of trail users' expenditures. The same metrics were lower in both 2016 and 2017 when intercept surveys were conducted in the spring. The decrease in the proportion of respondents who made purchases may have been further amplified by the reduction of overall estimated annual trips for those years, too. However, given that 2016 and 2017 results are not more consistent with one another, more in-depth research is needed to determine if seasonality is the primary factor resulting in expenditure behavior variations.

Annual Trip Volumes

As overall trail usage increases as measured by the continuous counters, so does the economic contribution for a given SUP. Variations in annual trip volume estimates were accounted for in this project by taking the 3-year average. On the American Tobacco Trail, for example, 558,200 trips were estimated to be made in 2015, 429,100 trips were estimated for 2016, and 455,000 for 2017 as shown in Table 28. Even if the proportion of respondents making purchases and the average cost of each type of purchase made stayed the same, variations in trip volumes will affect the economic contribution of a SUP from year to year. This project attempted to account for variations in annual trip volumes by collecting trip expenditure data on different days of the week and different times of day over two different seasons across three different study years.

Future Considerations

When possible, best research practices involve conducting multiple survey periods over the course of the year. This would enable researchers to better account for the changes in expenditure behaviors that may occur as a result of seasonality and more accurately estimate annual trips. Additionally, using multiple years of survey data and taking the annual average of economic activity enables researchers to round out uncharacteristically high or low annual periods of economic activity. For this research we used a three-year average to estimate the economic contribution of the American Tobacco Trail. Furthermore, annual trip counts impact the magnitude of estimated economic activity a shared use path supports. When possible, applying an accurate annual trip volume or an average count of annual trip volumes in a recent time period is important for generating an accurate economic appraisal.

RETAIL SALES TAX COLLECTION 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. Estimated tax collections from expenditures made during trips on the American Tobacco Trail, Brevard Greenway, Duck Trail, and Little Sugar Creek Greenway are shown in Table 31.

Bicycle and recreation supply shop along Duck Trail.

Table 31: Summary of Annual Local and State Tax Collections Resulting from SUP Trip Expenditures

Shared Use Path	Year	Employee Compensation	Tax on Production & Imports	Households	Corporations	Total
American Tobacco Trail	Annual average*	$2,000	$169,300	$41,800	$6,600	$219,700
Brevard Greenway	Annual average*	$700	$43,900	$8,100	$700	$53,400
Little Sugar Creek Greenway	2016	$1,600	$132,700	$38,400	$6,300	$179,000
Duck Trail	2016	$3,500	$176,900	$44,400	$7,000	$231,800
All 4 SUPs	**Annual Estimated**	**$7,800**	**$522,800**	**$132,700**	**$20,600**	**$683,900**

**Based on the average annual tax collections from 2015-2017*

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, which were modeled in this project using IMPLAN. Using average cost data of $853,750 per mile from the "Cost of Independent Bicycle and Pedestrian Facilities in North Carolina" study[1] and multiplying by the SUP length in miles, the economic activity supported by the estimated construction costs of the American Tobacco Trail, Brevard Greenway, Little Sugar Creek Greenway, and Duck Trail can be found in Table 32.

SUP construction in western NC.

Table 32: Summary of the Economic Contribution of Shared Use Path Construction

Shared Use Path	SUP Length in Miles*	Type of Construction Benefit	Business Output	Employment (No. of Job Years**)	Labor Income
American Tobacco Trail	17.5	Direct	$14,900,000	155	$5,600,000
		Indirect	$5,600,000	50	$2,100,000
		Induced	$6,700,000	95	$2,100,000
		Total	**$27,200,000**	**300**	**$9,800,000**
Brevard	4.82	Direct	$4,100,000	40	$1,500,000
		Indirect	$4,100,000	15	$600,000
		Induced	$1,800,000	25	$600,000
		Total	**$7,500,000**	**80**	**$2,700,000**
Little Sugar Creek Greenway	3	Direct	$2,600,000	25	$1,000,000
		Indirect	$1,000,000	10	$400,000
		Induced	$1,200,000	15	$400,000
		Total	**$4,700,000**	**50**	**$1,800,000**
Duck Trail	6	Direct	$5,100,000	55	$1,900,000
		Indirect	$1,900,000	15	$700,000
		Induced	$2,300,000	35	$700,000
		Total	**$9,300,000**	**100**	**$3,300,000**

***A job year signifies the quantity of labor equivalent to full-time employment over the course of one year. Thus, if an IMPLAN job output were to equal 100 jobs this could be the equivalent of 100 jobs in 1 year or 10 jobs at full-time effort over the course of 10 years.*

The construction of the American Tobacco Trail bicycle and pedestrian bridge crossing Intrstate-40 also has supported economic activity in North Carolina (shown in Table 33). To determine the economic impacts of the bridge construction, the total bridge segment cost ($11.2 million) was broken down into cost components. The estimated expenditures for each of these cost components were used as inputs into IMPLAN.

An important caveat of this methodology is recognizing that impacts of capital expenditures are displayed as a one-time total benefit based on the entire construction of an SUP. For example, the American Tobacco Trail was constructed in segments over a long time horizon. For this trail, and others, the economic impacts of capital expenditures are estimated to be the total economic impacts realized by completing the entire trail, with impacts estimated in 2017 dollars and job-years. A job year signifies the quantity of labor equivalent to full-time employment over the course of one year. Thus, if an IMPLAN job output were to equal 100 jobs this could be the equivalent of 100 jobs in 1 year or 10 jobs at full-time effort over the course of 10 years (read more about the research approach for capital cost valuations in the "Construction Expenditure Impacts Methodology" section of the report).

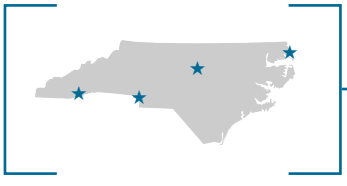
Table 33: Summary of the Economic Contribution of Bridge Construction

Shared Use Path	Bridge Cost*	Type of Construction Benefit	Business Output	Employment (No. of Job Years**)	Labor Income
American Tobacco Trail	$11.2 million	Direct	$11,000	70	$3,976,000
		Indirect	$4,831,000	30	$1,613,000
		Induced	$5,019,000	40	$1,539,000
		Total	**$21,048,000**	**140**	**$7,128,000**

** Estimated economic impacts are based on the $11.2 million construction costs for the bridge and corresponding trail connections. Bridge cost component categories were based on the May 2016 Study - "Cost of Independent Bicycle and Pedestrian Facilities in North Carolina."*

***A job year signifies the quantity of labor equivalent to full-time employment over the course of one year. Thus, if an IMPLAN job output were to equal 100 jobs this could be the equivalent of 100 jobs in 1 year or 10 jobs at full-time effort over the course of 10 years.*

The American Tobacco Trail bicycle and pedestrian bridge crossing Intrstate-40.



PROPERTY VALUES IMPACTS

Several methods can be used to explore the impact of SUPs on property values. Each method approaches the problem from a different angle by either: 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, 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), or 3) using surveying methods that relate the opinions of local realtors and residents adjacent to SUPs to property sales prices.

This project applied and examined the first two approaches. 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. While a survey of local realtors and residents adjacent to SUPs was outside the scope of this project, such additional qualitative information can provide further context and insight into the true effect of trails on property values.

HEALTH, CONGESTION, AND POLLUTION REDUCTION BENEFITS

American Tobacco Trail Application

When applied to 2016 intercept survey data of American Tobacco Trail users' levels of physical activity, ITHIM estimated that the trail contributes to a reduction in one (1) death per year through a decreased risk in chronic disease. Broken down further, physical activity from walking, running, and bicycling on the trail was estimated to increase 0.5 DALYs from a decreased risk of breast cancer, 0.2 DALYs from a decreased risk of colon cancer, 3.9 DALYs from a decreased risk of dementia, 1.9 DALYs from a decreased risk of depression, 6.0 DALYs from a decreased risk of diabetes, 9.9 DALYs from a decreased risk of ischemic heart disease, 0.3 DALYs from a decreased risk of lung cancer, 0.2 DALYs from a decreased risk of respiratory diseases, and 1.0 DALYs from a decreased risk of stroke. Overall, the trail is estimated to collectively provide its users with 23.9 additional years of "healthy life" for each year it maintains the same rate of walking and bicycling as it did in 2016. The decreased healthcare cost savings associated with this decreased health burden was $1,437,000 per year, as shown in Table 34.

Table 34: ITHIM Outputs – Change in Burden of Disease from Physical Activity Alone

Cause	Change in Annual Attrib-utable Deaths	Change in Annual Disability-adjusted Life Years (DALYs)	Annual Regional Cost Savings Attributable to Physical Activity
Breast Cancer	0.0	0.5	$12,000
Colon Cancer	0.0	0.2	$12,000
Dementia	0.1	3.9	$146,000
Depression	0.0	1.9	$55,000
Diabetes	0.2	6.0	$533,000
Ischemic Heart Disease	0.6	9.9	$559,000
Lung Cancer	0.0	0.3	$9,000
Respiratory Diseases	0.0	0.2	$3,000
Stroke	0.1	1.0	$108,000
All-cause Mortality	1.0	23.9	$1,437,000

In addition to a change in burden of disease, the American Tobacco Trail also encourages individuals to replace some motor vehicle trips with off-street walking and bicycling trips. This decrease in motor vehicle travel is associated with a decreased risk of road traffic injuries. ITHIM estimated that the trail contributes to a reduction in one (1) death for every two (2) years or a collective annual increase of 16.6 additional years of "healthy life" if 2016 walking and bicycling rates are maintained. In monetary terms, ITHIM estimated that the decreased in risk of road traffic injuries provided by the trail is the equivalent of $913,000 per year, as shown in Table 35.

While ITHIM did include pollution reduction estimates, the impacts of the American Tobacco Trail on exposure to fine particulate matter (PM2.5) within the study area was found to be negligible.

Table 35: ITHIM Outputs – Change in Risk of Road Traffic Injuries

Cause	Change in Annual Attributable Deaths	Change in Annual Disability-adjusted Life Years (DALYs)	Annual Regional Cost Savings Attributable to Decreased Risk of Road Traffic Injuries
Road Traffic Injuries	0.5	16.6	$913,000

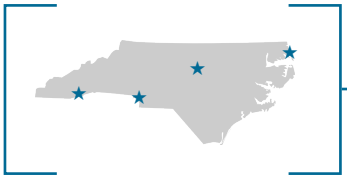
Brevard Greenway, Little Sugar Creek Greenway, and Duck Trail Applications

To better understand the typical outputs of Alta's Benefit Impact Model, it was applied to the other three trail systems studied through this project using 2016 survey data collected on each. Estimated transportation benefits are summarized in Table 36 and include the following for each SUP:

- The estimated annual benefits of the Brevard Greenway include $365,000 in annual traffic reduction costs, $670,000 in annual vehicle collision costs, $456,000 in annual roadway maintenance costs, and $1,735,000 in annual household vehicle operation costs.
- The estimated annual benefits of the Little Sugar Creek Greenway include $2,151,000 in annual traffic reduction costs, $3,943,000 in annual vehicle collision costs, $2,689,000 in annual roadway maintenance costs, and $10,216,000 in annual household vehicle operation costs.
- The estimated annual benefits of the Duck Trail include $19,000 in annual traffic reduction costs, $36,000 in annual vehicle collision costs, $25,000 in annual roadway maintenance costs, and $93,000 in annual household vehicle operation costs.

Table 36: Alta Benefit Impact Model Outputs – Estimated Transportation Benefits

	Baseline Estimates		
	Brevard Greenway	Little Sugar Creek Greenway	Duck Trail
Annual Walk Trips (miles traveled)	2,972,000 (2,202,000)	10,042,000 (7,425,000)	209,000 (156,000)
Annual Bike Trips (miles traveled)	954,000 (1,950,000)	9,646,000 (19,190,000)	31,000 (63,000)
Annual Vehicle-Miles Traveled Reduced	3,043,000	17,924,000	163,000
Reduced Traffic Congestion Costs	$365,000	$2,151,000	$19,000
Reduced Vehicle Crash Costs	$670,000	$3,943,000	$36,000
Reduced Road Maintenance Costs	$456,000	$2,689,000	$25,000
Reduced Household Vehicle Operation Costs	$1,735,000	$10,216,000	$93,000
Total Transportation Benefits	**$3,226,000**	**$18,999,000**	**$173,000**



As walk and bicycle trips replace motor vehicle trips and fewer VMT take place within the study areas each year, there is an associated reduction in motor vehicle emissions. The estimated annual benefits of the Brevard Greenway include a reduction of 4,952,000 lbs of Carbon Dioxide (CO_2), 99,000 lbs of other criteria pollutants, and an estimated annual cost savings of $102,000 in associated environmental mitigation or clean up. The estimated annual benefits of the Little Sugar Creek Greenway include a reduction of 48,397,000 lbs of CO_2, 582,000 of other criteria pollutants, and an estimated annual cost savings of $600,000 in associated environmental mitigation or clean up. The estimated annual benefits of the Duck Trail include a reduction of 266,000 lbs of CO_2, 5,000 lbs of other criteria pollutants, and an annual cost savings of $5,000 in associated environmental mitigation or clean up (as shown in Table 37).

Table 37: Alta Benefit Impact Model Outputs – Estimated Environmental Benefits

	Baseline Estimates		
	Brevard Greenway	Little Sugar Creek Greenway	Duck Trail
Annual Reduced CO_2 Emissions (lbs)	4,952,000	48,397,000	266,000
Annual Reduced Other Motor Vehicle Emissions (lbs)	99,000	582,000	5,000
Annual Environmental Cost Savings	$102,000	$600,000	$5,000

Lastly, an increase in walk and bicycle trips is correlated with increased levels of physical activity. Trail users are estimated to spend 929,000 hours each year on the Brevard Greenway, 4,394,000 hours on the Little Sugar Creek Greenway, and 58,000 on the Duck Trail. This level of physical activity is enough for 7,146 people near the Brevard Greenway, 33,800 people near the Little Sugar Creek Greenway, and 400 people near the Duck Trail to meet the Centers for Disease Control and Prevention minimum amount of weekly exercise (150 minutes), and it translates into a healthcare cost savings of $51,000, $243,000, and $2,000, respectively. Table 38 summarizes the estimated health of benefits of the three trails.

Table 38: Alta Benefit Impact Model Outputs – Estimated Health Benefits

	Baseline Estimates		
	Brevard Greenway	Little Sugar Creek Greenway	Duck Trail
Annual Hours of Physical Activity from Walking and Bicycling	929,000	4,394,000	58,000
Recommended Minimum Physical Activity Need Met from Walking and Bicycling	7,146 people	33,800 people	400
Healthcare Cost Savings	$51,000	$243,000	$2,000

DISCUSSION OF FINDINGS

Given the use of intercept survey data in both ITHIM and Alta's Benefit Impact Model, one may anticipate variability in the resultant benefits estimated based on fluctuations in distances people travel on a given SUP, their frequency in using the trail, and their duration of physical activity for each trip. For the American Tobacco Trail and the Brevard Greenway, variability was seen in the estimated annual trips by study year. The magnitude of these outcomes may change year to year or be influenced by seasonality, much like variations in the business and employee benefits were found to be.

Section Notes:

1. *"Cost of Independent Bicycle and Pedestrian Facilities in North Carolina," IDEAS Center. 31 May 2016. https://connect.ncdot.gov/projects/BikePed/Documents/Bicycle%20and%20Pedestrian%20Facility%20Cost%20Tool%20-%20Report.pdf*

Appendix A-F

Trail users come in all shapes and sizes.

APPENDIX A: TECHNICAL RESULTS BY SUP AND STUDY YEAR

As each study was conducted, the research team compiled the summary results in a technical brief to be available online prior to the culmination of this full report. While the briefs were designed to be stand alone, they have been reincorporated here into this appendix in order to maintain the complete findings of the NCDOT all in one place. This Appendix provides results for each case study by SUP and the project study year in which the data were collected:

- American Tobacco Trail Year 1 (2015)
- American Tobacco Trail Year 2 (2016)
- American Tobacco Trail Year 3 (2017)
- Brevard Greenway Year 1 (2015)
- Brevard Greenway Year 2 (2016)
- Brevard Greenway Year 3 (2017)
- Duck Trail Year 2 (2016)
- Little Sugar Creek Greenway Year 2 (2016)

APPENDIX B: SURVEY FORM

APPENDIX C: COUNT FORM

APPENDIX D: DATA COLLECTION PROCEDURES

APPENDIX E: DATA COLLECTION TRAINING SLIDES

APPENDIX F: DATA CLEANING PROTOCOL

AMERICAN TOBACCO TRAIL 2015

Results have been compiled for overall use of the trail based on the aggregated data collected at the ten survey/count stations. Findings include users' demographics, their usage of the trail, and transportation, economic, and health aspects of trail use. The preliminary findings provided have not been tested for statistical significance. These results will be further evaluated for significance and for comparative analysis once all years of data collection are complete.

Table 1 summarizes the data collection effort indicating the data collection period, survey/count location on the trail, the raw number of users counted, and the raw number of users intercepted to fill out a survey while using the trail. A total of 16,222 counts were collected during the survey period, and 2,401 surveys were completed.

TABLE 1: DATA COLLECTION SCHEDULE AND SUMMARY STATISTICS

DAY OF WEEK	DATE	TIME PERIOD	STATION	LOCATION	2015 COUNTS	2015 SURVEYS
Thursday	10/8/2015	7AM to 7PM	1	Bridge Over Lakewood	399	106
			2	MM1/Lawson Street	365	42
			3	Cornwallis Road	283	29
			4	Cook Road	556	93
			5	Southpoint Crossing	568	143
			6	MM7.5/Southpoint Mall	353	71
			7	Herndon Park	530	113
			8	New Hope Church Road	518	106
			9	White Oak Church Road	677	130
			10	New Hill Olive Chapel Road	185	72
Sunday	10/11/2015	7AM to 7PM	1	Bridge Over Lakewood	699	97
			2	MM1/Lawson Street	672	56
			3	Cornwallis Road	617	50
			4	Cook Road	1,180	80
			5	Southpoint Crossing	1,254	224
			6	MM7.5/Southpoint Mall	1,216	144
			7	Herndon Park	1,631	198
			8	New Hope Church Road	1,728	267
			9	White Oak Church Road	1,948	208
			10	New Hill Olive Chapel Road	843	172
				TOTALS	**16,222**	**2,401**

TRAIL USER DEMOGRAPHICS

Table 2 shows the **percentages of surveyed trail users and counts by gender and age group** for ATT users and counts overall:

- In general, a greater percentage of males than females used the trail.
- Nearly a quarter of those surveyed were over the age of 55.

Table 3 provides additional **demographic information for the surveyed trail users,** including education level, annual household income, and race.

- The majority of surveyed trail users (87%) completed college or obtained an advanced degree.
- The majority of surveyed trail users were white (83%) and earned annual household incomes greater than $74,999 (67%).

Survey user type data were compared to manual count user type data to determine if the survey responses could be considered representative of the population of trail users during the data collection period. Count data were adjusted based on the survey responses indicating the percentage of trips that were round trips and the number of survey/count stations passed according to user reported trail origin, turnaround, and destination points to avoid overestimating or 'double/multi-counting' unique users of the trail. A summary of the methods used to adjust the counts to unique users can be found in Chapter 5 of the Final Report.

TABLE 2: SURVEYED TRAIL USER AND COUNT DEMOGRAPHICS GENDER AND AGE

DEMOGRAPHIC	2015 SURVEYED USERS (N)	2015 COUNTS (N)
Male	55% (1,166)	59% (9,413)
Female	45% (961)	41% (6,555)
Age 18-25	7% (125)	9% (1,286)
Age 26-55	71% (1,188)	70% (10,327)
Age >55	22% (364)	21% (3,168)

TABLE 3: SURVEYED TRAIL USER DEMOGRAPHICS – EDUCATION, ANNUAL HOUSEHOLD INCOME, AND RACE

DEMOGRAPHIC	2015 SURVEYED USERS (N)
Some High School	1% (13)
Completed High School	2% (42)
Some College	8% (172)
Completed Business/Technical School	2% (53)
Completed College	38% (826)
Advanced Degree	49% (1,058)
Less than $25,000	6% (108)
$25,000-$34,999	4% (6)
$35,000-$49,999	8% (161)
$50,000-$74,999	15% (250)
$75,000-$99,999	15% (294)
$100,000-$149,999	24% (464)
$150,000-$199,999	12% (235)
$200,000 or more	16% (315)
White	83% (1,807)
Black	9% (193)
Asian	7% (157)
Native Hawaiian or Pacific Islander	<1% (8)
American Indian	<1% (7)

Table 4 provides the **percentages of ATT surveyed users, counts, and unique users by travel mode on the trail during the survey period**. Comparing data across the columns shows the degree to which those surveyed represent a proportionate sample of all those using the trail. Note that while children less than 18 years of age were counted, they were not surveyed.

TABLE 4: ALL TRAIL USERS DURING SURVEY PERIODS – TRAVEL MODE ON TRAIL

MODE	DAY	2015 SURVEYED USERS (N)	2015 COUNTS (N)	2015 UNIQUE USERS (N)
Bike	Thurs	32% (276)	46% (2,024)	33% (479)
	Sun	38% (553)	55% (6,493)	41% (1,465)
Walk	Thurs	33% (288)	28% (1,252)	40% (585)
	Sun	26% (377)	21% (2,426)	31% (1,081)
Jog/Run	Thurs	34% (298)	25% (1,109)	27% (398)
	Sun	35% (515)	23% (2,759)	27% (969)
All Other Modes	Thurs	1% (10)	1% (42)	1% (10)
	Sun	1% (16)	1% (76)	1% (24)

- In general, surveyed user proportions are similar to unique user proportions by mode.
- The proportion of counted bicyclists is much greater than the proportion of surveyed and estimated unique bicyclists. This is likely due to the longer distances traveled by bicyclists on average, which allows an individual cyclist to be surveyed once per data collection day but counted multiple times along the trail.
- The proportion of surveyed joggers/runners is greater than counted and unique joggers/runners. This is likely due to multiple track and field groups utilizing the southernmost portion of the trail where survey/count stations are further apart, which diminishes the likelihood of multi-counting while increasing the likelihood of overrepresentation in the surveys.

Table 5 provides data separated by travel mode on the trail, gender, and age group for trail users intercepted during the survey period.

TABLE 5: COMPARATIVE PERCENTAGES/NUMBERS OF COUNTS AND THOSE SURVEYED, BY TRAVEL MODE ON TRAIL, GENDER, AND AGE

MODE, GENDER, AGE	2015 PERCENTAGE OF SURVEYED USERS (N)	2015 PERCENTAGE OF COUNTS (N)
Bicycle, M, 18-25	1% (17)	2% (258)
Bicycle, M, 26-55	16% (258)	24% (3,495)
Bicycle, M, >55	8% (123)	10% (1,475)
All Bicycle, Male	**24% (505)**	**36% (5,701)**
Bicycle, F, 18-25	1% (9)	1% (193)
Bicycle, F, 26-55	8% (124)	11% (1,636)
Bicycle, F, >55	3% (51)	4% (579)
All Bicycle, Female	**11% (230)**	**17% (2,702)**
Walker, M, 18-25	1% (12)	1% (115)
Walker, M, 26-55	7% (120)	6% (872)
Walker, M, >55	4% (71)	3% (374)
All Walker, Male	**12% (256)**	**9% (1,497)**
Walker, F, 18-25	1% (15)	1% (179)
Walker, F, 26-55	12% (188)	10% (1,399)
Walker, F, >55	4% (60)	3% (387)
All Walker, Female	**17% (355)**	**13% (2,094)**
Jogger/Runner, M, 18-25	2% (27)	1% (199)
Jogger/Runner, M, 26-55	15% (241)	10% (1,516)
Jogger/Runner, M, >55	2% (32)	2% (243)
Jogger/Runner, Male	**18% (372)**	**13% (2,128)**
Jogger/Runner, F, 18-25	2% (38)	2% (284)
Jogger/Runner, F, 26-55	14% (231)	8% (1,222)
Jogger/Runner, F, >55	1% (15)	<1% (60)
Jogger/Runner, Female	**17% (355)**	**11% (1,689)**

TRAIL USER PROFILES

Information was compiled to investigate the travel modes used both to travel to the trail as well as while traveling on the trail, where trail users live in relation to the trail, whether they used the trail for recreational/non-recreational purposes, the frequency of trail use, and the distance users traveled on the trail.

Table 6 shows information on **"Local" versus "Non-Local"** point of trip origin by travel mode on the trail. "Local" is defined as zip code areas through which the ATT passes (27701, 27707, 27713, 27519 Cary, and 27523 Apex). "Non-Local" is defined as all other zip code areas.

- In general, more Local people used the trail, with the highest percentage being those who walk on the trail (76%).
- The highest proportion of Non-Local trail users are bicyclists and runners (37% each).

Trail users were asked about their **frequency of use** of the trail. The figures shown in Table 7 are averages of the total number of trips taken in the past 14 days as reported by survey respondents. Most of those surveyed used the trail several times during the previous two week period.

- On average, use of the trail during the previous two weeks was similar across all modes, with an average of six trips in the past 14 days for all modes.
- Surveyed walkers were the most frequent trail users, averaging one trip every other day.

Table 8 provides information on the **distance traveled** on the ATT by travel mode on the trail and Table 9 provides information on the **distance traveled** on the ATT by gender and travel mode on the trail. The figures reported in the table are average trip distances in miles. Cases in which inadequate data was provided to compute trip distance were not included.

- Bicyclists traveled greater distances than those traveling by other modes. Distance

TABLE 6: TRIP POINT OF ORIGIN BY TRAVEL MODE ON TRAIL

MODE	2015 LOCAL (N)	2015 NON-LOCAL (N)
Bike	63% (474)	37% (281)
Walk	76% (439)	24% (140)
Jog/Run	63% (450)	37% (265)
All Modes	66% (1,374)	34% (697)

TABLE 7: AVERAGE NUMBER OF TRIPS IN THE PAST 14 DAYS

MODE	AVERAGE NUMBER OF TRIPS	(N)
Bike	5	501
Walk	7	453
Jog/Run	5	629
All Modes	6	1,600

TABLE 8: AVERAGE TRIP DISTANCE (IN MILES) BY TRAVEL MODE ON TRAIL

MODE	2015 AVERAGE MILES TRAVELED (N)
Bike	13.1 (804)
Walk	3.3 (624)
Jog/Run	6.6 (794)
All Modes	8 (2,248)

TABLE 9: AVERAGE TRIP DISTANCE (IN MILES) BY GENDER AND TRAVEL MODE ON TRAIL

GENDER	MODE	2015 AVERAGE MILES TRAVELED (N)
Male	Bike	13.6 (489)
	Walk	3.1 (243)
	Jog/Run	7.3 (360)
	All Modes	9.1 (1,108)
Female	Bike	12.3 (226)
	Walk	3.4 (331)
	Jog/Run	6.0 (348)
	All Modes	6.6 (914)

traveled varied directly with the relative speed of each mode.

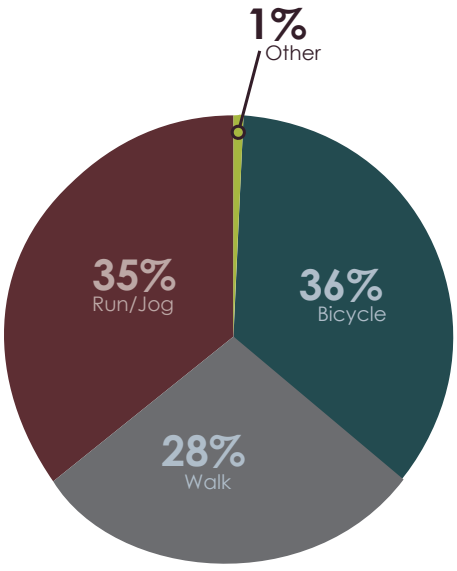
- Male bicyclists traveled the greatest distances on the trail.
- Male bicyclists and male joggers tended to travel slightly farther on the trail than females.
- Female walkers traveled nearly a third of a mile further on average than male walkers.

TRANSPORTATION IMPACTS

Analysis of transportation-related factors included:

- Mode used to travel on the trail
- Primary trip purpose
- Frequency of round trips versus one-way trips
- Mode used to travel to the trail
- Trail access points

FIGURE 1: TYPE OF USER BY TRAVEL MODE ON TRAIL



Analysis of survey responses found differences in **proportions of users by travel mode on the trail,** as shown in Figure 1.

- The majority of trail users traveled on the trail by foot (63%).

Given the relatively high use of the trail for exercise/recreational purposes (92% of trips – see Table 10), it is not surprising that most travel involved a roundtrip, not a one-way trip on the trail, as illustrated in Table 11.

- Across all modes, nearly all trips were roundtrips.

TABLE 10: PRIMARY TRIP PURPOSE

PRIMARY TRIP PURPOSE	2015 PERCENTAGE OF SURVEYED USERS (N)
For exercise/ recreation/ sightseeing	92% (2,187)
Travel to/from work or school	4% (84)
Travel to/from dining/shopping/ running errands	3% (69)
Travel to/from cultural attraction/ entertainment/ leisure activity	2% (45)

TABLE 11: TRIP TYPE

MODE	2015 ROUNDTRIP (N)	2015 THROUGHTRIP (N)
Bike	95% (784)	5% (41)
Walk	95% (628)	5% (31)
Jog/Run	98% (794)	2% (15)
All Modes	96% (2,232)	4% (87)

TABLE 12: MODE TO THE TRAIL BY MODE USED ON TRAIL

MODE ON TRAIL	MODE TO TRAIL		
	2015 by Bicycle (n)	2015 by Car (n)	2015 by Foot (n)
Bike	51% (409)	48% (385)	1% (6)
Walk	<1% (3)	59% (369)	41% (257)
Jog/Run	1% (5)	71% (546)	29% (221)
All Modes	19% (417)	59% (1,322)	22% (484)

TABLE 13: TOP FIVE ACCESS POINTS ON THE ATT

ATT ACCESS POINT DESCRIPTION	PERCENT SURVEYED (N)
White Oak Church Parking Lot	11% (254)
New Hill Olive Chapel Road	10% (235)
Jackie Robinson Drive	9% (211)
New Hope Church Road	7% (173)
Woodcroft Parkway	6% (154)

The survey also revealed the **mode by which trail users traveled to the trail.** Table 12 provides information on the access modes used to travel to the trail by all survey respondents, sorted by mode of travel on the trail. The percentages shown are calculated by row to reflect the shares of travel to the trail according to the mode used on the trail.

- Over half of those using the trail traveled to the trail by car. 65% of respondents traveling by foot on the trail accessed the trail by car compared to 48% of respondents traveling by bicycle.
- 41% of respondents used an active mode of transportation to access the ATT.
- Bicyclists were more likely to bicycle to the trail than drive to the trail.

The survey also provided information on **where trail users were accessing the trail**. Table 13 includes the top five access points on the trail according to where survey respondents accessed the trail.

- The majority of respondents (11%) accessed the trail from the White Oak Church Parking Lot.
- Nearly the same number of respondents accessed the trail from the northernmost access point at Jackie Robinson Drive as from the southernmost access point at New Hill Olive Chapel Road.

ECONOMIC IMPACTS

The users of the trail can have an impact on businesses through expenditures on a variety of goods and services. The survey asked trail users to list expenditures on goods or services directly related to their trip on the trail on the day of the survey. If a trail user was traveling with members of their household, estimates represent the total for their household.

The results are shown in the following table. Table 14 shows **trail users' expenditures related to their trip on the ATT** categorized by the type of expenditure and separated by user group.

- Food-related expenditures were the most common among surveyed trail users. The largest percentage of respondents made purchases at a restaurant. 20% of respondents made a restaurant-related purchase with an average cost of $21, and 13% of respondents made a grocery-related purchase with an average cost of $28.
- Retail and entertainment purchases were less common. Only 5% of respondents made a retail-related purchase with an average cost of $73, while 1% of respondents made an entertainment-related purchase with an average cost of $36.

TABLE 14: TYPE OF AND AVERAGE EXPENDITURE BY USER GROUP

ATT USER GROUP	Restaurant			Grocery			Retail			Entertainment			Bike Rental		
	Respondents	% of Respondents	Average Expenses	Respondents	% of Respondents	Average Expenses	Respondents	% of Respondents	Average Expenses	Respondents	% of Respondents	Average Expenses	Respondents	% of Respondents	Average Expenses
Bicycle	696	25%	$24	692	14%	$18	695	5%	$77	694	1%	$19	695	0%	$45
Jog/Run	664	18%	$19	663	11%	$41	663	4%	$97	663	1%	$29	663	1%	$58
Walk	542	17%	$20	540	14%	$28	540	6%	$50	542	1%	$84	542	0%	$15
Total	1,927	20%	$21	1,920	13%	$28	1,923	5%	$73	1,924	1%	$36	1,925	0%	$48

PUBLIC HEALTH IMPACTS

Increasing physical activity among children and adults is a national health objective in the United States. Access to facilities, such as trails, is one of the factors positively associated with physical activity. Information compiled that relates to public health impacts from user of the ATT included:

- The percentage of trail users who indicated exercise as their primary trip purpose
- The mode of activity users engaged in while on the trail
- The average duration of each activity by user type

Table 15 indicates users' **primary trip purpose.** Non-recreational trip purposes included work, school, shopping, restaurant, and entertainment trips. It is important to note that users on the trail whose purpose was not primarily exercise/recreation were still engaging in physical activity while on the trail.

- Overall, 92% of all users on the ATT indicate their primary trip purpose as exercise/recreation.

Table 16 indicates the **duration of the active portion of a trail user's trip** (in minutes) by mode traveled on the trail. The total active portion of a trail user's trip was self-reported on the survey and may include time spent actively traveling to or from the trail. This table includes respondents who did not indicate gender so overall totals vary slightly from those reported in Table 17.

TABLE 15: RECREATIONAL VERSUS NON-RECREATIONAL TRIP PURPOSES

PRIMARY TRIP PURPOSE	2015 PERCENTAGE OF SURVEYED USERS (N)
For exercise/recreation/ sightseeing	92% (2,187)
Non-recreational (all other trip purposes)	8% (198)

TABLE 16: AVERAGE DURATION (IN MINUTES) OF THE ACTIVE PORTION OF USER'S TRIP

MODE	2015 DURATION (N)
Bike	83 min (805)
Walk	59 min (653)
Jog/Run	71 min (790)
All Modes	72 min (2,274)

- The average duration of the active portion of the trip for all users surveyed on the trail was 72 minutes.
- Bicyclists reported the highest average duration of the active portion of the trip (83 minutes) compared to walkers (59 minutes) and joggers/runners (71 minutes).

Table 17 breaks out the **duration of the active portion of a user's trip by gender and travel mode on the trail**. Respondents that did not indicate gender are excluded from the data in the table.

- Overall, male trail users reported spending an average of 6 minutes more traveling on the ATT than female trail users.
- Male bicyclists and joggers/runners reported a longer duration for the active portion of their trip than females on the same modes.
- Female respondents spent five more minutes on average on their walking trips than male respondents.

Table 18 presents information on the **duration of the active portion of a user's trip in relation to annual household income** to assess the activity of users of differing socio-economic status. Duration of the active portion of the trip may include active travel to/from the trail.

- Individuals with household incomes of less than $25,000 reported using the trail for an average of 84 minutes.
- The longest duration of activity on average (107 minutes) was reported by those in the $50,000-$74,999 household income bracket.

Table 19 presents information on the **percentage of exercise met by using the trail over the past 14 days by travel mode on the trail.**

TABLE 17: AVERAGE DURATION (IN MINUTES) OF THE ACTIVE PORTION OF USER'S TRIP BY GENDER AND TRAVEL MODE ON TRAIL

GENDER	MODE	2015 DURATION (N)
Male	Bike	86 min (490)
	Walk	57 min (249)
	Jog/Run	72 min (360)
	All Modes	75 min (1,115)
Female	Bike	82 min (224)
	Walk	62 min (350)
	Jog/Run	69 min (346)
	All Modes	69 min (929)

TABLE 18: AVERAGE DURATION (IN MINUTES) OF THE ACTIVE PORTION OF USER'S TRIP BY ANNUAL HOUSEHOLD INCOME

HOUSEHOLD INCOME	2015 DURATION (N)
<$25,000	84 min (108)
$25,000-$34,999	85 min (161)
$35,000-$49,999	87 min (82)
$50,000-$74,999	107 min (290)
$75,000-$99,999	94 min (294)
$100,000-$149,999	92 min (461)
$150,000-$199,999	101 min (235)
>$200,000	89 min (315)

TABLE 19: AVERAGE PERCENTAGE OF EXERCISE MET BY USING THE TRAIL OVER THE PAST 14 DAYS BY TRAVEL MODE ON TRAIL

MODE	2015 PERCENT EXERCISE (N)
Bike	50% (695)
Walk	54% (557)
Jog/Run	54% (731)
All Modes	52% (2,003)

- Respondents used the trail to meet 52% of their total exercise on average over the past 14 days.
- A slightly larger percentage of exercise was met by using the trail for pedestrians compared to bicyclists.

Table 20 presents information on the **percentage of exercise met by using the trail over the past 14 days by gender and travel mode on the trail.**

- Overall, the average percentage of exercise met by using the trail over the past 14 days was slightly larger for male trail users compared to female trail users; the difference was the greatest for male bicyclists compared to female bicyclists.

TABLE 20: AVERAGE PERCENTAGE OF EXERCISE MET BY USING THE TRAIL OVER THE PAST 14 DAYS BY TRAVEL MODE ON TRAIL

GENDER	MODE	2015 PERCENT EXERCISE (N)
Male	Bike	51% (444)
	Walk	53% (215)
	Jog/Run	54% (349)
	All Modes	53% (1,020)
Female	Bike	45% (173)
	Walk	53% (302)
	Jog/Run	54% (318)
	All Modes	51% (800)

TRAVEL ACTIVITY MAPS

The following maps provide a visualization of travel activity on the American Tobacco Trail generated using the user reported trail origin, turnaround, and destination points taken from the surveys. Figure 3 shows where roundtrips for all modes (left) and one-way, throughtrips for all modes (right) occurred on the trail during the survey period. While roundtrips occurred on the entire length of the trail, no one-way trips were reported on the non-paved portion of the trail south of New Hope Church Road. Figure 4 shows where trips occurred on the trail during the survey period by primary trip purpose. The majority of trips were for exercise/recreation and these trips occurred on the entire length of the trail. Commuting trips were concentrated north of I-40, but happened on most on the trail. Errands trips were reported at consistent levels along the entire trail except for a small portion of the trail near the southern terminus, where no errand-related travel activity was reported. Figures 5-7 show travel activity on the trail by mode on the trail, and include the average trip duration and average miles traveled for each mode.

FIGURE 3: ROUNDTRIP (LEFT) AND THROUGHTRIP (RIGHT) TRAVEL ACTIVITY FOR ALL MODES – *96% OF REPORTED TRIPS WERE ROUNDTRIPS AND 4% OF REPORTED TRIPS WERE THROUGHTRIPS*

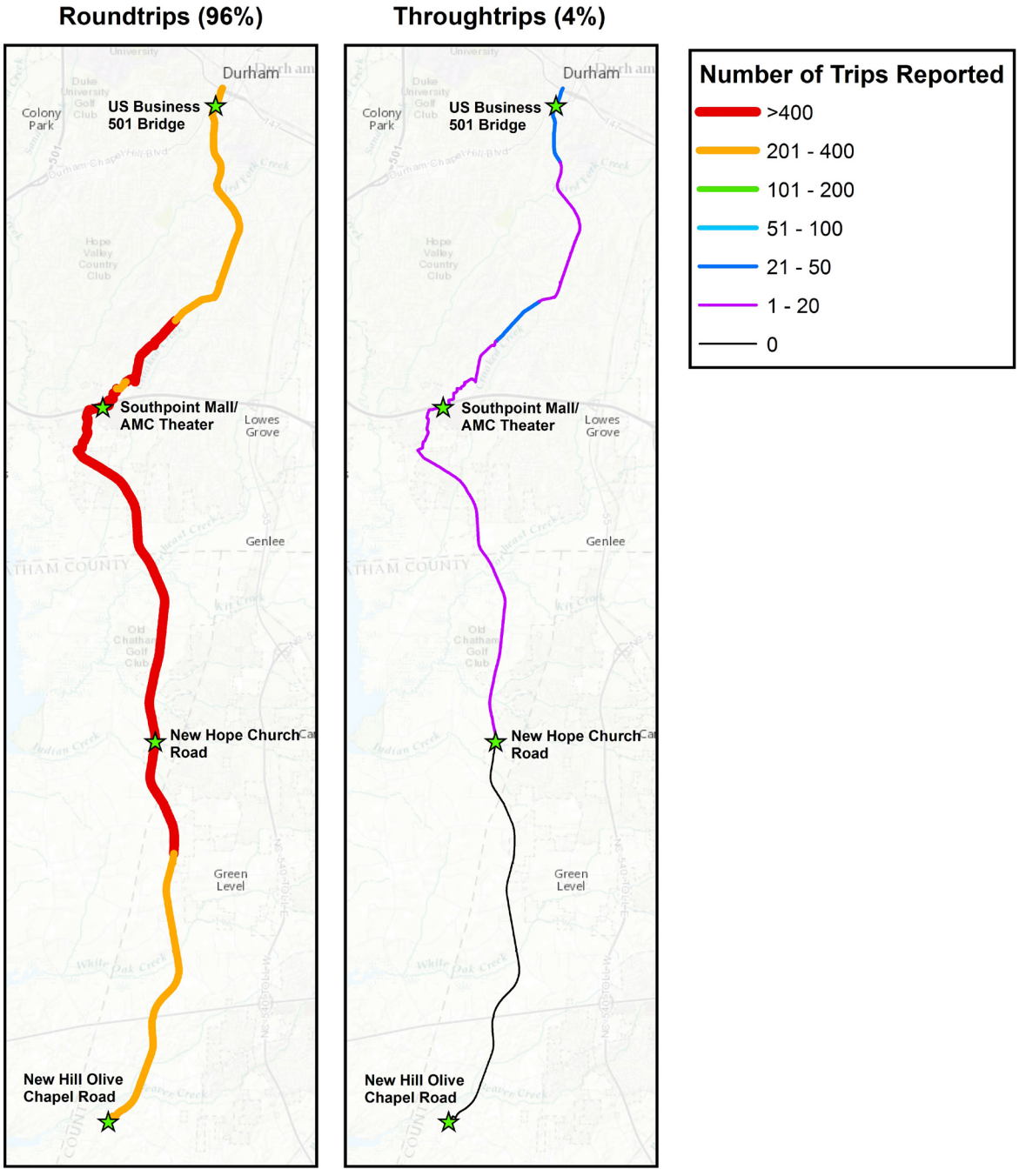


FIGURE 4: COMMUTE (LEFT), ERRANDS (CENTER), AND EXERCISE/RECREATION (RIGHT) TRAVEL ACTIVITY FOR ALL MODES – *4% OF REPORTED TRIPS WERE COMMUTE TRIPS, 3% OF REPORTED TRIPS WERE ERRANDS TRIPS, AND 92% OF REPORTED TRIPS WERE FOR EXERCISE/RECREATION*

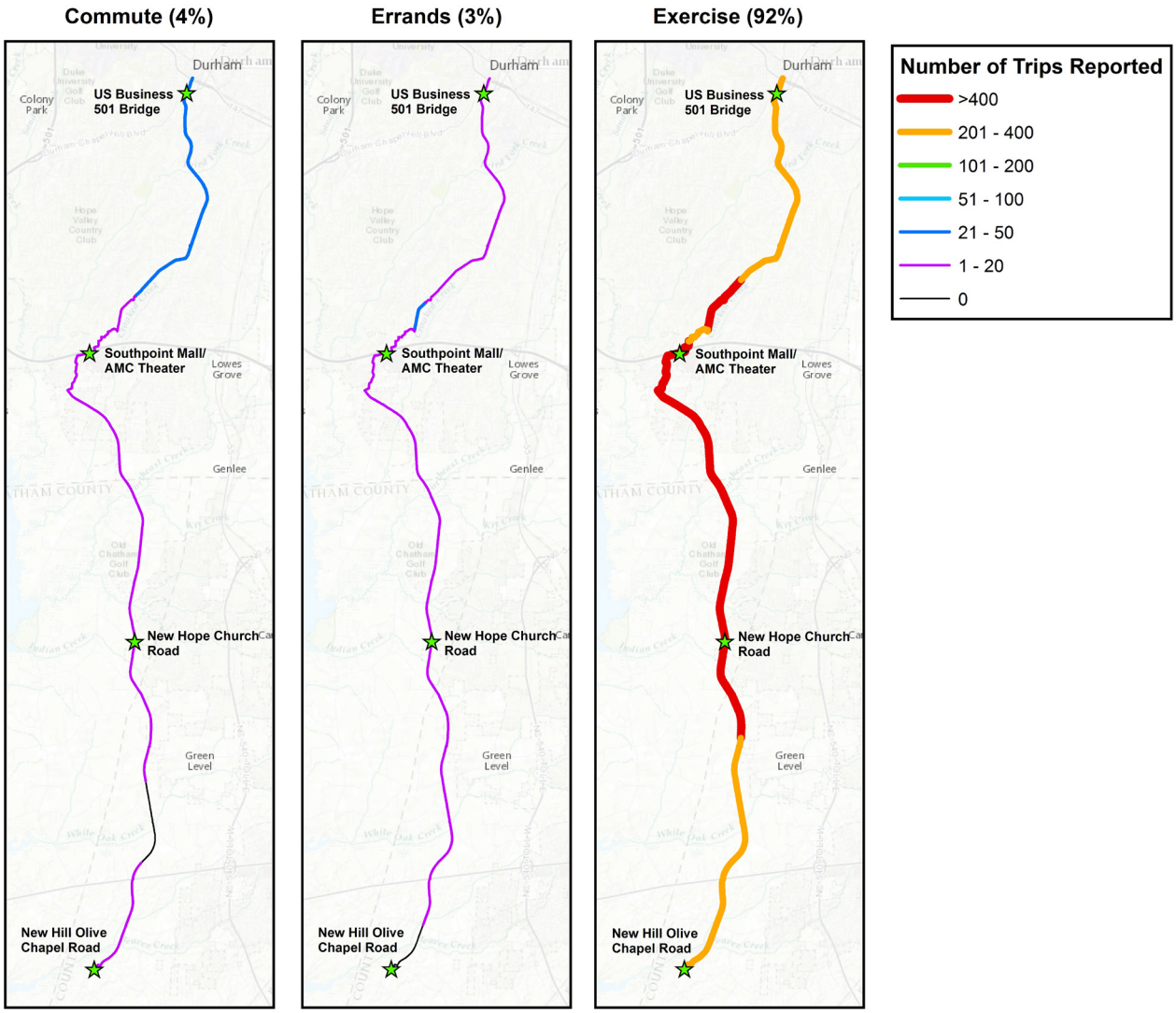


FIGURE 5: ROUNDTRIPS (LEFT) AND THROUGHTRIPS (RIGHT) FOR BICYCLISTS – *95% OF REPORTED BICYCLING TRIPS WERE ROUNDTRIPS AND 5% OF REPORTED BICYCLING TRIPS WERE THROUGHTRIPS; THE AVERAGE TRIP DURATION FOR BICYCLISTS WAS 83 MIN; THE AVERAGE DISTANCE TRAVELED BY BICYCLISTS WAS 13.1 MI*

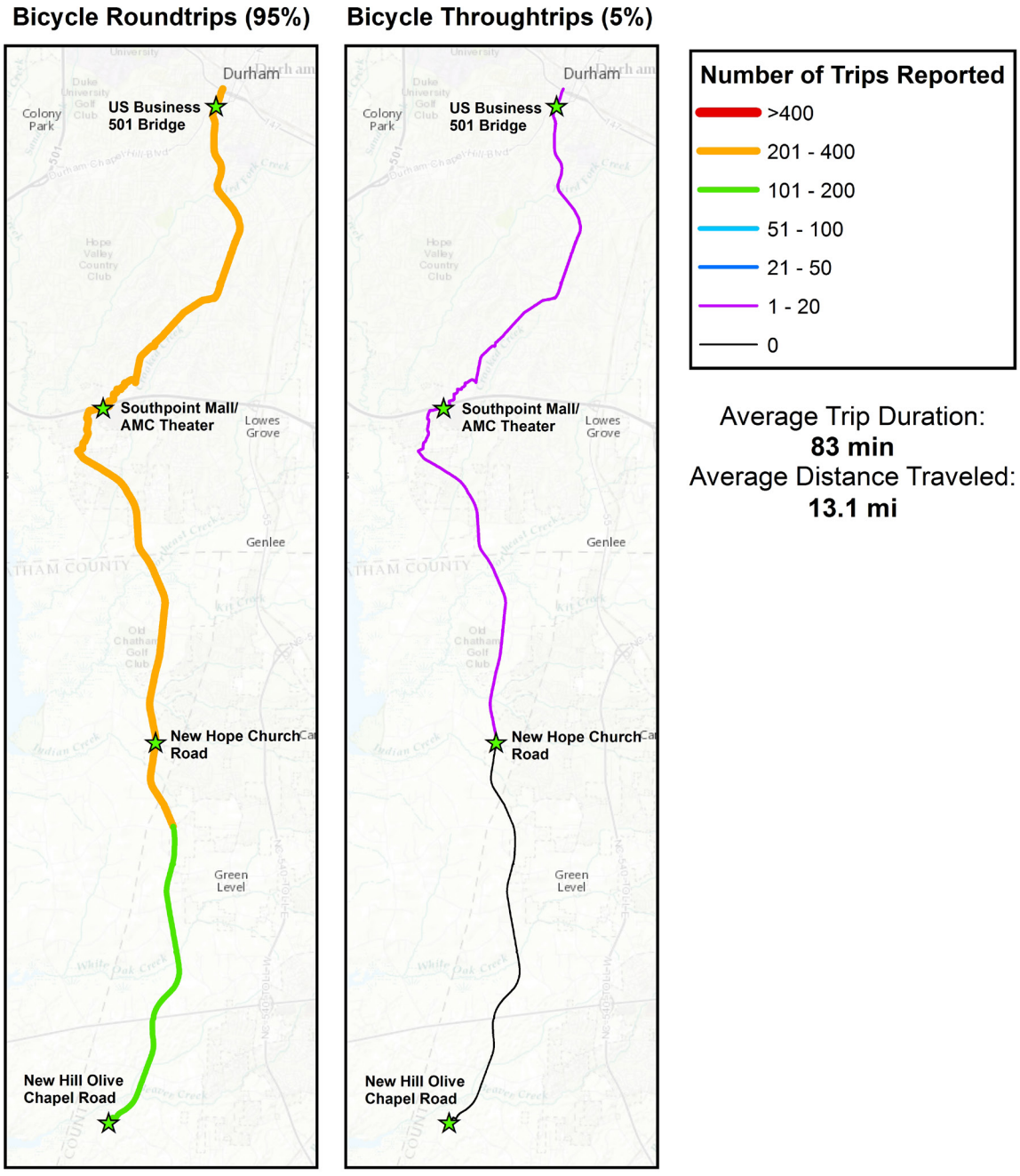


FIGURE 6: ROUNDTRIPS (LEFT) AND THROUGHTRIPS (RIGHT) FOR RUNNERS – *98% OF REPORTED RUNNING TRIPS WERE ROUNDTRIPS AND 2% OF REPORTED RUNNING TRIPS WERE THROUGHTRIPS; THE AVERAGE TRIP DURATION FOR RUNNERS WAS 71 MIN; THE AVERAGE DISTANCE TRAVELED BY RUNNERS WAS 6.6 MI*

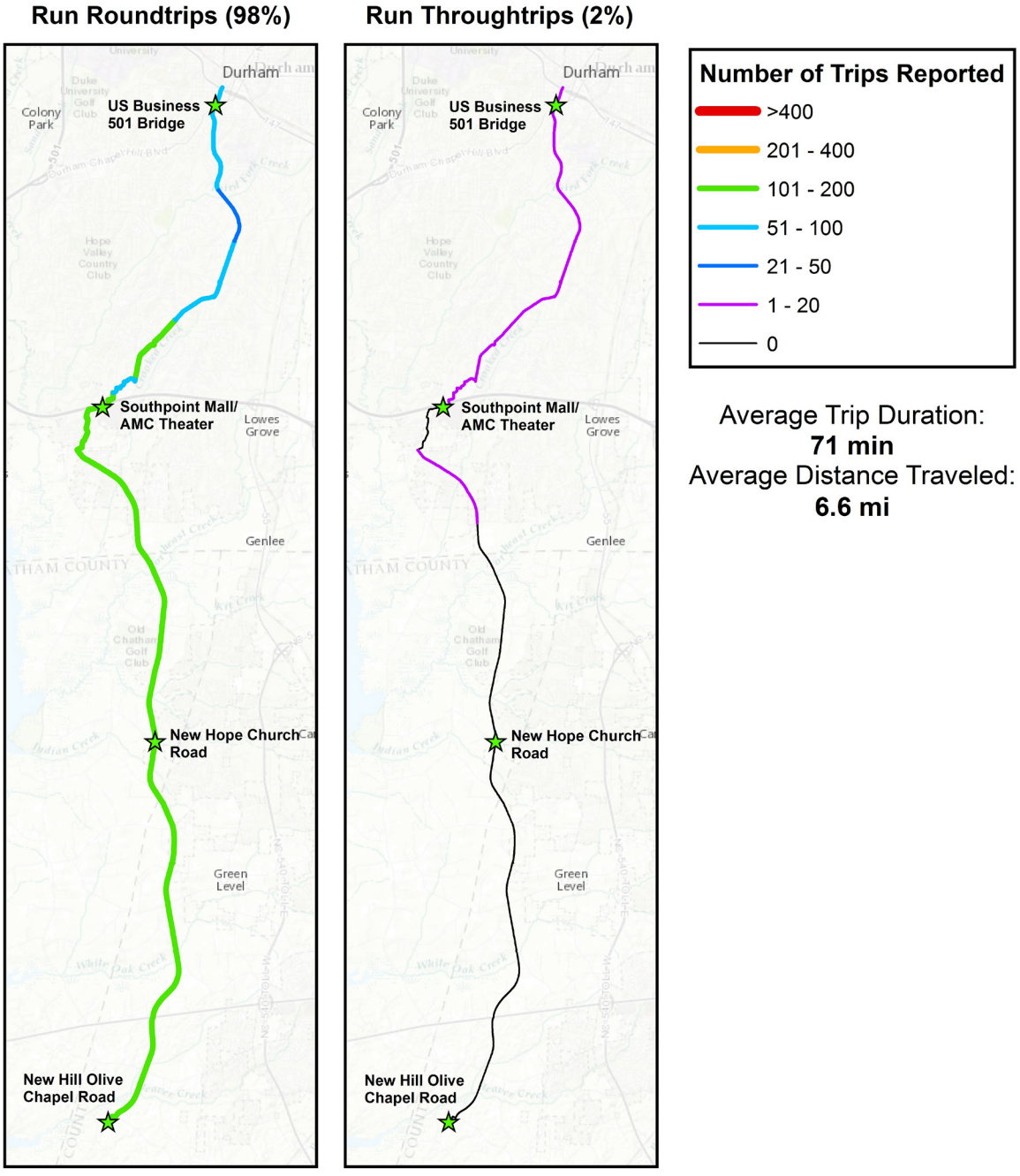
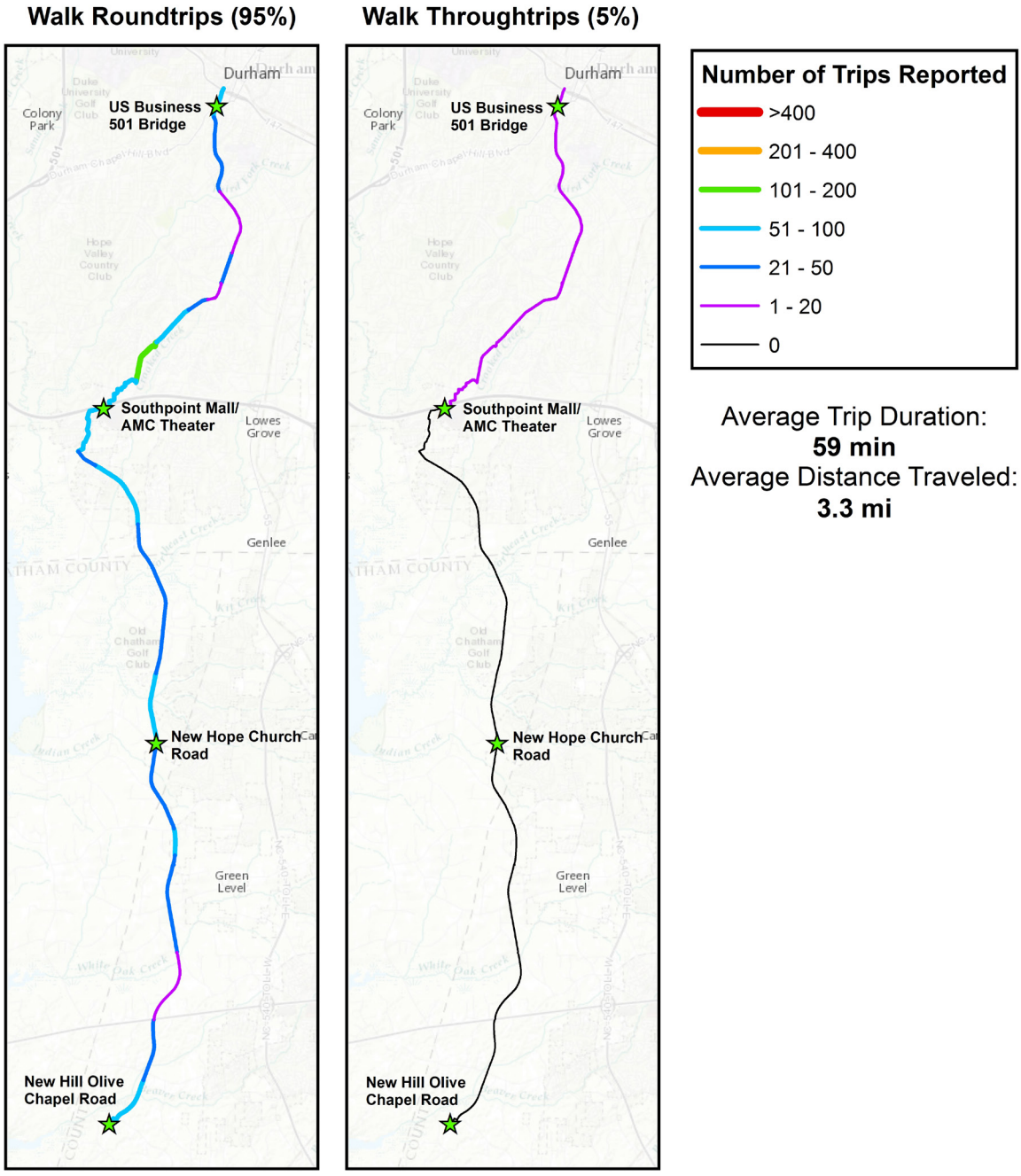


FIGURE 7: ROUNDTRIPS (LEFT) AND THROUGHTRIPS (RIGHT) FOR WALKERS – *95% OF REPORTED WALKING TRIPS WERE ROUNDTRIPS AND 5% OF REPORTED WALKING TRIPS WERE THROUGHTRIPS; THE AVERAGE TRIP DURATION FOR WALKERS WAS 59 MIN; THE AVERAGE DISTANCE TRAVELED BY WALKERS WAS 3.3 MI*



AMERICAN TOBACCO TRAIL 2016

Results have been compiled for overall use of the trail based on the aggregated data collected at the ten survey/count stations. Findings include users' demographics, their usage of the trail, and transportation, economic, and health aspects of trail use. The preliminary findings provided have not been tested for statistical significance. These results will be further evaluated for significance and for comparative analysis once all years of data collection are complete.

Table 1 summarizes the data collection effort indicating the data collection period, survey/ count location on the trail, the raw number of users counted, and the raw number of users intercepted to fill out a survey while using the trail. A total of 13,095 counts were collected during the survey period, and 1,996 surveys were completed.

TABLE 1: DATA COLLECTION SCHEDULE AND SUMMARY STATISTICS

DAY OF WEEK	DATE	TIME PERIOD	STATION	LOCATION	2016 COUNTS	2015 SURVEYS
Saturday	5/14/2016	7AM to 7PM	1	Bridge Over Lakewood	639	107
			2	MM1/Lawson Street	616	41
			3	Cornwallis Road	570	86
			4	Cook Road	1,040	88
			5	Southpoint Crossing	1,078	122
			6	MM7.5/Southpoint Mall	989	160
			7	Herndon Park	1,411	180
			8	New Hope Church Road	1,223	162
			9	White Oak Church Road	901	158
			10	New Hill Olive Chapel Road	487	126
Monday	5/16/2016	7AM to 7PM	1	Bridge Over Lakewood	370	93
			2	MM1/Lawson Street	338	37
			3	Cornwallis Road	282	36
			4	Cook Road	593	62
			5	Southpoint Crossing	565	113
			6	MM7.5/Southpoint Mall	462	88
			7	Herndon Park	507	101
			8	New Hope Church Road	507	102
			9	White Oak Church Road	298	63
			10	New Hill Olive Chapel Road	219	71
				TOTALS	**13,095**	**1,996**

TRAIL USER DEMOGRAPHICS

Table 2 shows the **percentages of surveyed trail users and counts by gender and age group** for ATT users and counts overall:

- In general, a greater percentage of males than females used the trail.
- Nearly a quarter of those surveyed were over the age of 55.

Table 3 provides additional **demographic information for the surveyed trail users,** including education level, annual household income, and race.

- The majority of surveyed trail users (87%) completed college or obtained an advanced degree.
- The majority of surveyed trail users were white (80%) and earned annual household incomes greater than $74,999 (68%).

Survey user type data were compared to manual count user type data to determine if the survey responses could be considered representative of the population of trail users during the data collection period. Count data were adjusted based on the survey responses indicating the percentage of trips that were round trips and the number of survey/count stations passed according to user reported trail origin, turnaround, and destination points to avoid overestimating or 'double/multi-counting' unique users of the trail. A summary of the methods used to adjust the counts to unique users can be found in Chapter 5 of the Final Report.

TABLE 2: SURVEYED TRAIL USER AND COUNT DEMOGRAPHICS GENDER AND AGE

DEMOGRAPHIC	2016 SURVEYED USERS (N)	2016 COUNTS (N)
Male	57% (1,083)	61% (7,839)
Female	43% (804)	39% (5,019)
Age 18-25	7% (108)	9% (1,034)
Age 26-55	69% (1,073)	67% (8,111)
Age >55	24% (372)	24% (2,941)

TABLE 3: SURVEYED TRAIL USER DEMOGRAPHICS – EDUCATION, ANNUAL HOUSEHOLD INCOME, AND RACE

DEMOGRAPHIC	2016 SURVEYED USERS (N)
Some High School	1% (13)
Completed High School	2% (42)
Some College	7% (132)
Completed Business/Technical School	3% (52)
Completed College	37% (702)
Advanced Degree	50% (949)
Less than $25,000	5% (94)
$25,000-$34,999	5% (83)
$35,000-$49,999	7% (128)
$50,000-$74,999	14% (247)
$75,000-$99,999	16% (285)
$100,000-$149,999	23% (401)
$150,000-$199,999	13% (225)
$200,000 or more	16% (278)
White	80% (1,517)
Black	11% (219)
Asian	8% (149)
Native Hawaiian or Pacific Islander	<1% (5)
American Indian	1% (17)

Table 4 provides the **percentages of ATT surveyed users, counts, and unique users by travel mode on the trail during the survey period**. Comparing data across the columns shows the degree to which those surveyed represent a proportionate sample of all those using the trail. Note that while children less than 18 years of age were counted, they were not surveyed.

TABLE 4: ALL TRAIL USERS DURING SURVEY PERIODS – TRAVEL MODE ON TRAIL

MODE	DAY	2016 SURVEYED USERS (N)	2016 COUNTS (N)	2016 UNIQUE USERS (N)
Bike	Sat	42% (510)	62% (5,507)	47% (1,182)
	Mon	35% (263)	50% (2,041)	36% (492)
Walk	Sat	25% (305)	20% (1,747)	30% (762)
	Mon	35% (260)	31% (1,278)	41% (549)
Jog/Run	Sat	32% (393)	18% (1,600)	22% (564)
	Mon	28% (212)	18% (761)	23% (306)
All Other Modes	Sat	1% (7)	1% (74)	1% (17)
	Mon	1% (10)	1% (43)	1% (7)

- In general, surveyed user proportions are similar to unique user proportions by mode.
- The proportion of counted bicyclists is much greater than the proportion of surveyed and estimated unique bicyclists. This is likely due to the longer distances traveled by bicyclists on average, which allows an individual cyclist to be surveyed once per data collection day but counted multiple times along the trail.

Table 5 provides data separated by travel mode on the trail, gender, and age group for trail users intercepted during the survey period.

TRAIL USER PROFILES

Information was compiled to investigate the travel modes used both to travel to the trail as well as while traveling on the trail, where trail users live in relation to the trail, whether they used the trail for recreational/non-recreational purposes, the frequency of trail use, and the distance users traveled on the trail.

TABLE 5: COMPARATIVE PERCENTAGES/NUMBERS OF COUNTS AND THOSE SURVEYED, BY TRAVEL MODE ON TRAIL, GENDER, AND AGE

MODE, GENDER, AGE	2016 PERCENTAGE OF SURVEYED USERS (N)	2016 PERCENTAGE OF COUNTS (N)
Bicycle, M, 18-25	1% (18)	3% (296)
Bicycle, M, 26-55	17% (263)	26% (3,105)
Bicycle, M, >55	10% (154)	12% (1,400)
All Bicycle, Male	**28% (514)**	**40% (5,132)**
Bicycle, F, 18-25	1% (11)	1% (148)
Bicycle, F, 26-55	9% (137)	13% (1,480)
Bicycle, F, >55	3% (51)	4% (477)
All Bicycle, Female	**13% (236)**	**18% (2,296)**
Walker, M, 18-25	1% (17)	1% (101)
Walker, M, 26-55	8% (117)	6% (718)
Walker, M, >55	4% (59)	3% (381)
All Walker, Male	**13% (236)**	**10% (1,305)**
Walker, F, 18-25	1% (21)	1% (166)
Walker, F, 26-55	10% (156)	9% (1,048)
Walker, F, >55	4% (53)	3% (358)
All Walker, Female	**16% (292)**	**13% (1,660)**
Jogger/Runner, M, 18-25	1% (11)	1% (99)
Jogger/Runner, M, 26-55	13% (196)	7% (868)
Jogger/Runner, M, >55	2% (32)	2% (208)
Jogger/Runner, Male	**17% (310)**	**10% (1,302)**
Jogger/Runner, F, 18-25	2% (28)	2% (186)
Jogger/Runner, F, 26-55	11% (173)	6% (678)
Jogger/Runner, F, >55	1% (12)	1% (78)
Jogger/Runner, Female	**14% (263)**	**8% (1,012)**

Table 6 shows information on **"Local" versus "Non-Local"** point of trip origin by travel mode on the trail. "Local" is defined as zip code areas through which the ATT passes (27701, 27707, 27713, 27519 Cary, and 27523 Apex). "Non-Local" is defined as all other zip code areas.

- In general, more Local people used the trail, with the highest percentage being those who walk on the trail (74%).
- The highest proportion of Non-Local trail users are bicyclists (43%).

Trail users were asked about their **frequency of use** of the trail. The figures shown in Table 7 are averages of the total number of trips taken in the past 14 days as reported by survey respondents. Most of those surveyed used the trail several times during the previous two week period.

- On average, use of the trail during the previous two weeks was similar across all modes, with an average of six trips in the past 14 days for all modes.
- Surveyed walkers were the most frequent trail users, averaging one trip every other day.

Table 8 provides information on the **distance traveled** on the ATT by travel mode on the trail and Table 9 provides information on the **distance traveled** on the ATT by gender and travel mode on the trail. The figures reported in the table are average trip distances in miles. Cases in which inadequate data was provided to compute trip distance were not included.

- Bicyclists traveled greater distances than those traveling by other modes. Distance traveled varied directly with the relative speed of each mode.
- Male bicyclists traveled the greatest distances on the trail.
- Male bicyclists tended to travel slightly farther on the trail than females.
- Female joggers tended to travel slightly farther on the trail than males.

TABLE 6: TRIP POINT OF ORIGIN BY TRAVEL MODE ON TRAIL

MODE	2016 LOCAL (N)	2016 NON-LOCAL (N)
Bike	57% (439)	43% (328)
Walk	74% (402)	26% (143)
Jog/Run	63% (371)	37% (219)
All Modes	64% (1,219)	36% (699)

TABLE 7: AVERAGE NUMBER OF TRIPS IN THE PAST 14 DAYS

MODE	AVERAGE NUMBER OF TRIPS	(N)
Bike	6	544
Walk	7	431
Jog/Run	6	482
All Modes	6	1,472

TABLE 8: AVERAGE TRIP DISTANCE (IN MILES) BY TRAVEL MODE ON TRAIL

MODE	2016 AVERAGE MILES TRAVELED (N)
Bike	13.6 (765)
Walk	3.1 (554)
Jog/Run	5.6 (600)
All Modes	8.1 (1,936)

TABLE 9: AVERAGE TRIP DISTANCE (IN MILES) BY GENDER AND TRAVEL MODE ON TRAIL

GENDER	MODE	2016 AVERAGE MILES TRAVELED (N)
Male	Bike	14.3 (510)
	Walk	3.1 (233)
	Jog/Run	5.4 (307)
	All Modes	9.2 (1,060)
Female	Bike	12.3 (232)
	Walk	3.1 (285)
	Jog/Run	5.9 (261)
	All Modes	6.8 (785)

TRANSPORTATION IMPACTS

Analysis of transportation-related factors included:

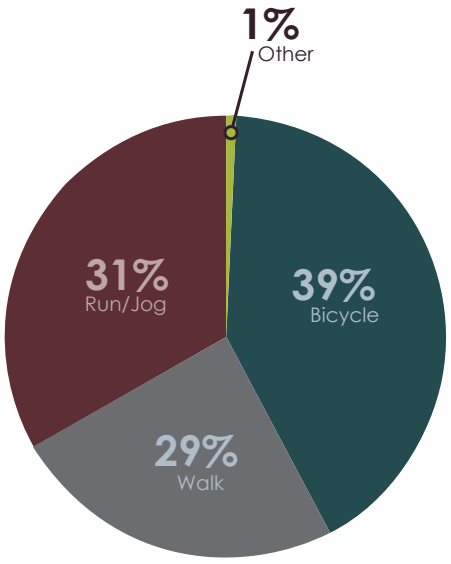
- Mode used to travel on the trail
- Primary trip purpose
- Frequency of round trips versus one-way trips
- Mode used to travel to the trail
- Trail access points

Analysis of survey responses found differences in **proportions of users by travel mode on the trail,** as shown in Figure 1.

- The majority of trail users traveled on the trail by foot (60%).

Given the relatively high use of the trail for exercise/recreational purposes (90% of trips – see Table 10), it is not surprising that most travel involved a roundtrip, not a one-way trip on the trail, as illustrated in Table 11.

FIGURE 1: TYPE OF USER BY TRAVEL MODE ON TRAIL



- Across all modes, nearly all trips were roundtrips.

The survey also revealed the **mode by which trail users traveled to the trail.** Table 12 provides information on the access modes used to travel to the trail by all survey respondents, sorted by mode of travel on the trail. The percentages shown are calculated by row to reflect the shares of travel to the trail according to the mode used on the trail.

- Over half of those using the trail traveled to the trail by car. 61% of respondents traveling by foot on the trail

TABLE 10: PRIMARY TRIP PURPOSE

PRIMARY TRIP PURPOSE	2016 PERCENTAGE OF SURVEYED USERS (N)
For exercise/ recreation/ sightseeing	90% (1,799)
Travel to/from work or school	3% (59)
Travel to/from dining/shopping/ running errands	3% (59)
Travel to/from cultural attraction/ entertainment/ leisure activity	4% (76)

TABLE 11: TRIP TYPE

MODE	2016 ROUNDTRIP (N)	2016 THROUGHTRIP (N)
Bike	95% (735)	5% (35)
Walk	95% (538)	5% (27)
Jog/Run	99% (599)	1% (5)
All Modes	96% (1,887)	4% (69)

TABLE 12: MODE TO THE TRAIL BY MODE USED ON TRAIL

MODE ON TRAIL	MODE TO TRAIL		
	2016 by Bicycle (n)	2016 by Car (n)	2016 by Foot (n)
Bike	47% (355)	52% (392)	1% (4)
Walk	0% (0)	55% (299)	45% (247)
Jog/Run	0% (0)	66% (387)	34% (200)
All Modes	19% (355)	57% (1,087)	24% (452)

TABLE 13: TOP FIVE ACCESS POINTS ON THE ATT

ATT ACCESS POINT DESCRIPTION	PERCENT SURVEYED (N)
Jackie Robinson Drive	10% (201)
New Hill Olive Chapel Road	9% (184)
Southpoint Crossing Drive	7% (149)
White Oak Church Parking Lot	7% (136)
Woodcroft Parkway	6% (119)

accessed the trail by car compared to 52% of respondents traveling by bicycle.

- 43% of respondents used an active mode of transportation to access the ATT.
- Bicyclists were more likely to drive to the trail than bicycle to the trail.

The survey also provided information on **where trail users were accessing the trail**. Table 13 includes the top five access points on the trail according to where survey respondents accessed the trail.

- The majority of respondents (10%) accessed the trail from Jackie Robinson Drive.

ECONOMIC IMPACTS

The users of the trail can have an impact on businesses through expenditures on a variety of goods and services. The survey asked trail users to list expenditures on goods or services directly related to their trip on the trail on the day of the survey. If a trail user was traveling with members of their household, estimates represent the total for their household.

The results are shown in the following table. Table 14 shows **trail users' expenditures related to their trip on the ATT** categorized by the type of expenditure and separated by user group.

- Food-related expenditures were the most common among surveyed trail users. The largest percentage of respondents

made purchases at a restaurant. 19% of respondents made a restaurant-related purchase with an average cost of $15, and 8% of respondents made a grocery-related purchase with an average cost of $31.

- Retail and entertainment purchases were less common. Only 3% of respondents made a retail-related purchase with an average cost of $73, while 1% of respondents made an entertainment-related purchase with an average cost of $22.

PUBLIC HEALTH IMPACTS

Increasing physical activity among children and adults is a national health objective in the United States. Access to facilities, such as trails, is one of the factors positively associated with physical activity. Information compiled that relates to public health impacts from user of the ATT included:

- The percentage of trail users who indicated exercise as their primary trip purpose
- The mode of activity users engaged in while on the trail
- The average duration of each activity by user type

TABLE 14: TYPE OF AND AVERAGE EXPENDITURE BY USER GROUP

ATT USER GROUP	Restaurant			Grocery			Retail			Entertainment			Bike Rental		
	Respondents	% of Respondents	Average Expenses	Respondents	% of Respondents	Average Expenses	Respondents	% of Respondents	Average Expenses	Respondents	% of Respondents	Average Expenses	Respondents	% of Respondents	Average Expenses
Bicycle	745	27%	$16	744	8%	$25	745	4%	$100	745	1%	$28	745	1%	$34
Jog/Run	557	14%	$14	559	8%	$34	559	3%	$51	559	1%	$13	559	0%	$2
Walk	514	14%	$14	514	9%	$35	514	2%	$40	514	0%	$ -	514	0%	$5
Total	1,833	19%	$15	1,834	8%	$31	1,835	3%	$73	1,835	1%	$22	1,835	0%	$25

Table 15 indicates users' **primary trip purpose.** Non-recreational trip purposes included work, school, shopping, restaurant, and entertainment trips. It is important to note that users on the trail whose purpose was not primarily exercise/recreation were still engaging in physical activity while on the trail.

- Overall, 90% of all users on the ATT indicate their primary trip purpose as exercise/recreation.

Table 16 indicates the **duration of the active portion of a trail user's trip** (in minutes) by mode traveled on the trail. The total active portion of a trail user's trip was self-reported on the survey and may include time spent actively traveling to or from the trail. This table includes respondents who did not indicate gender so overall totals vary slightly from those reported in Table 17.

- The average duration of the active portion of the trip for all users surveyed on the trail was 69 minutes.
- Bicyclists reported the highest average duration of the active portion of the trip (87 minutes) compared to walkers (55 minutes) and joggers/runners (58 minutes).

TABLE 15: RECREATIONAL VERSUS NON-RECREATIONAL TRIP PURPOSES

PRIMARY TRIP PURPOSE	2016 PERCENTAGE OF SURVEYED USERS (N)
For exercise/recreation/ sightseeing	90% (1,799)
Non-recreational (all other trip purposes)	10% (194)

TABLE 16: AVERAGE DURATION (IN MINUTES) OF THE ACTIVE PORTION OF USER'S TRIP

MODE	2016 DURATION (N)
Bike	87 min (759)
Walk	55 min (555)
Jog/Run	58 min (595)
All Modes	69 min (1,923)

Table 17 breaks out the **duration of the active portion of a user's trip by gender and travel mode on the trail**. Respondents that did not indicate gender are excluded from the data in the table.

- Overall, male trail users reported spending an average of 9 minutes more traveling on the ATT than female trail users.
- Male bicyclists reported a longer duration for the active portion of their trip than females.
- Female respondents spent five more minutes on average on their running trips than male respondents.

Table 18 presents information on the **duration of the active portion of a user's trip in relation to annual household income** to assess the activity of users of differing socio-economic status. Duration of the active portion of the trip may include active travel to/from the trail.

- Individuals with household incomes of less than $25,000 reported using the trail for an average of 69 minutes.
- The longest duration of activity on average (73 minutes) was reported by those in the $75,000-$99,999 household income bracket.

Table 19 presents information on the **percentage of exercise met by using the trail over the past 14 days by travel mode on the trail.**

- Respondents used the trail to meet 50% of their total exercise on average over the past 14 days.
- A slightly larger percentage of exercise was met by using the trail for pedestrians compared to bicyclists.

TABLE 17: AVERAGE DURATION (IN MINUTES) OF THE ACTIVE PORTION OF USER'S TRIP BY GENDER AND TRAVEL MODE ON TRAIL

GENDER	MODE	2016 DURATION (N)
Male	Bike	90 min (508)
	Walk	57 min (233)
	Jog/Run	56 min (304)
	All Modes	73 min (1,052)
Female	Bike	80 min (228)
	Walk	55 min (286)
	Jog/Run	61 min (261)
	All Modes	64 min (782)

TABLE 18: AVERAGE DURATION (IN MINUTES) OF THE ACTIVE PORTION OF USER'S TRIP BY ANNUAL HOUSEHOLD INCOME

HOUSEHOLD INCOME	2016 DURATION (N)
<$25,000	69 min (91)
$25,000-$34,999	58 min (82)
$35,000-$49,999	65 min (124)
$50,000-$74,999	65 min (241)
$75,000-$99,999	73 min (282)
$100,000-$149,999	71 min (394)
$150,000-$199,999	72 min (222)
>$200,000	68 min (273)

TABLE 19: AVERAGE PERCENTAGE OF EXERCISE MET BY USING THE TRAIL OVER THE PAST 14 DAYS BY TRAVEL MODE ON TRAIL

MODE	2016 PERCENT EXERCISE (N)
Bike	47% (731)
Walk	54% (519)
Jog/Run	52% (580)
All Modes	50% (1,844)

Table 20 presents information on the **percentage of exercise met by using the trail over the past 14 days by gender and travel mode on the trail.**

- Overall, the average percentage of exercise met by using the trail over the past 14 days was slightly larger for male trail users compared to female trail users; the difference was the greatest for male bicyclists compared to female bicyclists.

TABLE 20: AVERAGE PERCENTAGE OF EXERCISE MET BY USING THE TRAIL OVER THE PAST 14 DAYS BY TRAVEL MODE ON TRAIL

GENDER	MODE	2016 PERCENT EXERCISE (N)
Male	Bike	50% (494)
	Walk	54% (220)
	Jog/Run	51% (300)
	All Modes	51% (1,021)
Female	Bike	41% (215)
	Walk	53% (271)
	Jog/Run	52% (250)
	All Modes	49% (743)

TRAVEL ACTIVITY MAPS

The following maps provide a visualization of travel activity on the American Tobacco Trail generated using the user reported trail origin, turnaround, and destination points taken from the surveys. Figure 3 shows where roundtrips for all modes (left) and one-way, throughtrips for all modes (right) occurred on the trail during the survey period. While roundtrips occurred on the entire length of the trail, no one-way trips were reported on the non-paved portion of the trail south of New Hope Church Road. Figure 4 shows where trips occurred on the trail during the survey period by primary trip purpose. The majority of trips were for exercise/recreation and these trips occurred on the entire length of the trail. Commuting trips were concentrated north of I-40, but happened on most on the trail. Errands trips were reported at consistent levels along the entire trail except for a small portion of the trail near the southern terminus, where no errand-related travel activity was reported. Figures 5-7 show travel activity on the trail by mode on the trail, and include the average trip duration and average miles traveled for each mode.

FIGURE 3: ROUNDTRIP (LEFT) AND THROUGHTRIP (RIGHT) TRAVEL ACTIVITY FOR ALL MODES – *96% OF REPORTED TRIPS WERE ROUNDTRIPS AND 4% OF REPORTED TRIPS WERE THROUGHTRIPS*

FIGURE 4: COMMUTE (LEFT), ERRANDS (CENTER), AND EXERCISE/RECREATION (RIGHT) TRAVEL ACTIVITY FOR ALL MODES – *3% OF REPORTED TRIPS WERE COMMUTE TRIPS, 3% OF REPORTED TRIPS WERE ERRANDS TRIPS, AND 90% OF REPORTED TRIPS WERE FOR EXERCISE/ RECREATION*

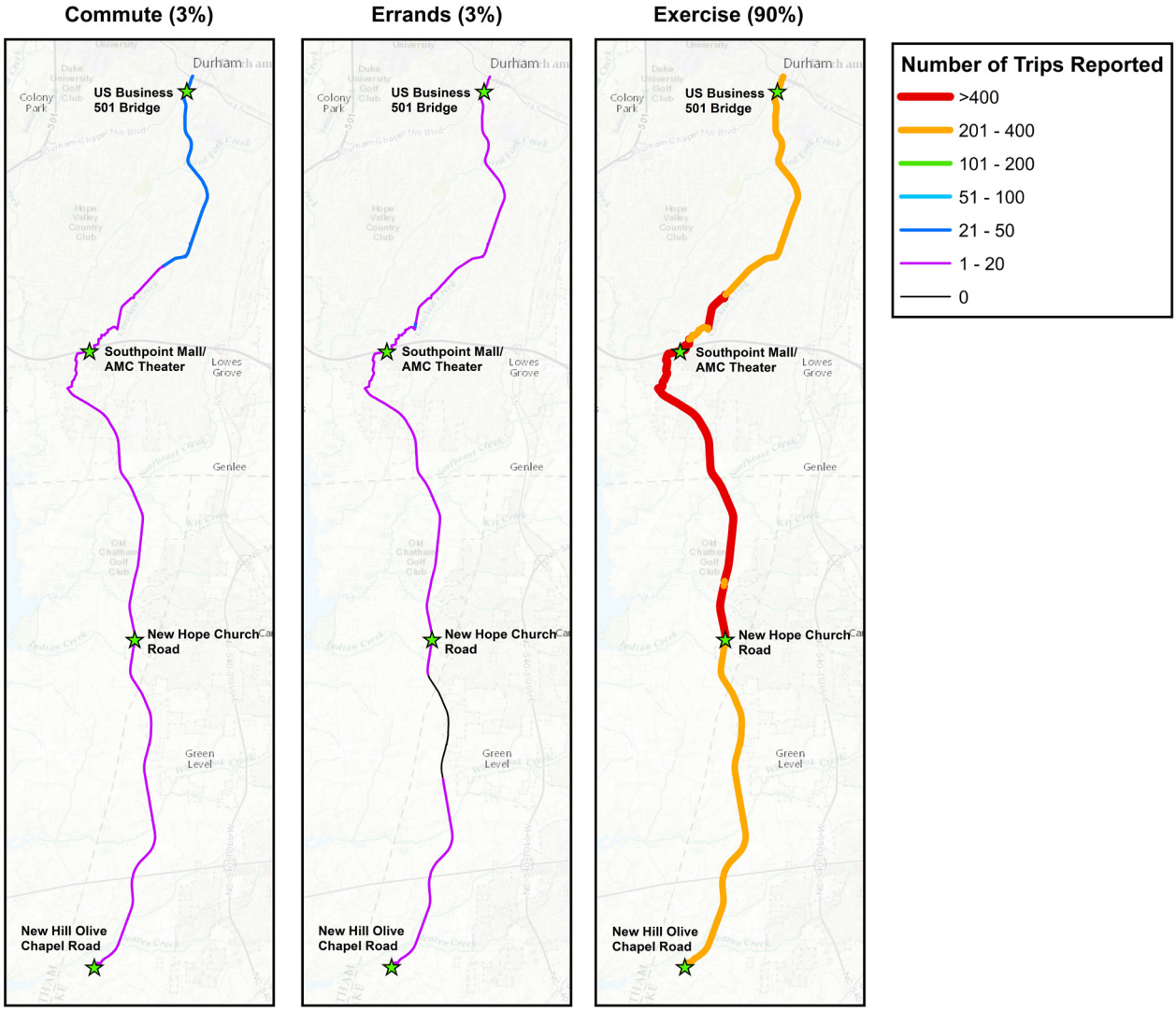


FIGURE 5: ROUNDTRIPS (LEFT) AND THROUGHTRIPS (RIGHT) FOR BICYCLISTS – *95% OF REPORTED BICYCLING TRIPS WERE ROUNDTRIPS AND 5% OF REPORTED BICYCLING TRIPS WERE THROUGHTRIPS; THE AVERAGE TRIP DURATION FOR BICYCLISTS WAS 87 MIN; THE AVERAGE DISTANCE TRAVELED BY BICYCLISTS WAS 13.6 MI*

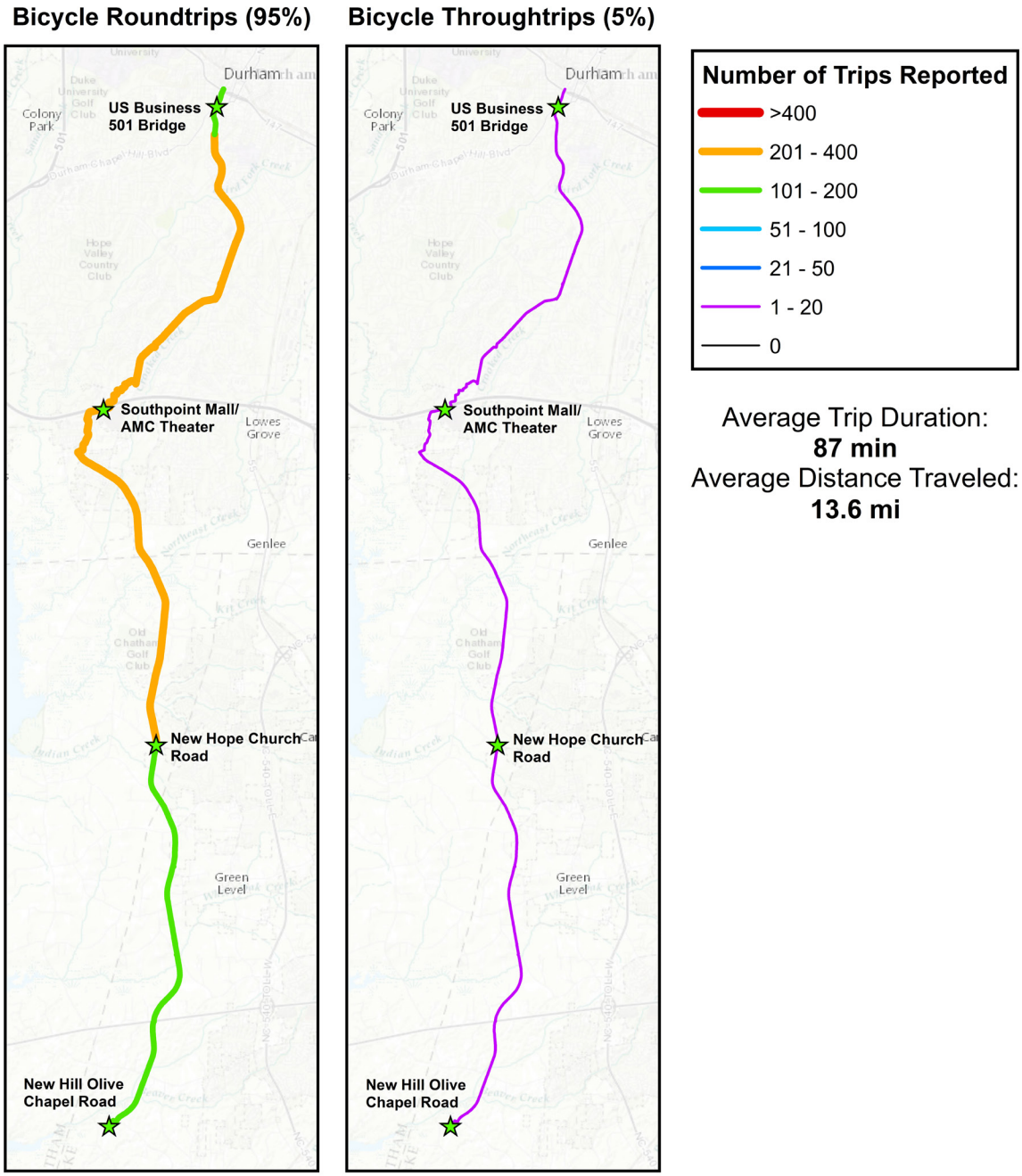


FIGURE 6: ROUNDTRIPS (LEFT) AND THROUGHTRIPS (RIGHT) FOR RUNNERS – *98% OF REPORTED RUNNING TRIPS WERE ROUNDTRIPS AND 2% OF REPORTED RUNNING TRIPS WERE THROUGHTRIPS; THE AVERAGE TRIP DURATION FOR RUNNERS WAS 58 MIN; THE AVERAGE DISTANCE TRAVELED BY RUNNERS WAS 5.6 MI*

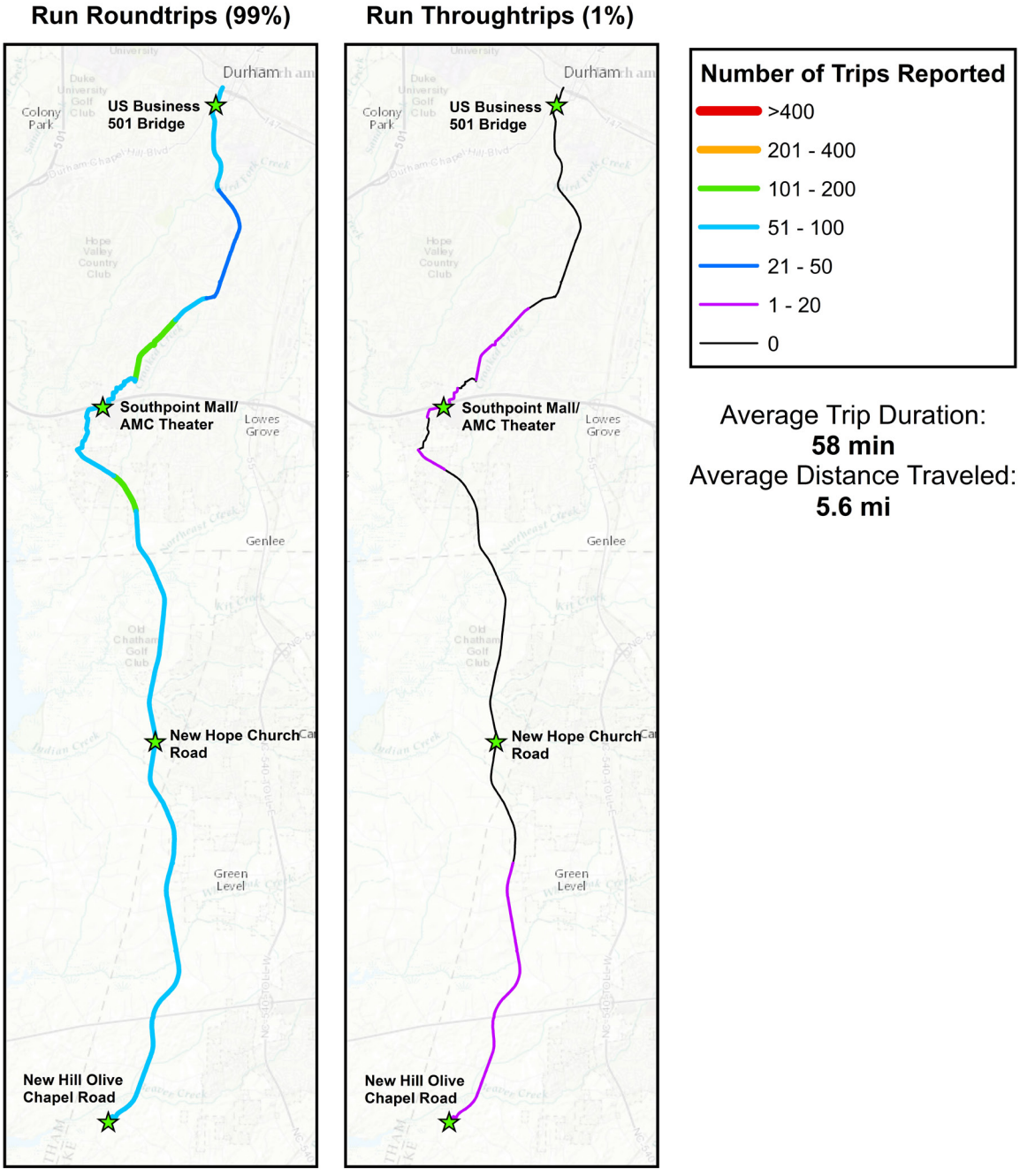
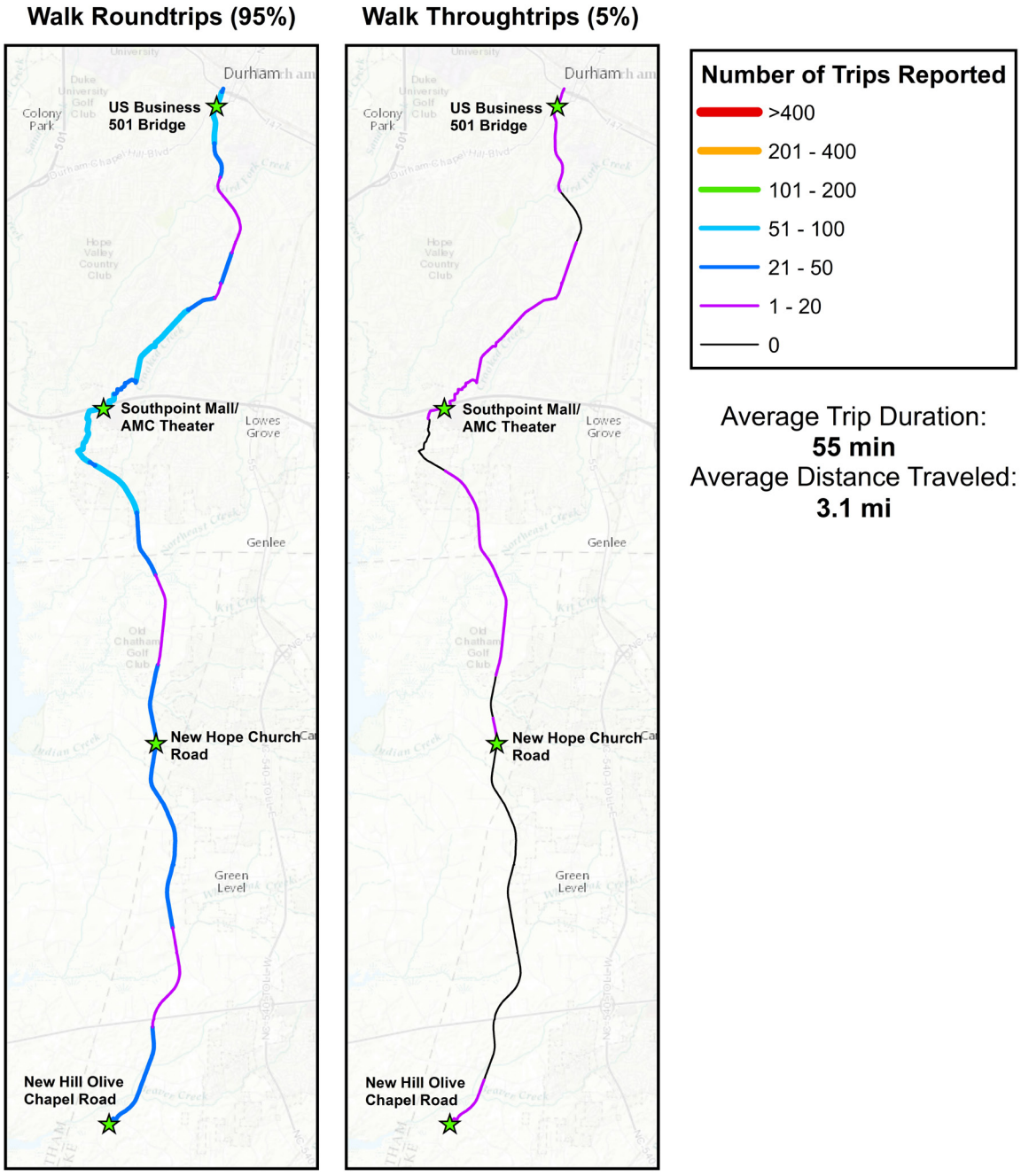


FIGURE 7: ROUNDTRIPS (LEFT) AND THROUGHTRIPS (RIGHT) FOR WALKERS – *95% OF REPORTED WALKING TRIPS WERE ROUNDTRIPS AND 5% OF REPORTED WALKING TRIPS WERE THROUGHTRIPS; THE AVERAGE TRIP DURATION FOR WALKERS WAS 55 MIN; THE AVERAGE DISTANCE TRAVELED BY WALKERS WAS 3.1 MI*



AMERICAN TOBACCO TRAIL 2017

Results have been compiled for overall use of the trail based on the aggregated data collected at the ten survey/count stations. Findings include users' demographics, their usage of the trail, and transportation, economic, and health aspects of trail use. The preliminary findings provided have not been tested for statistical significance. These results will be further evaluated for significance and for comparative analysis once all years of data collection are complete.

Table 1 summarizes the data collection effort indicating the data collection period, survey/count location on the trail, the raw number of users counted, and the raw number of users intercepted to fill out a survey while using the trail. A total of 11,910 counts were collected during the survey period, and 1,668 surveys were completed.

TABLE 1: DATA COLLECTION SCHEDULE AND SUMMARY STATISTICS

DAY OF WEEK	DATE	TIME PERIOD	STATION	LOCATION	2017 COUNTS	2017 SURVEYS
Tuesday	5/16/2017	7AM to 7PM	1	Bridge Over Lakewood	346	97
			2	MM1/Lawson Street	327	36
			3	Cornwallis Road	244	28
			4	Cook Road	584	97
			5	Southpoint Crossing	630	93
			6	MM7.5/Southpoint Mall	400	98
			7	Herndon Park	550	67
			8	New Hope Church Road	596	109
			9	White Oak Church Road	320	72
			10	New Hill Olive Chapel Road	168	60
Saturday	5/20/2017	7AM to 7PM	1	Bridge Over Lakewood	404	68
			2	MM1/Lawson Street	438	30
			3	Cornwallis Road	464	43
			4	Cook Road	909	103
			5	Southpoint Crossing	934	97
			6	MM7.5/Southpoint Mall	891	110
			7	Herndon Park	1,028	92
			8	New Hope Church Road	1,289	103
			9	White Oak Church Road	870	136
			10	New Hill Olive Chapel Road	518	129
				TOTALS	**11,910**	**1,668**

TRAIL USER DEMOGRAPHICS

Table 2 shows the **percentages of surveyed trail users and counts by gender and age group** for ATT users and counts overall:

- In general, a greater percentage of males than females used the trail.
- Nearly a quarter of those surveyed were over the age of 55.

Table 3 provides additional **demographic information for the surveyed trail users,** including education level, annual household income, and race.

- The majority of surveyed trail users (85%) completed college or obtained an advanced degree.
- The majority of surveyed trail users were white (80%) and earned annual household incomes greater than $74,999 (68%).

Survey user type data were compared to manual count user type data to determine if the survey responses could be considered representative of the population of trail users during the data collection period. Count data were adjusted based on the survey responses indicating the percentage of trips that were round trips and the number of survey/count stations passed according to user reported trail origin, turnaround, and destination points to avoid overestimating or 'double/multi-counting' unique users of the trail. A summary of the methods used to adjust the counts to unique users can be found in Chapter 5 of the Final Report.

TABLE 2: SURVEYED TRAIL USER AND COUNT DEMOGRAPHICS GENDER AND AGE

DEMOGRAPHIC	2017 SURVEYED USERS (N)	2017 COUNTS (N)
Male	60% (987)	64% (7,525)
Female	40% (663)	36% (4,253)
Age 18-25	8% (121)	7% (793)
Age 26-55	66% (1,027)	67% (7,503)
Age >55	26% (394)	26% (2,985)

TABLE 3: SURVEYED TRAIL USER DEMOGRAPHICS – EDUCATION, ANNUAL HOUSEHOLD INCOME, AND RACE

DEMOGRAPHIC	2017 SURVEYED USERS (N)
Some High School	<1% (6)
Completed High School	3% (42)
Some College	9% (145)
Completed Business/Technical School	2% (39)
Completed College	36% (571)
Advanced Degree	49% (784)
Less than $25,000	5% (68)
$25,000-$34,999	5% (69)
$35,000-$49,999	8% (122)
$50,000-$74,999	14% (211)
$75,000-$99,999	15% (213)
$100,000-$149,999	24% (347)
$150,000-$199,999	13% (192)
$200,000 or more	16% (234)
White	80% (1,240)
Black	11% (183)
Asian	8% (124)
Native Hawaiian or Pacific Islander	<1% (6)
American Indian	1% (2)

Table 4 provides the **percentages of ATT surveyed users, counts, and unique users by travel mode on the trail during the survey period**. Comparing data across the columns shows the degree to which those surveyed represent a proportionate sample of all those using the trail. Note that while children less than 18 years of age were counted, they were not surveyed.

TABLE 4: ALL TRAIL USERS DURING SURVEY PERIODS – TRAVEL MODE ON TRAIL

MODE	DAY	2017 SURVEYED USERS (N)	2017 COUNTS (N)	2017 UNIQUE USERS (N)
Bike	Tues	41% (310)	57% (2,366)	43% (572)
	Sat	41% (371)	60% (4,660)	45% (1,014)
Walk	Tues	30% (229)	25% (1,026)	36% (474)
	Sat	22% (202)	20% (1,505)	31% (709)
Jog/Run	Tues	27% (206)	17% (723)	20% (271)
	Sat	36% (330)	19% (1,471)	24% (542)
All Other Modes	Tues	1% (6)	1% (42)	<1% (9)
	Sat	<1% (4)	1% (68)	1% (11)

- In general, surveyed user proportions are similar to unique user proportions by mode.
- The proportion of counted bicyclists is much greater than the proportion of surveyed and estimated unique bicyclists. This is likely due to the longer distances traveled by bicyclists on average, which allows an individual cyclist to be surveyed once per data collection day but counted multiple times along the trail.

Table 5 provides data separated by travel mode on the trail, gender, and age group for trail users intercepted during the survey period.

TRAIL USER PROFILES

Information was compiled to investigate the travel modes used both to travel to the trail as well as while traveling on the trail, where trail users live in relation to the trail, whether they used the trail for recreational/non-recreational purposes, the frequency of trail use, and the distance users traveled on the trail.

TABLE 5: COMPARATIVE PERCENTAGES/NUMBERS OF COUNTS AND THOSE SURVEYED, BY TRAVEL MODE ON TRAIL, GENDER, AND AGE

MODE, GENDER, AGE	2017 PERCENTAGE OF SURVEYED USERS (N)	2017 PERCENTAGE OF COUNTS (N)
Bicycle, M, 18-25	1% (22)	2% (213)
Bicycle, M, 26-55	17% (261)	26% (2,903)
Bicycle, M, >55	13% (194)	15% (1,639)
All Bicycle, Male	**31% (508)**	**43% (4,976)**
Bicycle, F, 18-25	1% (10)	1% (118)
Bicycle, F, 26-55	7% (99)	11% (1,203)
Bicycle, F, >55	3% (40)	5% (553)
All Bicycle, Female	**10% (166)**	**17% (1,968)**
Walker, M, 18-25	1% (12)	1% (71)
Walker, M, 26-55	7% (101)	7% (748)
Walker, M, >55	4% (66)	3% (313)
All Walker, Male	**12% (193)**	**10% (1,216)**
Walker, F, 18-25	2% (25)	1% (104)
Walker, F, 26-55	10% (145)	8% (864)
Walker, F, >55	3% (48)	2% (241)
All Walker, Female	**14% (233)**	**11% (1,289)**
Jogger/Runner, M, 18-25	1% (22)	1% (112)
Jogger/Runner, M, 26-55	13% (203)	8% (928)
Jogger/Runner, M, >55	2% (26)	1% (133)
Jogger/Runner, Male	**17% (274)**	**11% (1,235)**
Jogger/Runner, F, 18-25	2% (28)	1% (127)
Jogger/Runner, F, 26-55	13% (204)	7% (721)
Jogger/Runner, F, >55	1% (15)	1% (63)
Jogger/Runner, Female	**16% (2529**	**8% (939)**

Table 6 shows information on **"Local" versus "Non-Local"** point of trip origin by travel mode on the trail. "Local" is defined as zip code areas through which the ATT passes (27701, 27707, 27713, 27519 Cary, and 27523 Apex). "Non-Local" is defined as all other zip code areas.

- In general, more Local people used the trail, with the highest percentage being those who walk on the trail (72%).
- The highest proportion of Non-Local trail users are bicyclists (46%).

Trail users were asked about their **frequency of use of the trail.** The figures shown in Table 7 are averages of the total number of trips taken in the past 14 days as reported by survey respondents. Most of those surveyed used the trail several times during the previous two week period.

- On average, use of the trail during the previous two weeks was similar across all modes, with an average of five trips in the past 14 days for all modes.
- Surveyed walkers were the most frequent trail users, averaging almost one trip every other day.

Table 8 provides information on the **distance traveled** on the ATT by travel mode on the trail and Table 9 provides information on the **distance traveled** on the ATT by gender and travel mode on the trail. The figures reported in the table are average trip distances in miles. Cases in which inadequate data was provided to compute trip distance were not included.

- Bicyclists traveled greater distances than those traveling by other modes. Distance traveled varied directly with the relative speed of each mode.
- Male bicyclists traveled the greatest distances on the trail.
- Male bicyclists tended to travel slightly farther on the trail than females.
- Female joggers tended to travel slightly farther on the trail than males.

TABLE 6: TRIP POINT OF ORIGIN BY TRAVEL MODE ON TRAIL

MODE	2017 LOCAL (N)	2017 NON-LOCAL (N)
Bike	54% (365)	46% (315)
Walk	72% (311)	28% (120)
Jog/Run	64% (341)	36% (195)
All Modes	62% (1,025)	38% (632)

TABLE 7: AVERAGE NUMBER OF TRIPS IN THE PAST 14 DAYS

MODE	AVERAGE NUMBER OF TRIPS	(N)
Bike	5	681
Walk	6	431
Jog/Run	5	536
All Modes	5	1,658

TABLE 8: AVERAGE TRIP DISTANCE (IN MILES) BY TRAVEL MODE ON TRAIL

MODE	2017 AVERAGE MILES TRAVELED (N)
Bike	14.1 (652)
Walk	3.0 (415)
Jog/Run	5.6 (512)
All Modes	8.4 (1,589)

TABLE 9: AVERAGE TRIP DISTANCE (IN MILES) BY GENDER AND TRAVEL MODE ON TRAIL

GENDER	MODE	2017 AVERAGE MILES TRAVELED (N)
Male	Bike	14.7 (483)
	Walk	3.1 (183)
	Jog/Run	5.8 (266)
	All Modes	9.9 (944)
Female	Bike	12.5 (163)
	Walk	2.9 (227)
	Jog/Run	5.3 (243)
	All Modes	6.3 (637)

TRANSPORTATION IMPACTS

Analysis of transportation-related factors included:

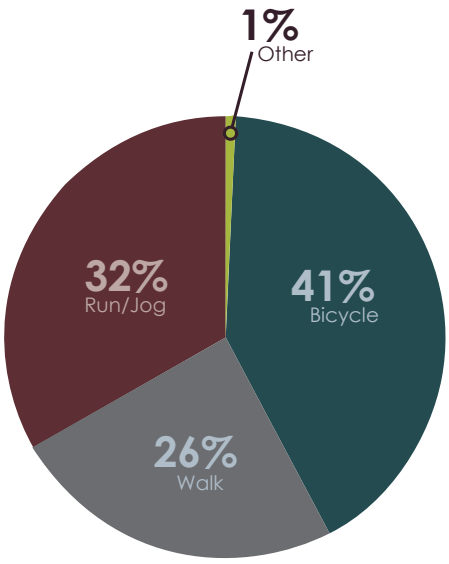
- Mode used to travel on the trail
- Primary trip purpose
- Frequency of round trips versus one-way trips
- Mode used to travel to the trail
- Trail access points

Analysis of survey responses found differences in **proportions of users by travel mode on the trail,** as shown in Figure 1.

- The majority of trail users traveled on the trail by foot (58%).

Given the relatively high use of the trail for exercise/recreational purposes (90% of trips – see Table 10), it is not surprising that most travel involved a roundtrip, not a one-way trip on the trail, as illustrated in Table 11.

FIGURE 1: TYPE OF USER BY TRAVEL MODE ON TRAIL



- Across all modes, nearly all trips were roundtrips.

The survey also revealed the **mode by which trail users traveled to the trail.** Table 12 provides information on the access modes used to travel to the trail by all survey respondents, sorted by mode of travel on the trail. The percentages shown are calculated by row to reflect the shares of travel to the trail according to the mode used on the trail.

- Over half of those using the trail traveled to the trail by car. 55% of respondents traveling by foot on the trail accessed

TABLE 10: PRIMARY TRIP PURPOSE

PRIMARY TRIP PURPOSE	2017 PERCENTAGE OF SURVEYED USERS (N)
For exercise/ recreation/ sightseeing	90% (1,500)
Travel to/from work or school	5% (87)
Travel to/from dining/shopping/ running errands	3% (56)
Travel to/from cultural attraction/ entertainment/ leisure activity	1% (25)

TABLE 11: TRIP TYPE

MODE	2017 ROUNDTRIP (N)	2017 THROUGHTRIP (N)
Bike	96% (654)	4% (28)
Walk	94% (403)	6% (28)
Jog/Run	97% (519)	3% (18)
All Modes	95% (1,585)	5% (75)

TABLE 12: MODE TO THE TRAIL BY MODE USED ON TRAIL

MODE ON TRAIL	MODE TO TRAIL		
	2017 by Bicycle (n)	2017 by Car (n)	2017 by Foot (n)
Bike	52% (343)	46% (300)	1% (9)
Walk	<1% (1)	44% (182)	55% (226)
Jog/Run	1% (3)	63% (320)	37% (187)
All Modes	22% (347)	51% (807)	27% (422)

TABLE 13: TOP FIVE ACCESS POINTS ON THE ATT

ATT ACCESS POINT DESCRIPTION	PERCENT SURVEYED (N)
New Hill Olive Chapel Rd	10% (169)
Jackie Robinson Dr	8% (125)
New Hope Church Rd	7% (122)
White Oak Church Parking Lot	7% (112)
Southpoint Crossing	6% (96)

the trail by car compared to 46% of respondents traveling by bicycle.

- 49% of respondents used an active mode of transportation to access the ATT.
- Bicyclists were more likely to bike to the trail than to drive.

The survey also provided information on **where trail users were accessing the trail.** Table 13 includes the top five access points on the trail according to where survey respondents accessed the trail.

- The majority of respondents (10%) accessed the trail from New Hill Olive Chapel Rd.

ECONOMIC IMPACTS

The users of the trail can have an impact on businesses through expenditures on a variety of goods and services. The survey asked trail users to list expenditures on goods or services directly related to their trip on the trail on the day of the survey. If a trail user was traveling with members of their household, estimates represent the total for their household. The results are shown in the following table.

Table 14 shows **trail users' expenditures related to their trip on the ATT** categorized by the type of expenditure and separated by user group.

- Food-related expenditures were the most common among surveyed trail users.

The largest percentage of respondents made purchases at a restaurant. 14% of respondents made a restaurant-related purchase with an average cost of $15, and 4% of respondents made a grocery-related purchase with an average cost of $28.

- Retail and entertainment purchases were less common. Only 2% of respondents made a retail-related purchase with an average cost of $131, while <1% of respondents made an entertainment-related purchase with an average cost of $72.

PUBLIC HEALTH IMPACTS

Increasing physical activity among children and adults is a national health objective in the United States. Access to facilities, such as trails, is one of the factors positively associated with physical activity. Information compiled that relates to public health impacts from user of the ATT included:

- The percentage of trail users who indicated exercise as their primary trip purpose
- The mode of activity users engaged in while on the trail

TABLE 14: TYPE OF AND AVERAGE EXPENDITURE BY USER GROUP

ATT USER GROUP	Respondents	Restaurant		Respondents	Grocery		Respondents	Retail		Respondents	Entertainment		Respondents	Bike Rental	
		% of Respondents	Average Expenses		% of Respondents	Average Expenses		% of Respondents	Average Expenses		% of Respondents	Average Expenses		% of Respondents	Average Expenses
Bicycle	669	22%	$16	669	4%	$24	668	2%	$77	669	0%	$96	669	0%	$30
Jog/Run	534	7%	$11	534	4%	$34	533	2%	$65	534	0%	$-	534	0%	$-
Walk	426	9%	$17	425	4%	$26	426	1%	$142	426	0%	$1	426	0%	$-
Total	1,639	14%	$15	1,638	4%	$28	1,637	2%	$133	1,639	0%	$72	1,639	0%	$30

- The average duration of each activity by user type

Table 15 indicates users' **primary trip purpose.** Non-recreational trip purposes included work, school, shopping, restaurant, and entertainment trips. It is important to note that users on the trail whose purpose was not primarily exercise/recreation were still engaging in physical activity while on the trail.

- Overall, 90% of all users on the ATT indicate their primary trip purpose as exercise/recreation.

Table 16 indicates the **duration of the active portion of a trail user's trip** (in minutes) by mode traveled on the trail. The total active portion of a trail user's trip was self-reported on the survey and may include time spent actively traveling to or from the trail. This table includes respondents who did not indicate gender so overall totals vary slightly from those reported in Table 17.

- The average duration of the active portion of the trip for all users surveyed on the trail was 68 minutes.
- Bicyclists reported the highest average duration of the active portion of the trip (86 minutes) compared to walkers (55 minutes) and joggers/runners (57 minutes).

TABLE 15: RECREATIONAL VERSUS NON-RECREATIONAL TRIP PURPOSES

PRIMARY TRIP PURPOSE	2017 PERCENTAGE OF SURVEYED USERS (N)
For exercise/recreation/ sightseeing	90% (1,500)
Non-recreational (all other trip purposes)	10% (168)

TABLE 16: AVERAGE DURATION (IN MINUTES) OF THE ACTIVE PORTION OF USER'S TRIP

MODE	2017 DURATION (N)
Bike	86 min (674)
Walk	55 min (428)
Jog/Run	57 min (533)
All Modes	68 min (1,655)

Table 17 breaks out the **duration of the active portion of a user's trip by gender and travel mode on the trail**. Respondents that did not indicate gender are excluded from the data in the table.

- Overall, male trail users reported spending an average of 11 minutes more traveling on the ATT than female trail users.
- Male bicyclists reported a longer duration for the active portion of their trip than females.
- Female respondents spent one more minute on average on their running trips than male respondents.

Table 18 presents information on the **duration of the active portion of a user's trip in relation to annual household income** to assess the activity of users of differing socio-economic status. Duration of the active portion of the trip may include active travel to/from the trail.

- Individuals with household incomes of less than $25,000 reported using the trail for an average of 72 minutes.
- The longest duration of activity on average (73 minutes) was reported by those in the >$200,000 household income bracket.

Table 19 presents information on the **percentage of exercise met by using the trail over the past 14 days by travel mode on the trail.**

- Respondents used the trail to meet 51% of their total exercise on average over the past 14 days.
- A slightly larger percentage of exercise was met by using the trail for pedestrians compared to bicyclists.

TABLE 17: AVERAGE DURATION (IN MINUTES) OF THE ACTIVE PORTION OF USER'S TRIP BY GENDER AND TRAVEL MODE ON TRAIL

GENDER	MODE	2017 DURATION (N)
Male	Bike	89 min (508)
	Walk	56 min (193)
	Jog/Run	58 min (274)
	All Modes	73 min (977)
Female	Bike	79 min (165)
	Walk	54 min (233)
	Jog/Run	59 min (259)
	All Modes	62 min (661)

TABLE 18: AVERAGE DURATION (IN MINUTES) OF THE ACTIVE PORTION OF USER'S TRIP BY ANNUAL HOUSEHOLD INCOME

HOUSEHOLD INCOME	2017 DURATION (N)
<$25,000	72 min (68)
$25,000-$34,999	56 min (69)
$35,000-$49,999	66 min (120)
$50,000-$74,999	62 min (209)
$75,000-$99,999	70 min (213)
$100,000-$149,999	70 min (345)
$150,000-$199,999	66 min (191)
>$200,000	73 min (232)

TABLE 19: AVERAGE PERCENTAGE OF EXERCISE MET BY USING THE TRAIL OVER THE PAST 14 DAYS BY TRAVEL MODE ON TRAIL

MODE	2017 PERCENT EXERCISE (N)
Bike	48% (672)
Walk	53% (421)
Jog/Run	52% (535)
All Modes	51% (1,647)

Table 20 presents information on the **percentage of exercise met by using the trail over the past 14 days by gender and travel mode on the trail.**

- Overall, the average percentage of exercise met by using the trail over the past 14 days was slightly larger for female trail users compared to male trail users; the difference was the greatest for female runners compared to male runners.

TABLE 20: AVERAGE PERCENTAGE OF EXERCISE MET BY USING THE TRAIL OVER THE PAST 14 DAYS BY TRAVEL MODE ON TRAIL

GENDER	MODE	2017 PERCENT EXERCISE (N)
Male	Bike	49% (495)
	Walk	51% (188)
	Jog/Run	48% (273)
	All Modes	45% (973)
Female	Bike	46% (166)
	Walk	54% (225)
	Jog/Run	57% (258)
	All Modes	58% (658)

TRAVEL ACTIVITY MAPS

The following maps provide a visualization of travel activity on the American Tobacco Trail generated using the user reported trail origin, turnaround, and destination points taken from the surveys. Figure 3 shows where roundtrips for all modes (left) and one-way, throughtrips for all modes (right) occurred on the trail during the survey period. While roundtrips occurred on the entire length of the trail, no one-way trips were reported on the non-paved portion of the trail south of New Hope Church Road. Figure 4 shows where trips occurred on the trail during the survey period by primary trip purpose. The majority of trips were for exercise/recreation and these trips occurred on the entire length of the trail. Commuting trips were concentrated north of I-40, but happened on most on the trail. Errands trips were reported at consistent levels along the entire trail except for a small portion of the trail near the southern terminus, where no errand-related travel activity was reported. Figures 5-7 show travel activity on the trail by mode on the trail, and include the average trip duration and average miles traveled for each mode.

FIGURE 3: ROUNDTRIP (LEFT) AND THROUGHTRIP (RIGHT) TRAVEL ACTIVITY FOR ALL MODES – *95% OF REPORTED TRIPS WERE ROUNDTRIPS AND 5% OF REPORTED TRIPS WERE THROUGHTRIPS*

FIGURE 4: COMMUTE (LEFT), ERRANDS (CENTER), AND EXERCISE/RECREATION (RIGHT) TRAVEL ACTIVITY FOR ALL MODES – *5% OF REPORTED TRIPS WERE COMMUTE TRIPS, 3% OF REPORTED TRIPS WERE ERRANDS TRIPS, AND 90% OF REPORTED TRIPS WERE FOR EXERCISE/RECREATION*

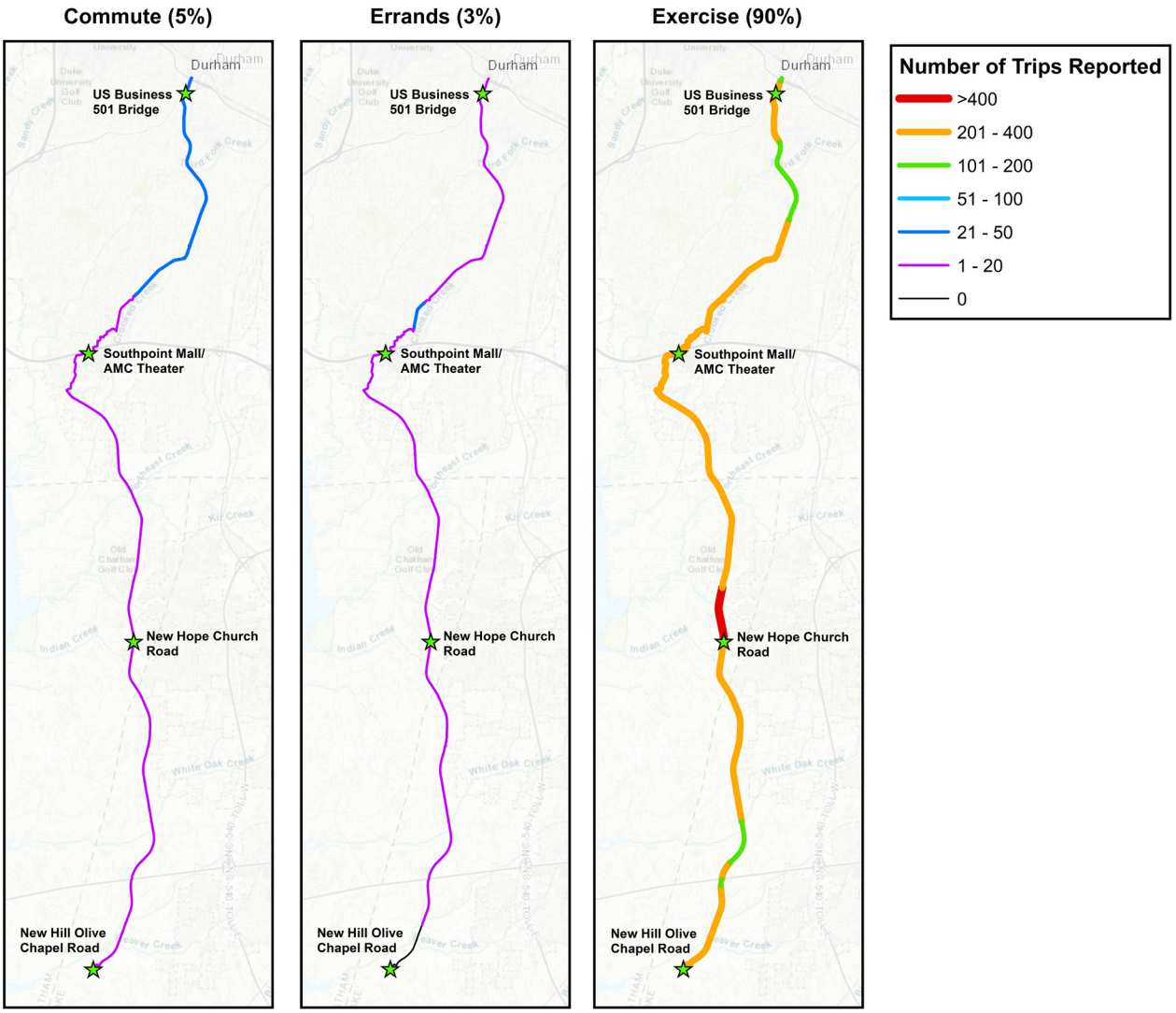


FIGURE 5: ROUNDTRIPS (LEFT) AND THROUGHTRIPS (RIGHT) FOR BICYCLISTS – *96% OF REPORTED BICYCLING TRIPS WERE ROUNDTRIPS AND 4% OF REPORTED BICYCLING TRIPS WERE THROUGHTRIPS; THE AVERAGE TRIP DURATION FOR BICYCLISTS WAS 86 MIN; THE AVERAGE DISTANCE TRAVELED BY BICYCLISTS WAS 14.1 MI*

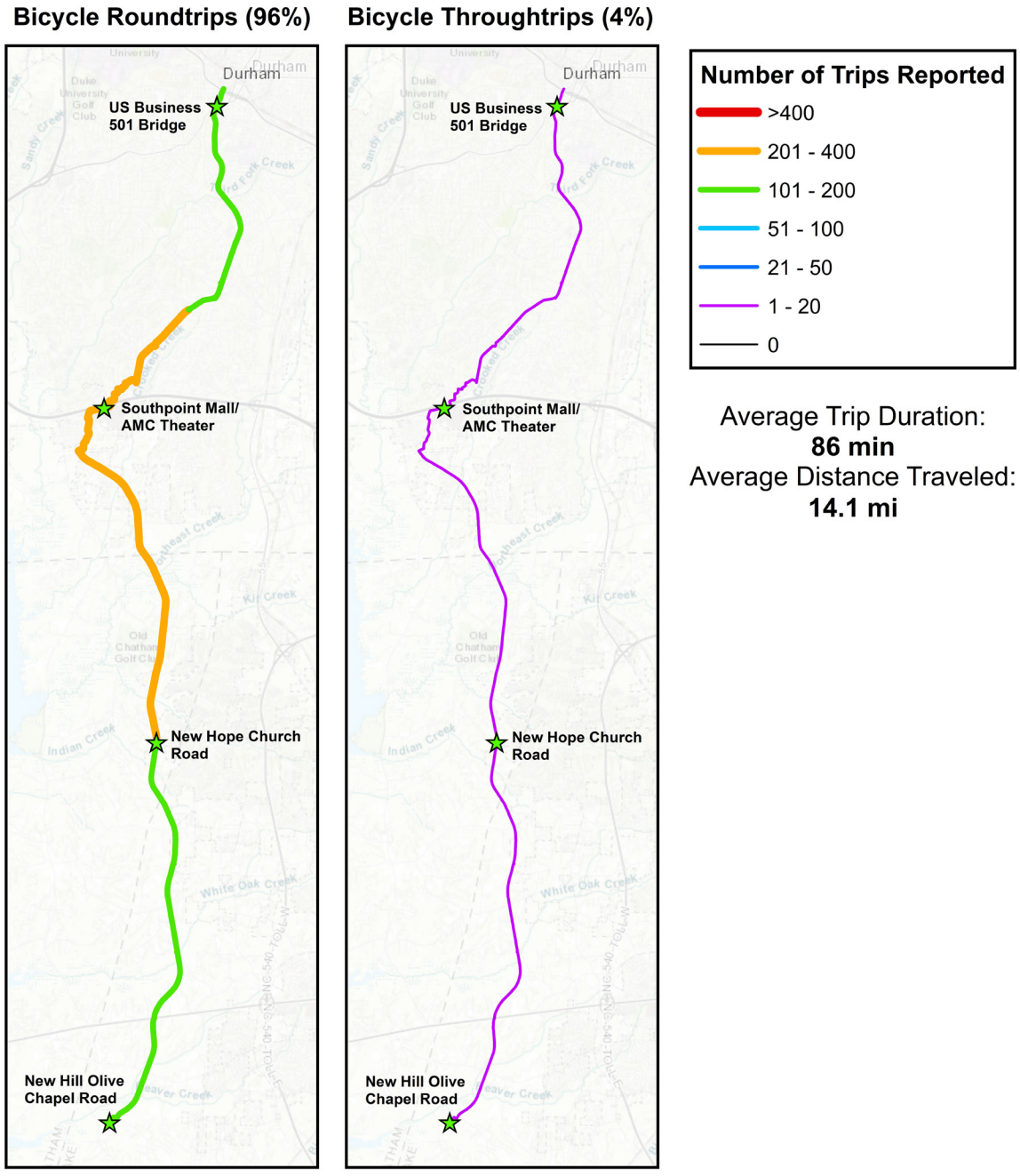


FIGURE 6: ROUNDTRIPS (LEFT) AND THROUGHTRIPS (RIGHT) FOR RUNNERS – *97% OF REPORTED RUNNING TRIPS WERE ROUNDTRIPS AND 3% OF REPORTED RUNNING TRIPS WERE THROUGHTRIPS; THE AVERAGE TRIP DURATION FOR RUNNERS WAS 57 MIN; THE AVERAGE DISTANCE TRAVELED BY RUNNERS WAS 5.6 MI*

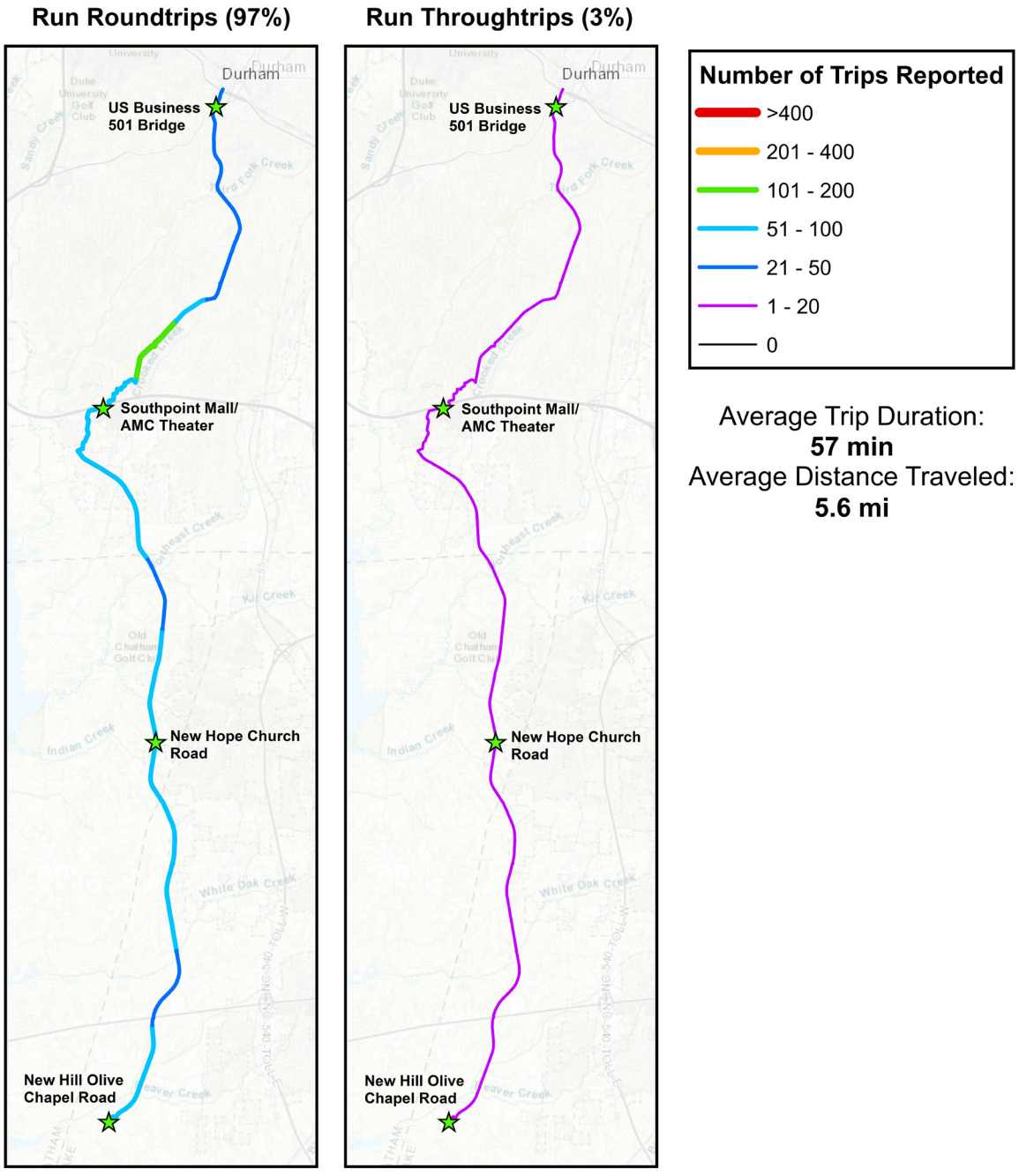
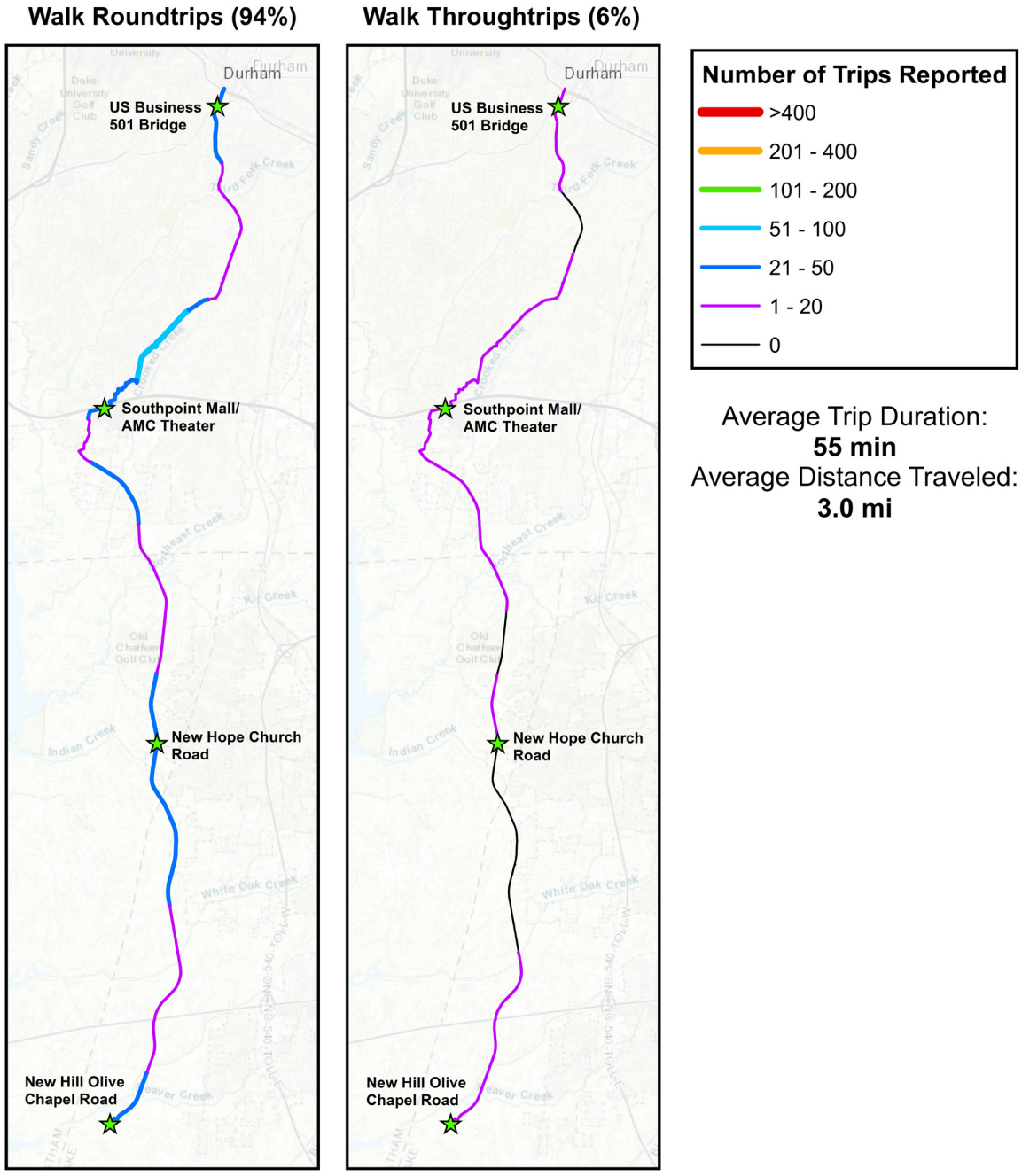


FIGURE 7: ROUNDTRIPS (LEFT) AND THROUGHTRIPS (RIGHT) FOR WALKERS – *94% OF REPORTED WALKING TRIPS WERE ROUNDTRIPS AND 6% OF REPORTED WALKING TRIPS WERE THROUGHTRIPS; THE AVERAGE TRIP DURATION FOR WALKERS WAS 55 MIN; THE AVERAGE DISTANCE TRAVELED BY WALKERS WAS 3.0 MI*



BREVARD GREENWAY 2015

Results have been compiled for overall use of the trail based on the aggregated data collected at the ten survey/count stations. Findings include users' demographics, their usage of the trail, and transportation, economic, and health aspects of trail use. The preliminary findings provided have not been tested for statistical significance. These results will be further evaluated for significance and for comparative analysis once all years of data collection are complete.

Table 1 summarizes the data collection effort indicating the data collection period, survey/count location on the trail, the raw number of users counted, and the raw number of users intercepted to fill out a survey while using the trail. A total of 1,028 counts were collected during the survey period, and 270 surveys were completed.

TRAIL USER DEMOGRAPHICS

Table 2 shows the **percentages of surveyed trail users and counts by gender and age group** for Brevard Greenway users and counts overall:

- In general, a greater percentage of males than females used the trail.
- Nearly half of those surveyed were over the age of 55.

Table 3 provides **additional demographic information for the surveyed trail users**, including education level, annual household income, and race.

TABLE 1: DATA COLLECTION SCHEDULE AND SUMMARY STATISTICS

DAY OF WEEK	DATE	TIME PERIOD	STATION	LOCATION	2015 COUNTS	2015 SURVEYS
Wednesday	10/14/2015	7AM to 7PM	1	US 64 Intersection	164	49
			2	Transylvania Activity Center	189	60
			3	McDonald's	152	28
Saturday	10/17/2015	7AM to 7PM	1	US 64 Intersection	282	89
			2	Transylvania Activity Center	182	33
			3	McDonald's	59	11
				TOTALS	**1,028**	**270**

TABLE 2: SURVEYED TRAIL USER AND COUNT DEMOGRAPHICS – GENDER AND AGE

DEMOGRAPHIC	2015 SURVEYED USERS (N)	2015 COUNTS (N)
Male	53% (139)	51% (525)
Female	47% (123)	49% (497)
Age 18-25	9% (23)	7% (57)
Age 26-55	46% (115)	47% (388)
Age >55	45% (112)	46% (378)

- One-fifth (21%) of surveyed trail users completed some college or business/ technical school, while the majority of surveyed trail users completed college or earned an advanced degree (72%).
- Nearly all surveyed trail users were white (98%) and earned annual household incomes less than $75,000 (59%).

Survey user type data were compared to manual count user type data to determine if the survey responses could be considered representative of the population of trail users during the data collection period. Count data were adjusted based on the survey responses indicating the percentage of trips that were round trips and the number of survey/count stations passed according to user reported trail origin, turnaround, and destination points to avoid overestimating or 'double/multi-counting' unique users of the trail. A summary of the methods used to adjust the counts to unique users can be found in Chapter 5 of the Final Report.

Table 4 provides the **percentages of surveyed users, counts, and unique**

TABLE 3: SURVEYED TRAIL USER DEMOGRAPHICS – EDUCATION, ANNUAL HOUSEHOLD INCOME, AND RACE

DEMOGRAPHIC	2015 SURVEYED USERS (N)
Some High School	1% (2)
Completed High School	6% (14)
Some College	17% (41)
Completed Business/Technical School	4% (10)
Completed College	35% (86)
Advanced Degree	37% (90)
Less than $25,000	16% (32)
$25,000-$34,999	9% (18)
$35,000-$49,999	11% (23)
$50,000-$74,999	23% (47)
$75,000-$99,999	16% (33)
$100,000-$149,999	15% (31)
$150,000-$199,999	5% (10)
$200,000 or more	5% (11)
White	98% (244)
Black	1% (2)
Asian	1% (3)
Native Hawaiian or Pacific Islander	<1% (1)
American Indian	0% (0)

users by travel mode on the trail during the survey period. Comparing data across the columns shows the degree to which those surveyed represent a proportionate sample of all those using the trail. Note that while children less than 18 years of age were counted, they were not surveyed.

- In general, surveyed user proportions are similar to unique user proportions by mode.
- The proportion of counted bicyclists is much greater than the proportion of surveyed and estimated unique bicyclists. This is likely due to the longer distances traveled by bicyclists on average, which allows an individual cyclist to be surveyed once per data collection day but counted multiple times along the trail.

TABLE 4: ALL TRAIL USERS DURING SURVEY PERIODS – TRAVEL MODE ON TRAIL

MODE	DAY	2015 SURVEYED USERS (N)	2015 COUNTS (N)	2015 UNIQUE USERS (N)
Bike	Wed	23% (31)	25% (126)	22% (52)
	Sat	30% (40)	38% (199)	42% (115)
Walk	Wed	57% (77)	59% (298)	63% (152)
	Sat	45% (60)	40% (211)	41% (111)
Jog/Run	Wed	20% (27)	15% (73)	14% (34)
	Sat	24% (32)	21% (108)	17% (47)
All Other Modes	Wed	1% (1)	1% (6)	1% (2)
	Sat	0% (0)	1% (3)	0% (0)

Table 5 provides data separated by travel mode on the trail, gender, and age group for trail users intercepted during the survey period.

TRAIL USER PROFILES

Information was compiled to investigate the travel modes used both to travel to the trail as well as while traveling on the trail, where trail users live in relation to the trail, whether they used the trail for recreational/ non-recreational purposes, the frequency of trail use, and the distance users traveled on the trail.

Table 6 shows information on **"Local" versus "Non-Local" point of trip origin** by travel mode on the trail. "Local" is defined as zip code areas through which the Brevard

TABLE 5: COMPARATIVE PERCENTAGES/NUMBERS OF COUNTS AND THOSE SURVEYED, BY TRAVEL MODE ON TRAIL, GENDER, AND AGE

MODE, GENDER, AGE	2015 PERCENTAGE OF SURVEYED USERS (N)	2015 PERCENTAGE OF COUNTS (N)
Bicycle, M, 18-25	1% (2)	1% (9)
Bicycle, M, 26-55	13% (32)	13% (106)
Bicycle, M, >55	4% (10)	4% (36)
All Bicycle, Male	**17% (44)**	**20% (202)**
Bicycle, F, 18-25	<1% (1)	<1% (2)
Bicycle, F, 26-55	7% (16)	7% (57)
Bicycle, F, >55	3% (7)	5% (37)
All Bicycle, Female	**10% (27)**	**12% (121)**
Walker, M, 18-25	3% (7)	1% (10)
Walker, M, 26-55	7% (17)	7% (58)
Walker, M, >55	14% (34)	14% (112)
All Walker, Male	**24% (62)**	**22% (219)**
Walker, F, 18-25	<1% (1)	1% (5)
Walker, F, 26-55	7% (16)	8% (61)
Walker, F, >55	19% (45)	20% (161)
All Walker, Female	**26% (67)**	**28% (286)**
Jogger/Runner, M, 18-25	2% (6)	2% (17)
Jogger/Runner, M, 26-55	6% (15)	7% (53)
Jogger/Runner, M, >55	3% (7)	2% (15)
Jogger/Runner, Male	**12% (31)**	**9% (93)**
Jogger/Runner, F, 18-25	2% (5)	2% (13)
Jogger/Runner, F, 26-55	7% (17)	6% (50)
Jogger/Runner, F, >55	2% (5)	1% (11)
Jogger/Runner, Female	**11% (28)**	**9% (88)**

Greenway passes (28768, 28712). "Non-Local" is defined as all other zip code areas.

- In general, more Local people used the trail, with the highest percentage being those who walk on the trail (68%).
- The highest proportion of Non-Local trail users is bicyclists (58%).

Trail users were asked about their **frequency of use** of the trail. The figures shown in Table 7 are averages of the total trips taken in the past 14 days as reported by survey respondents. As shown in the table, most of those surveyed used the trail several times during the previous two week period.

- On average, use of the trail during the previous two weeks was similar across all modes, with an average of six trips in the past 14 days for all modes.
- Surveyed bicyclists were the most frequent trail users, averaging one trip every other day.

Table 8 provides information on the **distance traveled** on the Brevard Greenway by travel mode on the trail and Table 9 provides information on the **distance traveled** on the Brevard Greenway by gender and travel mode on the trail. The figures reported in the table are average trip distances in miles. Cases in which inadequate data was provided to compute trip distance were not included.

- Bicyclists traveled greater distances than those traveling by other modes. Distance traveled varied directly with the relative speed of each mode.
- Female bicyclists traveled the greatest distances on the trail.
- Females tended to travel slightly longer distances than males for each mode.

TRANSPORTATION IMPACTS

Analysis of transportation-related factors included:

TABLE 6: TRIP POINT OF ORIGIN BY TRAVEL MODE ON TRAIL

MODE	2015 LOCAL (N)	2015 NON-LOCAL (N)
Bike	42% (30)	58% (41)
Walk	68% (90)	32% (43)
Jog/Run	52% (30)	48% (28)
All Modes	57% (151)	43% (112)

TABLE 7: AVERAGE NUMBER OF TRIPS IN THE PAST 14 DAYS

MODE	AVERAGE NUMBER OF TRIPS	(N)
Bike	7	38
Walk	6	90
Jog/Run	5	48
All Modes	6	177

TABLE 8: AVERAGE TRIP DISTANCE (IN MILES) BY TRAVEL MODE ON TRAIL

MODE	2015 AVERAGE MILES TRAVELED (N)
Bike	3.8 (71)
Walk	2.1 (135)
Jog/Run	3.5 (59)
All Modes	2.9 (266)

TABLE 9: AVERAGE TRIP DISTANCE (IN MILES) BY GENDER AND TRAVEL MODE ON TRAIL

GENDER	MODE	2015 AVERAGE MILES TRAVELED (N)
Male	Bike	3.7 (44)
	Walk	2.0 (61)
	Jog/Run	3.4 (31)
	All Modes	2.9 (137)
Female	Bike	4.1 (27)
	Walk	2.2 (67)
	Jog/Run	3.7 (28)
	All Modes	2.9 (122)

- Mode used to travel on the trail
- Primary trip purpose
- Frequency of round trips versus one-way trips
- Mode used to travel to the trail
- Trail access points

Analysis of survey responses found differences in **proportions of users by travel mode on the trail,** as shown in Figure 1.

- The majority of trail users traveled on the trail by foot (73%).

Given the relatively high use of the trail for exercise/recreational purposes (86% of trips – see Table 10), it is not surprising that most travel involved a roundtrip, not a one-way trip on the trail, as illustrated in Table 11.

- Across all modes, the majority of trips were roundtrips.

The survey also revealed the **mode by which trail users traveled to the trail.** Table 12 provides information on the access

FIGURE 1: TYPE OF USER BY TRAVEL MODE ON TRAIL

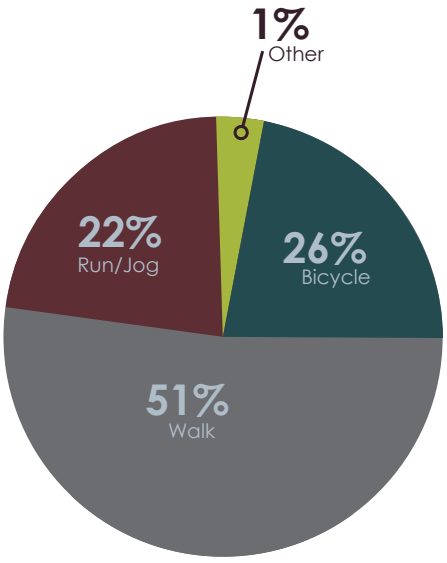


TABLE 10: PRIMARY TRIP PURPOSE

PRIMARY TRIP PURPOSE	2015 PERCENTAGE OF SURVEYED USERS (N)
For exercise/ recreation/ sightseeing	86% (232)
Travel to/from work or school	3% (8)
Travel to/from dining/shopping/ running errands	8% (21)
Travel to/from cultural attraction/ entertainment/ leisure activity	3% (9)

TABLE 11: TRIP TYPE

MODE	2015 ROUNDTRIP (N)	2015 THROUGHTRIP (N)
Bike	70% (50)	30% (21)
Walk	96% (132)	4% (5)
Jog/Run	100% (59)	0% (0)
All Modes	90% (242)	10% (26)

TABLE 12: MODE TO THE TRAIL BY MODE USED ON TRAIL

MODE ON TRAIL	MODE TO TRAIL		
	2015 by Bicycle (n)	2015 by Car (n)	2015 by Foot (n)
Bike	64% (43)	36% (24)	0% (0)
Walk	0% (0)	82% (110)	18% (24)
Jog/Run	0% (0)	79% (46)	21% (12)
All Modes	17% (43)	69% (180)	14% (36)

TABLE 13: TOP FIVE ACCESS POINTS ON THE BREVARD GREENWAY

ACCESS POINT DESCRIPTION	PERCENT SURVEYED (N)
Lowe's Parking Lot Driveway Intersection North	23% (63)
Brevard Sports Complex Driveway	14% (37)
Art Loeb Trailhead	12% (31)
Trail Terminus at McLean Road	8% (21)
Davidson River Bridge	5% (14)

modes used to travel to the trail by all survey respondents, sorted by mode of travel on the trail. The percentages shown are calculated by row to reflect the shares of travel to the trail according to the mode used on the trail.

- Over two-thirds of those using the trail traveled to the trail by car while the other third used a mode of active transportation. 81% of respondents traveling by foot on the trail accessed the trail by car compared to 36% of respondents traveling by bicycle.
- 31% of respondents used an active mode of transportation to access the trail.
- Bicyclists were more likely to bicycle to the trail than drive to the trail.

The survey also provided information on **where trail users were accessing the trail**. Table 13 includes the top five access points on the trail according to where survey respondents accessed the trail.

- Nearly a quarter of respondents accessed the trail from the northernmost Lowe's parking lot driveway intersection.
- Nearly the same number of respondents accessed the trail from the Brevard Sports Complex driveway as from the Art Loeb trailhead.

ECONOMIC IMPACTS

The users of the trail can have an impact on businesses through expenditures on a variety of goods and services. The survey asked trail users to list expenditures on goods or services directly related to their trip on the trail on the day of the survey. If a trail user was traveling with members of their household, estimates represent the total for their household.

The results are shown in the following table. Table 14 shows **trail users' expenditures related to their trip on the Brevard Greenway** categorized by the type of expenditure and separated by user group.

TABLE 14: TYPE OF AND AVERAGE EXPENDITURE BY USER GROUP

BREVARD USER GROUP	Restaurant			Grocery			Retail			Entertainment			Bike Rental		
	Respondents	% of Respondents	Average Expenses	Respondents	% of Respondents	Average Expenses	Respondents	% of Respondents	Average Expenses	Respondents	% of Respondents	Average Expenses	Respondents	% of Respondents	Average Expenses
Bicycle	61	66%	$27	60	23%	$30	61	10%	$43	61	0%	$ -	61	7%	$70
Jog/Run	40	20%	$15	40	28%	$35	40	3%	$100	40	0%	$ -	40	0%	$ -
Walk	115	21%	$15	115	14%	$31	114	8%	$44	115	1%	$10	115	0%	$ -
Total	217	37%	$20	216	19%	$32	216	7%	$47	217	<1%	$10	217	2%	$70

- Food-related expenditures were the most common among surveyed trail users. The largest percentage of respondents made purchases at a restaurant. 37% of respondents made a restaurant-related purchase with an average cost of $20, and 19% of respondents made a grocery-related purchase with an average cost of $32.
- Retail and entertainment purchases were less common. Only 7% of respondents made a retail-related purchase with an average cost of $47, and only one respondent made an entertainment-related purchase with a cost of $10.

PUBLIC HEALTH IMPACTS

Increasing physical activity among children and adults is a national health objective in the United States. Access to facilities, such as trails, is one of the factors positively associated with physical activity. Information compiled that relates to public health impacts from user of the Brevard Greenway included:

- The percentage of trail users who indicated exercise as their primary trip purpose
- The mode of activity users engaged in while on the trail
- The average duration of each activity by user type

Table 15 indicates users' **primary trip purpose**. Non-recreational trip purposes included work, school, shopping, restaurant, and entertainment trips. It is important to note that users on the trail whose purpose was not primarily exercise/recreation were

still engaging in physical activity while on the trail.

- Overall, 86% of all users on the Brevard Greenway indicate their primary trip purpose as exercise/recreation.

Table 16 indicates the **duration of the active portion of a trail user's trip** (in minutes) by mode traveled on the trail. The total active portion of a trail user's trip was self-reported on the survey and may include time spent actively traveling to or from the trail. This table includes respondents who did not indicate gender so overall totals vary slightly from those reported in Table 17.

- The average duration of the active portion of the trip for all users surveyed on the trail was 62 minutes.
- Bicyclists reported the highest average duration of the active portion of the trip (89 minutes) compared to walkers (53 minutes) and joggers/runners (53 minutes).

Table 17 breaks out the **duration of the active portion of a user's trip by gender and travel mode on the trail**. Respondents that did not indicate gender are excluded from the data in the table.

- Male bicyclists reported spending an average of more than 30 minutes more traveling on the Brevard Greenway than female bicyclists.
- Female walkers and joggers/runners reported spending an average of more than 20 minutes more traveling on the trail than male walkers and joggers/runners.

Table 18 presents information on the **duration of the active portion of a user's trip in**

TABLE 15: RECREATIONAL VERSUS NON-RECREATIONAL TRIP PURPOSES

PRIMARY TRIP PURPOSE	2015 PERCENTAGE OF SURVEYED USERS (N)
For exercise/recreation/ sightseeing	86% (232)
Non-recreational (all other trip purposes)	14% (38)

TABLE 16: AVERAGE DURATION (IN MINUTES) OF THE ACTIVE PORTION OF USER'S TRIP

MODE	2015 DURATION (N)
Bike	89 min (69)
Walk	53 min (132)
Jog/Run	53 min (58)
All Modes	62 min (260)

TABLE 17: AVERAGE DURATION (IN MINUTES) OF THE ACTIVE PORTION OF USER'S TRIP BY GENDER AND TRAVEL MODE ON TRAIL

GENDER	MODE	2015 DURATION (N)
Male	Bike	102 min (44)
	Walk	42 min (61)
	Jog/Run	46 min (30)
	All Modes	62 min (136)
Female	Bike	66 min (25)
	Walk	63 min (63)
	Jog/Run	60 min (28)
	All Modes	63 min (116)

relation to annual household income to assess the activity of users of differing socio-economic status. Duration of the active portion of the trip may include active travel to/from the trail.

- Individuals with household incomes of less than $25,000 reported using the trail for an average of 46 minutes.
- The longest duration of activity on average (83 minutes) was reported by those in the >$200,000 household income bracket.

Table 19 presents information on the **percentage of exercise met by using the trail over the past 14 days by travel mode on the trail.**

- Respondents used the trail to meet 47% of their total exercise on average over the past 14 days.
- A slightly larger percentage of exercise was met by using the trail for walkers compared to joggers/runners and bicyclists.

Table 20 presents information on the **percentage of exercise met by using the trail over the past 14 days by gender and travel mode on the trail.**

- Overall, the average percentage of exercise met by using the trail over the past 14 days was slightly larger for female trail users compared to male trail users. The difference was the greatest for female joggers/runners compared to male joggers/runners.

TABLE 18: AVERAGE DURATION (IN MINUTES) OF THE ACTIVE PORTION OF USER'S TRIP BY ANNUAL HOUSEHOLD INCOME

HOUSEHOLD INCOME	2015 DURATION (N)
<$25,000	46 min (32)
$25,000-$34,999	49 min (22)
$35,000-$49,999	63 min (17)
$50,000-$74,999	64 min (45)
$75,000-$99,999	71 min (33)
$100,000-$149,999	72 min (28)
$150,000-$199,999	63 min (10)
>$200,000	83 min (11)

TABLE 19: AVERAGE PERCENTAGE OF EXERCISE MET BY USING THE TRAIL OVER THE PAST 14 DAYS BY TRAVEL MODE ON TRAIL

MODE	2015 PERCENT EXERCISE (N)
Bike	46% (52)
Walk	48% (113)
Jog/Run	46% (55)
All Modes	47% (221)

TABLE 20: AVERAGE PERCENTAGE OF EXERCISE MET BY USING THE TRAIL OVER THE PAST 14 DAYS BY TRAVEL MODE ON TRAIL

GENDER	MODE	2015 PERCENT EXERCISE (N)
Male	Bike	41% (33)
	Walk	45% (48)
	Jog/Run	39% (29)
	All Modes	43% (111)
Female	Bike	56% (19)
	Walk	49% (59)
	Jog/Run	53% (26)
	All Modes	51% (104)

TRAVEL ACTIVITY MAPS

The following maps provide a visualization of travel activity on the Brevard Greenway generated using the user reported trail origin, turnaround, and destination points taken from the surveys. Figure 3 shows where roundtrips for all modes (left) and one-way, throughtrips for all modes (right) occurred on the trail during the survey period. Roundtrips and throughtrips occurred on the entire length of the trail. Figure 4 shows where trips occurred on the trail during the survey period by primary trip purpose. The majority of trips were for exercise/recreation and these trips occurred on the entire length of the trail. Commuting trips were concentrated north of US-267 and south of the Transylvania Activity Center, but happened on most on the trail. Errands trips were reported at consistent levels along almost the entire trail except for a small portion of the trail that runs adjacent to US-267, where no errand-related travel activity was reported. Figures 5-7 show travel activity on the trail by mode on the trail, and include the average trip duration and average miles traveled for each mode.

FIGURE 3: ROUNDTRIP (LEFT) AND THROUGHTRIP (RIGHT) TRAVEL ACTIVITY FOR ALL MODES – *90% OF REPORTED TRIPS WERE ROUNDTRIPS AND 10% OF REPORTED TRIPS WERE THROUGHTRIPS*

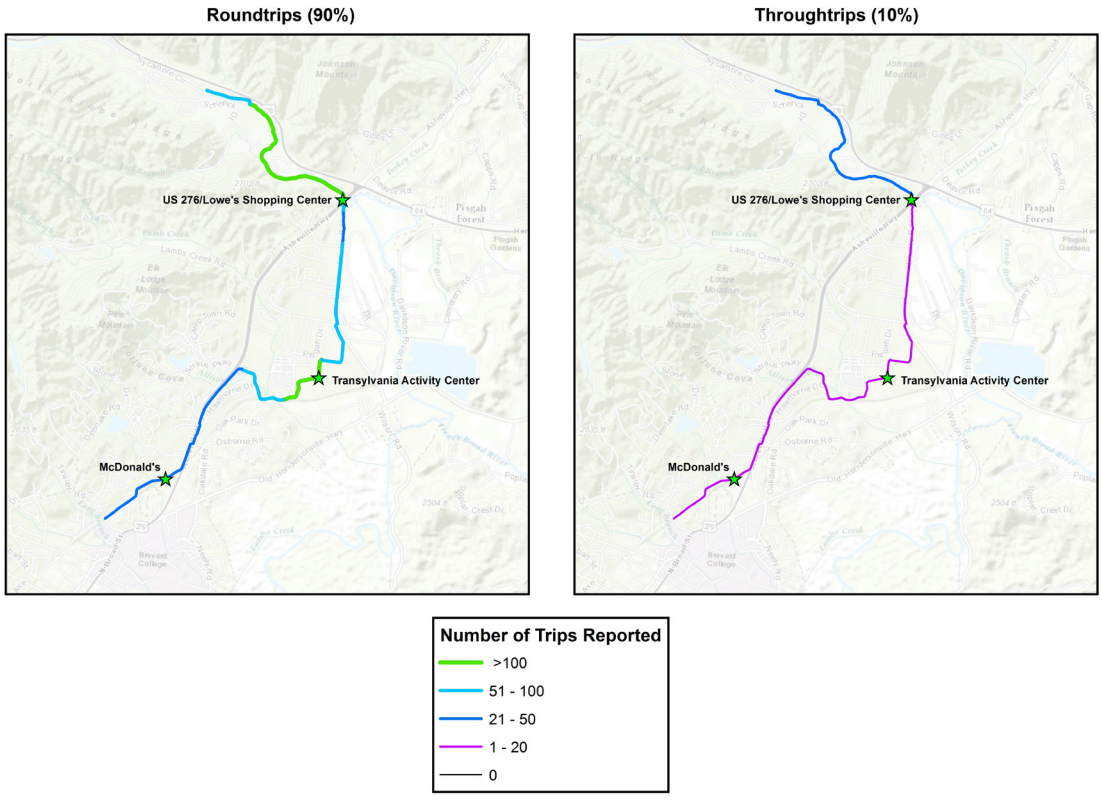


FIGURE 4: COMMUTE (TOP LEFT), ERRANDS (TOP RIGHT), AND EXERCISE/RECREATION (BOTTOM LEFT) TRAVEL ACTIVITY FOR ALL MODES – *3% OF REPORTED TRIPS WERE COMMUTE TRIPS, 8% OF REPORTED TRIPS WERE ERRANDS TRIPS, AND 86% OF REPORTED TRIPS WERE FOR EXERCISE/RECREATION*

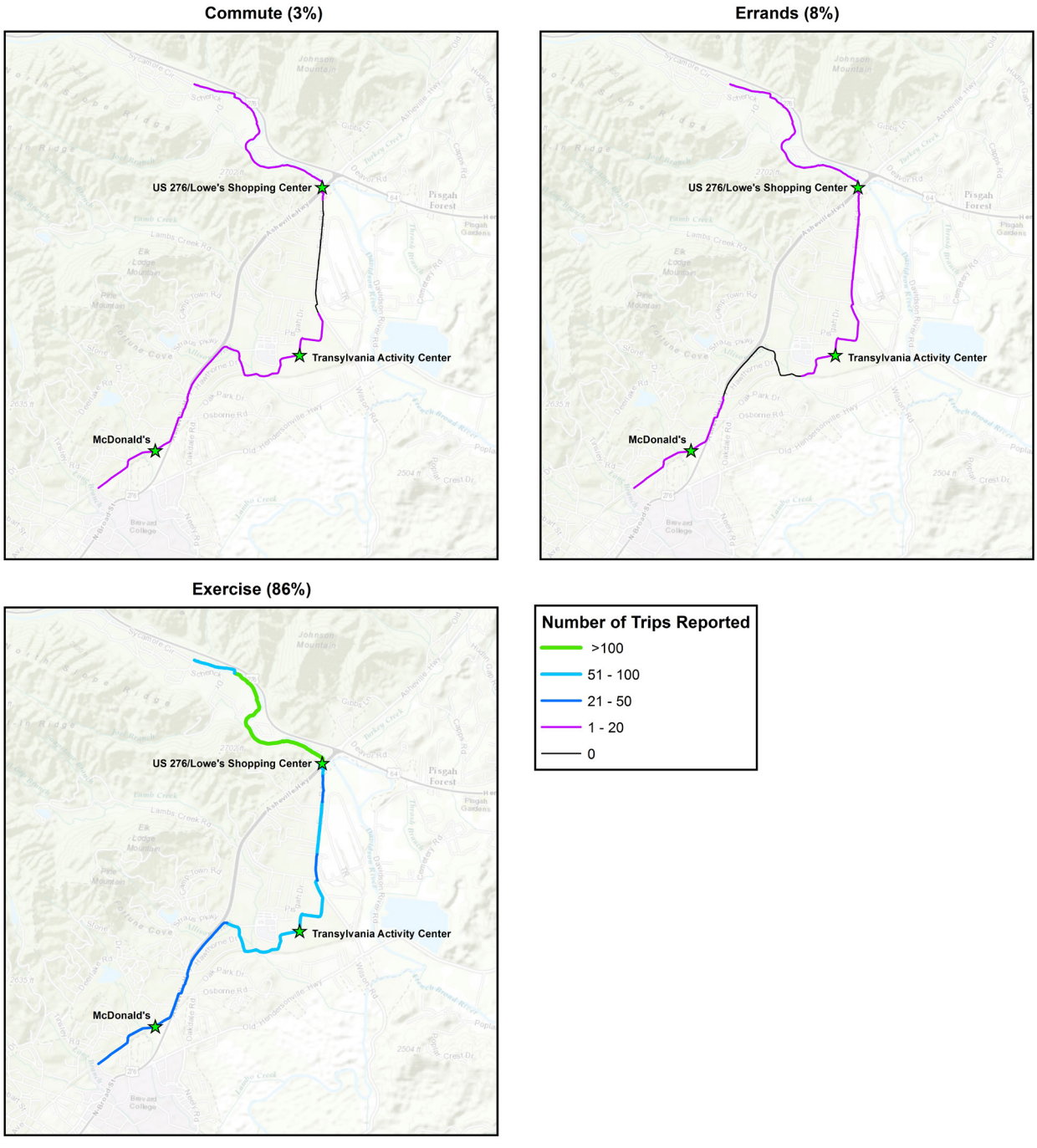


FIGURE 5: ROUNDTRIPS (LEFT) AND THROUGHTRIPS (RIGHT) FOR BICYCLISTS – *70% OF REPORTED BICYCLING TRIPS WERE ROUNDTRIPS AND 30% OF REPORTED BICYCLING TRIPS WERE THROUGHTRIPS; THE AVERAGE TRIP DURATION FOR BICYCLISTS WAS 89 MIN (102 MIN FOR MALES AND 66 MIN FOR FEMALES); THE AVERAGE DISTANCE TRAVELED BY BICYCLISTS WAS 3.8 MI*

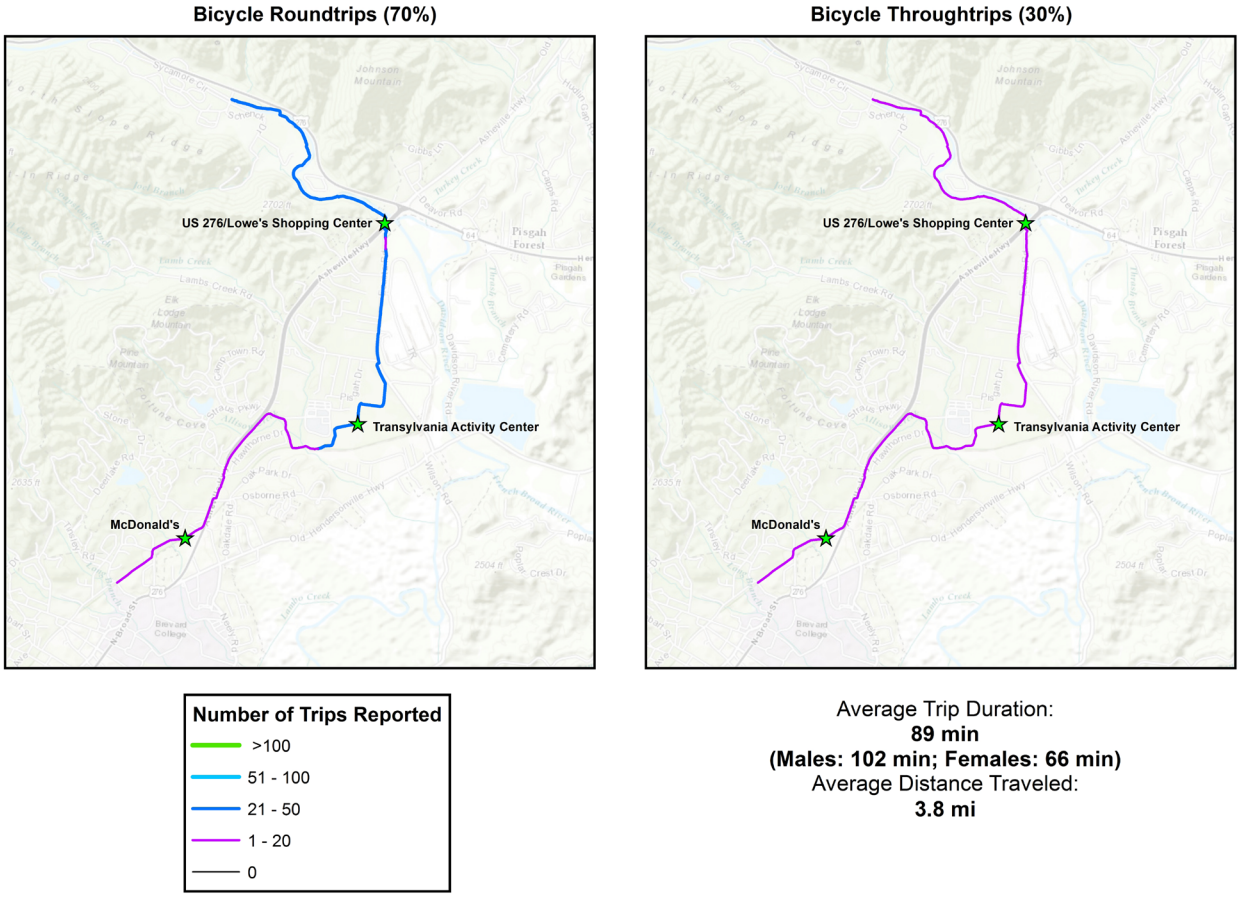


FIGURE 6: ROUNDTRIPS (LEFT) AND THROUGHTRIPS (RIGHT) FOR RUNNERS – *100% OF REPORTED RUNNING TRIPS WERE ROUNDTRIPS AND 0% OF REPORTED RUNNING TRIPS WERE THROUGHTRIPS; THE AVERAGE TRIP DURATION FOR RUNNERS WAS 53 MIN (46 MIN FOR MALES AND 60 MIN FOR FEMALES); THE AVERAGE DISTANCE TRAVELED BY RUNNERS WAS 3.5 MI*

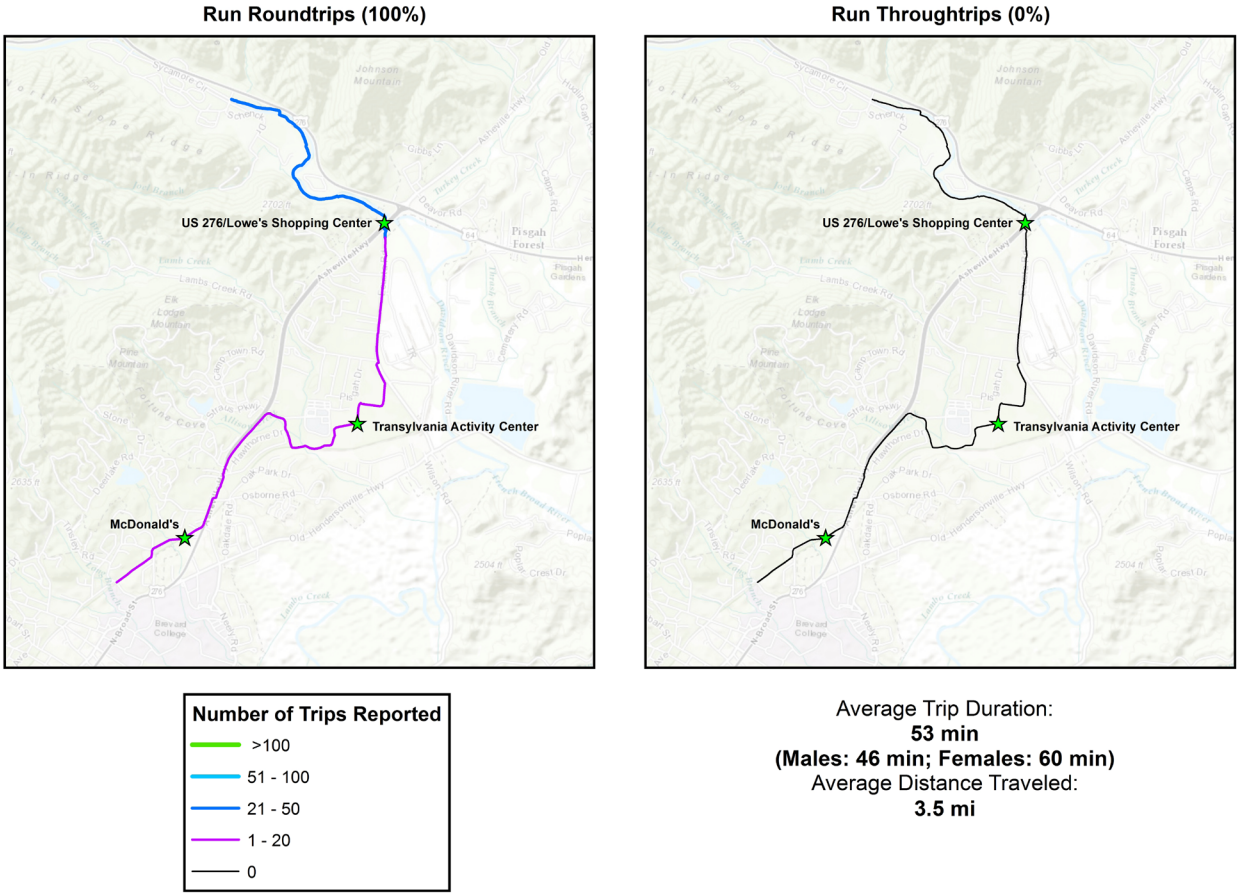
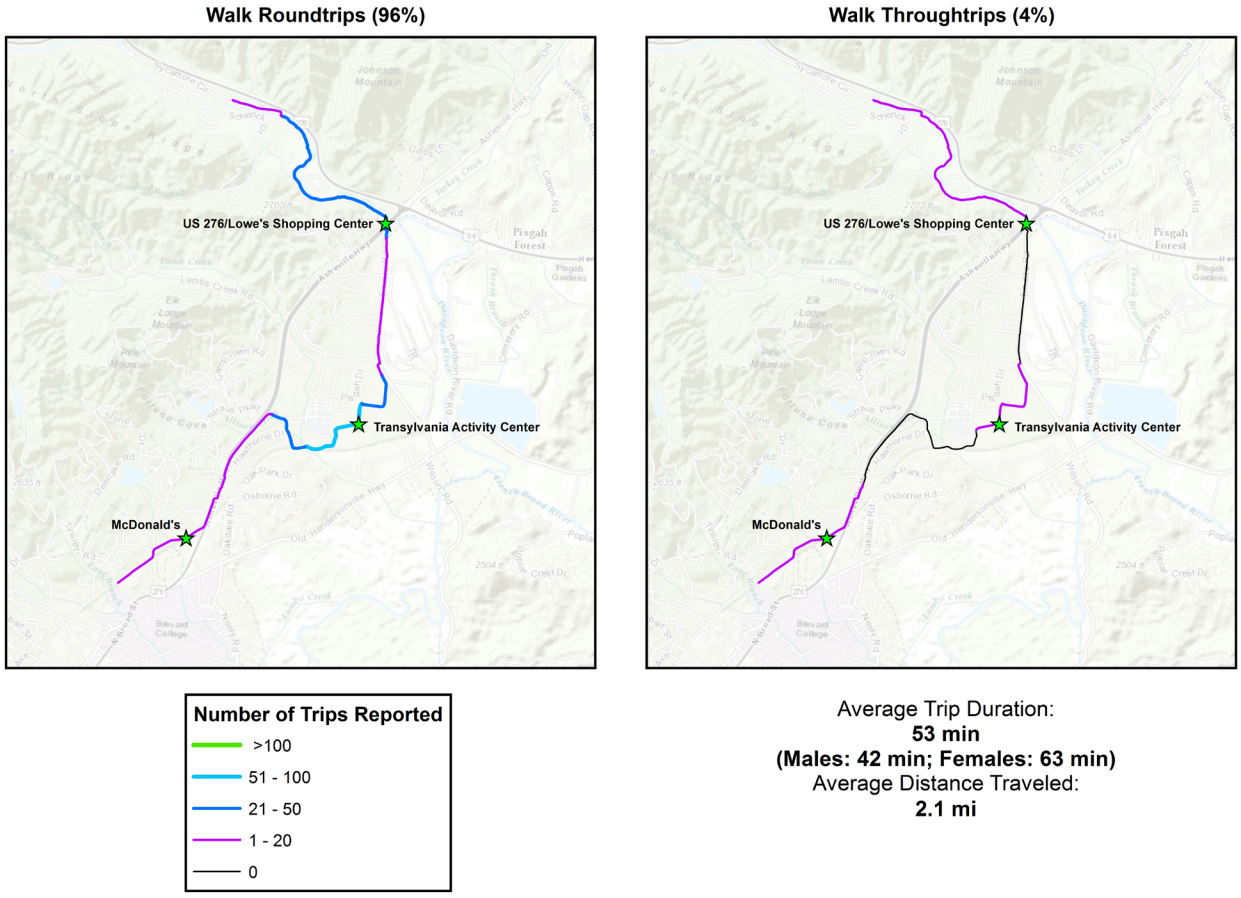


FIGURE 7: ROUNDTRIPS (LEFT) AND THROUGHTRIPS (RIGHT) FOR WALKERS – *96% OF REPORTED WALKING TRIPS WERE ROUNDTRIPS AND 4% OF REPORTED WALKING TRIPS WERE THROUGHTRIPS; THE AVERAGE TRIP DURATION FOR WALKERS WAS 53 MIN (42 MIN FOR MALES AND 63 MIN FOR FEMALES); THE AVERAGE DISTANCE TRAVELED BY WALKERS WAS 2.1 MI*



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BREVARD GREENWAY 2016

Results have been compiled for overall use of the trail based on the aggregated data collected at the ten survey/count stations. Findings include users' demographics, their usage of the trail, and transportation, economic, and health aspects of trail use. The preliminary findings provided have not been tested for statistical significance. These results will be further evaluated for significance and for comparative analysis once all years of data collection are complete.

Table 1 summarizes the data collection effort indicating the data collection period, survey/count location on the trail, the raw number of users counted, and the raw number of users intercepted to fill out a survey while using the trail. A total of 853 counts were collected during the survey period, and 240 surveys were completed.

TRAIL USER DEMOGRAPHICS

Table 2 shows the **percentages of surveyed trail users and counts by gender and age group** for Brevard Greenway users and counts overall:

- In general, a greater percentage of males than females used the trail.
- Nearly half of those surveyed were over the age of 55.

TABLE 1: DATA COLLECTION SCHEDULE AND SUMMARY STATISTICS

DAY OF WEEK	DATE	TIME PERIOD	STATION	LOCATION	2016 COUNTS	2016 SURVEYS
Thursday	5/19/2016	7AM to 7PM	1	US 64 Intersection	128	37
			2	Transylvania Activity Center	141	46
			3	McDonald's	38	10
Saturday	5/21/2016	7AM to 7PM	1	US 64 Intersection	254	67
			2	Transylvania Activity Center	198	46
			3	McDonald's	94	34
				TOTALS	**853**	**240**

TABLE 2: SURVEYED TRAIL USER AND COUNT DEMOGRAPHICS – GENDER AND AGE

DEMOGRAPHIC	2016 SURVEYED USERS (N)	2016 COUNTS (N)
Male	54% (128)	54% (460)
Female	46% (109)	46% (387)
Age 18-25	4% (9)	7% (54)
Age 26-55	50% (112)	52% (391)
Age >55	45% (101)	40% (302)

Table 3 provides **additional demographic information for the surveyed trail users**, including education level, annual household income, and race.

- The majority of surveyed trail users completed college or earned an advanced degree (75%).
- Nearly all surveyed trail users were white (99%) and earned annual household incomes less than $75,000 (56%).

Survey user type data were compared to manual count user type data to determine if the survey responses could be considered representative of the population of trail users during the data collection period. Count data were adjusted based on the survey responses indicating the percentage of trips that were round trips and the number of survey/count stations passed according to user reported trail origin, turnaround, and destination points to avoid overestimating or 'double/multi-counting' unique users of the trail. A summary of the methods used to adjust the counts to unique users can be found in Chapter 5 of the Final Report.

Table 4 provides the **percentages of surveyed users, counts, and unique users by travel mode on the trail during the survey period**. Comparing data across the columns shows the degree to which those surveyed represent a proportionate sample of all those using the trail. Note that while children less than 18 years of age were counted, they were not surveyed.

- In general, surveyed user proportions are similar to unique user proportions by mode.

Table 5 provides data separated by travel mode on the trail, gender, and age group for trail users intercepted during the survey period.

TABLE 3: SURVEYED TRAIL USER DEMOGRAPHICS – EDUCATION, ANNUAL HOUSEHOLD INCOME, AND RACE

DEMOGRAPHIC	2016 SURVEYED USERS (N)
Some High School	2% (4)
Completed High School	6% (13)
Some College	12% (28)
Completed Business/Technical School	5% (12)
Completed College	41% (93)
Advanced Degree	34% (77)
Less than $25,000	11% (23)
$25,000-$34,999	13% (26)
$35,000-$49,999	14% (30)
$50,000-$74,999	18% (38)
$75,000-$99,999	18% (37)
$100,000-$149,999	14% (29)
$150,000-$199,999	6% (13)
$200,000 or more	6% (12)
White	99% (234)
Black	<1% (1)
Asian	0% (0)
Native Hawaiian or Pacific Islander	0% (0)
American Indian	<1% (1)

TABLE 4: ALL TRAIL USERS DURING SURVEY PERIODS – TRAVEL MODE ON TRAIL

MODE	DAY	2016 SURVEYED USERS (N)	2016 COUNTS (N)	2016 UNIQUE USERS (N)
Bike	Thurs	31% (29)	32% (97)	27% (36)
	Sat	27% (39)	40% (219)	37% (96)
Walk	Thurs	53% (49)	51% (156)	57% (77)
	Sat	53% (78)	46% (249)	51% (134)
Jog/Run	Thurs	16% (15)	14% (44)	16% (22)
	Sat	20% (30)	13% (69)	12% (31)
All Other Modes	Thurs	0% (0)	3% (10)	0% (0)
	Sat	0% (0)	1% (7)	0% (0)

TABLE 5: COMPARATIVE PERCENTAGES/NUMBERS OF COUNTS AND THOSE SURVEYED, BY TRAVEL MODE ON TRAIL, GENDER, AND AGE

MODE, GENDER, AGE	2016 PERCENTAGE OF SURVEYED USERS (N)	2016 PERCENTAGE OF COUNTS (N)
Bicycle, M, 18-25	1% (2)	3% (20)
Bicycle, M, 26-55	12% (27)	13% (94)
Bicycle, M, >55	7% (15)	9% (65)
All Bicycle, Male	**19% (46)**	**25% (206)**
Bicycle, F, 18-25	1% (2)	1% (6)
Bicycle, F, 26-55	5% (10)	7% (51)
Bicycle, F, >55	3% (7)	4% (30)
All Bicycle, Female	**8% (20)**	**13% (109)**
Walker, M, 18-25	0% (0)	1% (9)
Walker, M, 26-55	7% (16)	8% (60)
Walker, M, >55	18% (39)	12% (91)
All Walker, Male	**25% (60)**	**21% (178)**
Walker, F, 18-25	1% (3)	2% (14)
Walker, F, 26-55	11% (24)	11% (82)
Walker, F, >55	14% (30)	14% (105)
All Walker, Female	**28% (66)**	**27% (222)**
Jogger/Runner, M, 18-25	0% (0)	0% (1)
Jogger/Runner, M, 26-55	7% (16)	7% (55)
Jogger/Runner, M, >55	2% (5)	1% (5)
Jogger/Runner, Male	**9% (22)**	**8% (64)**
Jogger/Runner, F, 18-25	<1% (1)	<1% (1)
Jogger/Runner, F, 26-55	8% (18)	6% (46)
Jogger/Runner, F, >55	2% (4)	<1% (2)
Jogger/Runner, Female	**10% (23)**	**6% (49)**

TRAIL USER PROFILES

Information was compiled to investigate the travel modes used both to travel to the trail as well as while traveling on the trail, where trail users live in relation to the trail, whether they used the trail for recreational/ non-recreational purposes, the frequency of trail use, and the distance users traveled on the trail.

Table 6 shows information on **"Local" versus "Non-Local" point of trip origin** by travel mode on the trail. "Local" is defined as zip code areas through which the Brevard Greenway passes (28768, 28712). "Non-Local" is defined as all other zip code areas.

- In general, more Local people used the trail, with the highest percentage being those who jog/run on the trail (76%).
- The highest proportion of Non-Local trail users is bicyclists (37%).

Trail users were asked about their **frequency of use** of the trail. The figures shown in Table 7 are averages of the total trips taken in the past 14 days as reported by survey respondents. As shown in the table, most of those surveyed used the trail several times during the previous two week period.

- On average, use of the trail during the previous two weeks was similar across all modes, with an average of seven trips in the past 14 days for all modes.
- Surveyed bicyclists were the most frequent trail users.

Table 8 provides information on the **distance traveled** on the Brevard Greenway by travel mode on the trail and Table 9 provides information on the **distance traveled** on the Brevard Greenway by gender and travel mode on the trail. The figures reported in the table are average trip distances in miles. Cases in which inadequate data was provided to compute trip distance were not included.

TABLE 6: TRIP POINT OF ORIGIN BY TRAVEL MODE ON TRAIL

MODE	2016 LOCAL (N)	2016 NON-LOCAL (N)
Bike	63% (43)	37% (25)
Walk	71% (88)	29% (36)
Jog/Run	76% (34)	24% (11)
All Modes	70% (165)	30% (72)

TABLE 7: AVERAGE NUMBER OF TRIPS IN THE PAST 14 DAYS

MODE	AVERAGE NUMBER OF TRIPS	(N)
Bike	9	44
Walk	7	81
Jog/Run	5	38
All Modes	7	163

TABLE 8: AVERAGE TRIP DISTANCE (IN MILES) BY TRAVEL MODE ON TRAIL

MODE	2016 AVERAGE MILES TRAVELED (N)
Bike	5.3 mi (28)
Walk	2.3 mi (125)
Jog/Run	3.7 mi (45)
All Modes	3.4 mi (238)

TABLE 9: AVERAGE TRIP DISTANCE (IN MILES) BY GENDER AND TRAVEL MODE ON TRAIL

GENDER	MODE	2015 AVERAGE MILES TRAVELED (N)
Male	Bike	5.3 (46)
	Walk	2.4 (58)
	Jog/Run	3.9 (126)
	All Modes	3.7 (126)
Female	Bike	4.9 (20)
	Walk	2.2 (66)
	Jog/Run	3.4 (23)
	All Modes	3.0 (109)

- Bicyclists traveled greater distances than those traveling by other modes. Distance traveled varied directly with the relative speed of each mode.
- Male bicyclists traveled the greatest distances on the trail.

TRANSPORTATION IMPACTS

Analysis of transportation-related factors included:

- Mode used to travel on the trail
- Primary trip purpose
- Frequency of round trips versus one-way trips
- Mode used to travel to the trail
- Trail access points

Analysis of survey responses found differences in **proportions of users by travel mode on the trail,** as shown in Figure 1.

- The majority of trail users traveled on the trail by foot (72%).

Given the relatively high use of the trail for exercise/recreational purposes (92% of trips – see Table 10), it is not surprising that most travel involved a roundtrip, not a one-way trip on the trail, as illustrated in Table 11.

- Across all modes, the majority of trips were roundtrips.

FIGURE 1: TYPE OF USER BY TRAVEL MODE ON TRAIL

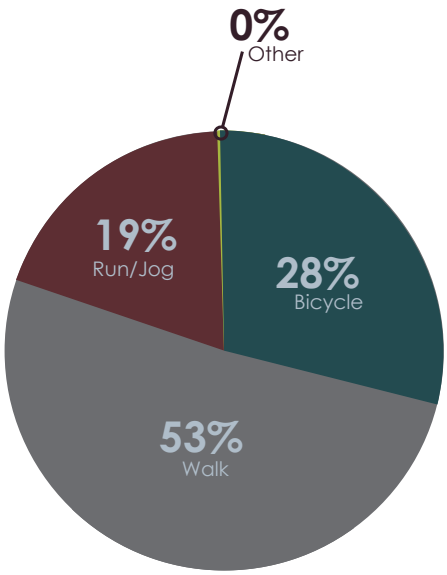


TABLE 10: PRIMARY TRIP PURPOSE

PRIMARY TRIP PURPOSE	2016 PERCENTAGE OF SURVEYED USERS (N)
For exercise/ recreation/ sightseeing	92% (221)
Travel to/from work or school	2% (5)
Travel to/from dining/shopping/ running errands	3% (7)
Travel to/from cultural attraction/ entertainment/ leisure activity	3% (6)

TABLE 11: TRIP TYPE

MODE	2016 ROUNDTRIP (N)	2016 THROUGHTRIP (N)
Bike	79% (54)	21% (14)
Walk	95% (121)	5% (6)
Jog/Run	98% (44)	2% (1)
All Modes	91% (219)	9% (21)

The survey also revealed the **mode by which trail users traveled to the trail.** Table 12 provides information on the access modes used to travel to the trail by all survey respondents, sorted by mode of travel on the trail. The percentages shown are calculated by row to reflect the shares of travel to the trail according to the mode used on the trail.

- Nearly two-thirds of those using the trail traveled to the trail by car while the other third used a mode of active transportation. 83% of respondents traveling by foot on the trail accessed the trail by car compared to 31% of respondents traveling by bicycle.
- 32% of respondents used an active mode of transportation to access the trail.
- Bicyclists were more likely to bicycle to the trail than drive to the trail.

The survey also provided information on **where trail users were accessing the trail**. Table 13 includes the top five access points on the trail according to where survey respondents accessed the trail.

- A quarter of respondents accessed the trail from the northernmost Lowe's parking lot driveway intersection.
- Nearly the same number of respondents accessed the trail from the Brevard Sports Complex driveway as from the Art Loeb trailhead.

TABLE 12: MODE TO THE TRAIL BY MODE USED ON TRAIL

MODE ON TRAIL	MODE TO TRAIL		
	2016 by Bicycle (n)	2016 by Car (n)	2016 by Foot (n)
Bike	69% (47)	31% (21)	0% (0)
Walk	0% (0)	85% (108)	15% (19)
Jog/Run	0% (0)	78% (35)	22% (10)
All Modes	20% (47)	68% (164)	12% (29)

TABLE 13: TOP FIVE ACCESS POINTS ON THE BREVARD GREENWAY

ACCESS POINT DESCRIPTION	PERCENT SURVEYED (N)
Lowe's Parking Lot Driveway Intersection North	25% (60)
Brevard Sports Complex Driveway	15% (36)
Art Loeb Trailhead	13% (31)
Trail Terminus at McLean Road	12% (29)
Davidson River Bridge	5% (12)

ECONOMIC IMPACTS

The users of the trail can have an impact on businesses through expenditures on a variety of goods and services. The survey asked trail users to list expenditures on goods or services directly related to their trip on the trail on the day of the survey. If a trail user was traveling with members of their household, estimates represent the total for their household.

The results are shown in the following table. Table 14 shows **trail users' expenditures related to their trip on the Brevard Greenway** categorized by the type of expenditure and separated by user group.

PUBLIC HEALTH IMPACTS

Increasing physical activity among children and adults is a national health objective in the United States. Access to facilities, such as trails, is one of the factors positively associated with physical activity. Information compiled that relates to public health impacts from user of the Brevard Greenway included:

- The percentage of trail users who indicated exercise as their primary trip purpose
- The mode of activity users engaged in while on the trail
- The average duration of each activity by user type

TABLE 14: TYPE OF AND AVERAGE EXPENDITURE BY USER GROUP

BREVARD USER GROUP	Restaurant			Grocery			Retail			Entertainment			Bike Rental		
	Respondents	% of Respondents	Average Expenses	Respondents	% of Respondents	Average Expenses	Respondents	% of Respondents	Average Expenses	Respondents	% of Respondents	Average Expenses	Respondents	% of Respondents	Average Expenses
Bicycle	68	37%	$34	68	13%	$16	68	7%	$11	68	0%	$ -	68	0%	$ -
Jog/Run	44	14%	$21	44	11%	$29	44	9%	$45	44	0%	$ -	44	0%	$ -
Walk	127	15%	$15	126	17%	$33	127	8%	$47	127	1%	$6	127	0%	$ -
Total	239	21%	$25	238	15%	$28	239	8%	$37	239	<1%	$6	239	2%	$ -

- Food-related expenditures were the most common among surveyed trail users. The largest percentage of respondents made purchases at a restaurant. 21% of respondents made a restaurant-related purchase with an average cost of $25, and 15% of respondents made a grocery-related purchase with an average cost of $28.
- Retail and entertainment purchases were less common. Only 8% of respondents made a retail-related purchase with an average cost of $37.

Table 15 indicates users' **primary trip purpose**. Non-recreational trip purposes included work, school, shopping, restaurant, and entertainment trips. It is important to note that users on the trail whose purpose was not primarily exercise/recreation were still engaging in physical activity while on the trail.

- Overall, 92% of all users on the Brevard Greenway indicate their primary trip purpose as exercise/recreation.

Table 16 indicates the **duration of the active portion of a trail user's trip** (in minutes) by mode traveled on the trail. The total active portion of a trail user's trip was self-reported on the survey and may include time spent actively traveling to or from the trail. This table includes respondents who did not indicate gender so overall totals vary slightly from those reported in Table 17.

- The average duration of the active portion of the trip for all users surveyed on the trail was 53 minutes.
- Bicyclists reported the highest average duration of the active portion of the trip (57 minutes) compared to walkers (52 minutes) and joggers/runners (48 minutes).

Table 17 breaks out the **duration of the active portion of a user's trip by gender and travel mode on the trail**. Respondents that did not indicate gender are excluded from the data in the table.

- Male bicyclists reported spending an average of more than 20 minutes more traveling on the Brevard Greenway than female bicyclists.
- Male walkers reported spending an average of 8 minutes more traveling on the trail than female walkers, while female joggers/runners reported spending an average of 8 minutes more traveling on the trail than male joggers/runners.

TABLE 15: RECREATIONAL VERSUS NON-RECREATIONAL TRIP PURPOSES

PRIMARY TRIP PURPOSE	2016 PERCENTAGE OF SURVEYED USERS (N)
For exercise/recreation/ sightseeing	92% (221)
Non-recreational (all other trip purposes)	8% (18)

TABLE 16: AVERAGE DURATION (IN MINUTES) OF THE ACTIVE PORTION OF USER'S TRIP

MODE	2016 DURATION (N)
Bike	57 min (68)
Walk	52 min (125)
Jog/Run	48 min (45)
All Modes	53 min (238)

TABLE 17: AVERAGE DURATION (IN MINUTES) OF THE ACTIVE PORTION OF USER'S TRIP BY GENDER AND TRAVEL MODE ON TRAIL

GENDER	MODE	2016 DURATION (N)
Male	Bike	59 min (46)
	Walk	56 min (60)
	Jog/Run	44 min (22)
	All Modes	55 min (128)
Female	Bike	39 min (20)
	Walk	48 min (64)
	Jog/Run	53 min (23)
	All Modes	47 min (107)

Table 18 presents information on the **duration of the active portion of a user's trip in relation to annual household income** to assess the activity of users of differing socio-economic status. Duration of the active portion of the trip may include active travel to/from the trail.

- Individuals with household incomes of less than $25,000 reported using the trail for an average of 47 minutes.

Table 19 presents information on the **percentage of exercise met by using the trail over the past 14 days by travel mode on the trail.**

- Respondents used the trail to meet 42% of their total exercise on average over the past 14 days.
- A slightly larger percentage of exercise was met by using the trail for joggers/runners compared to walkers and bicyclists.

Table 20 presents information on the **percentage of exercise met by using the trail over the past 14 days by gender and travel mode on the trail.**

- Overall, the average percentage of exercise met by using the trail over the past 14 days was similar for male and female trail users. The difference was the greatest for female joggers/runners compared to male joggers/runners.

TABLE 18: AVERAGE DURATION (IN MINUTES) OF THE ACTIVE PORTION OF USER'S TRIP BY ANNUAL HOUSEHOLD INCOME

HOUSEHOLD INCOME	2016 DURATION (N)
<$25,000	47 min (22)
$25,000-$34,999	61 min (26)
$35,000-$49,999	46 min (30)
$50,000-$74,999	48 min (37)
$75,000-$99,999	50 min (37)
$100,000-$149,999	61 min (29)
$150,000-$199,999	58 min (13)
>$200,000	60 min (12)

TABLE 19: AVERAGE PERCENTAGE OF EXERCISE MET BY USING THE TRAIL OVER THE PAST 14 DAYS BY TRAVEL MODE ON TRAIL

MODE	2016 PERCENT EXERCISE (N)
Bike	38% (67)
Walk	41% (120)
Jog/Run	51% (45)
All Modes	42% (232)

TABLE 20: AVERAGE PERCENTAGE OF EXERCISE MET BY USING THE TRAIL OVER THE PAST 14 DAYS BY TRAVEL MODE ON TRAIL

GENDER	MODE	2016 PERCENT EXERCISE (N)
Male	Bike	36% (46)
	Walk	43% (59)
	Jog/Run	55% (22)
	All Modes	43% (127)
Female	Bike	41% (19)
	Walk	39% (60)
	Jog/Run	47% (23)
	All Modes	41% (102)

TRAVEL ACTIVITY MAPS

The following maps provide a visualization of travel activity on the Brevard Greenway generated using the user reported trail origin, turnaround, and destination points taken from the surveys. Figure 3 shows where roundtrips for all modes (left) and one-way, throughtrips for all modes (right) occurred on the trail during the survey period. Roundtrips and throughtrips occurred on the entire length of the trail. Figure 4 shows where trips occurred on the trail during the survey period by primary trip purpose. The majority of trips were for exercise/recreation and these trips occurred on the entire length of the trail. Commuting trips occurred south of the US 276/Lowe's Shopping Center intersection. Errands trips were reported at consistent levels along almost the entire trail. Figures 5-7 show travel activity on the trail by mode on the trail, and include the average trip duration and average miles traveled for each mode.

FIGURE 3: ROUNDTRIP (LEFT) AND THROUGHTRIP (RIGHT) TRAVEL ACTIVITY FOR ALL MODES – *91% OF REPORTED TRIPS WERE ROUNDTRIPS AND 9% OF REPORTED TRIPS WERE THROUGHTRIPS*

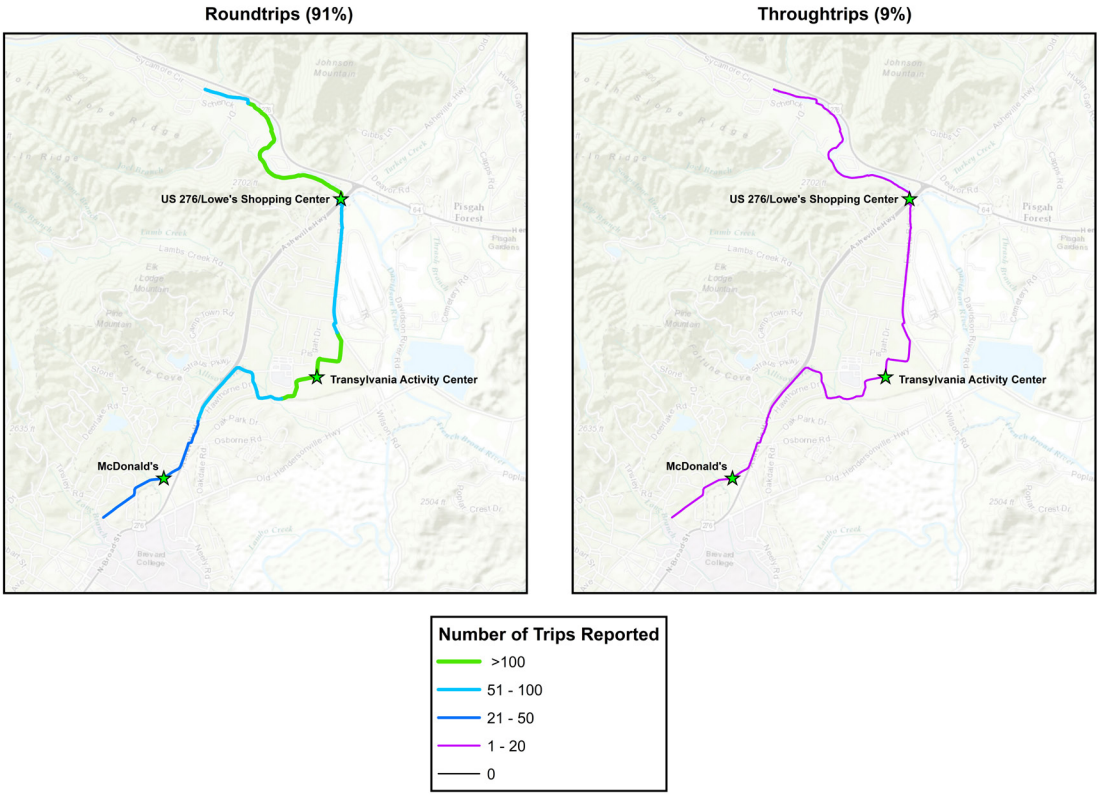


FIGURE 4: COMMUTE (TOP LEFT), ERRANDS (TOP RIGHT), AND EXERCISE/RECREATION (BOTTOM LEFT) TRAVEL ACTIVITY FOR ALL MODES – *2% OF REPORTED TRIPS WERE COMMUTE TRIPS, 3% OF REPORTED TRIPS WERE ERRANDS TRIPS, AND 92% OF REPORTED TRIPS WERE FOR EXERCISE/RECREATION*

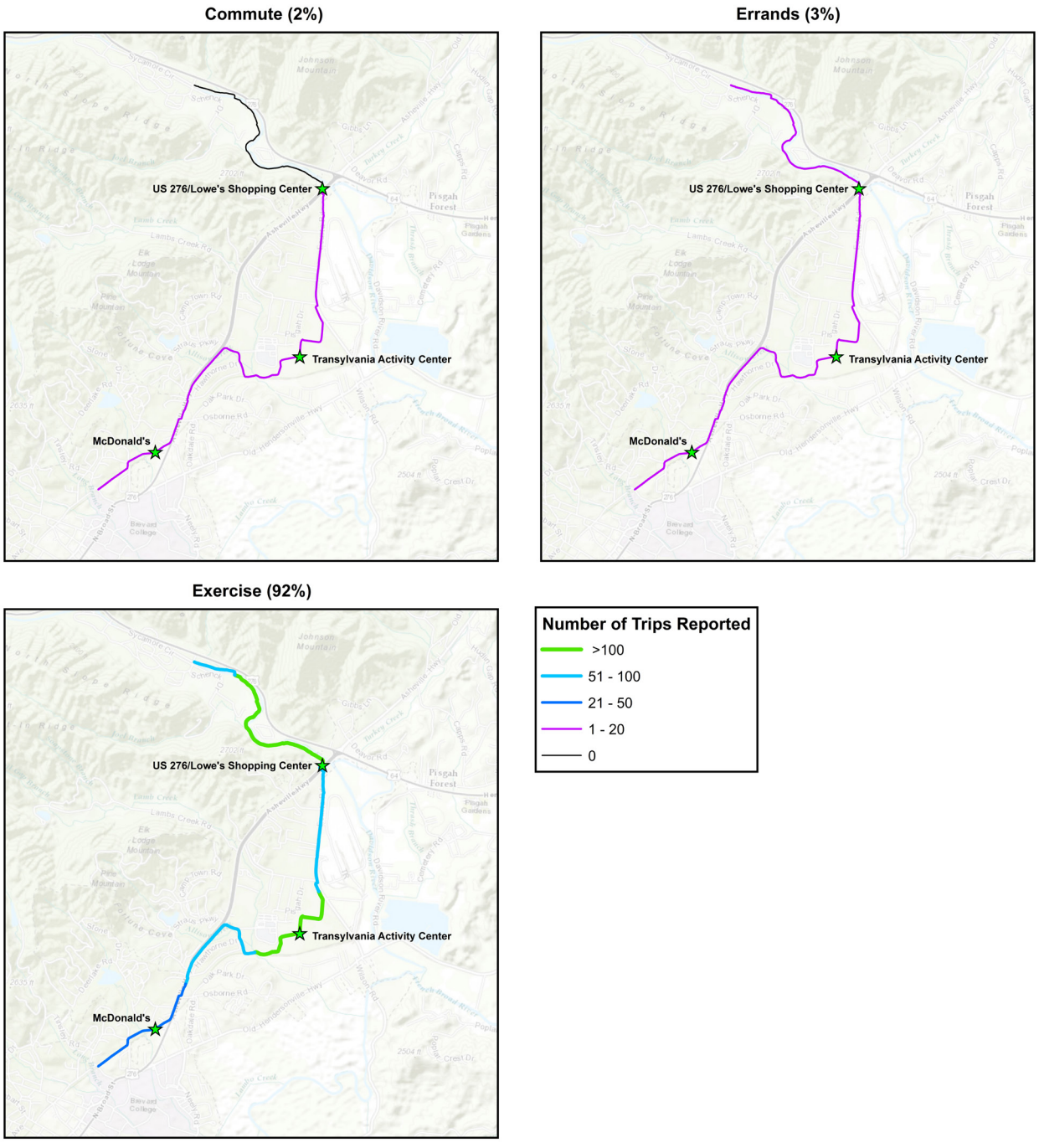
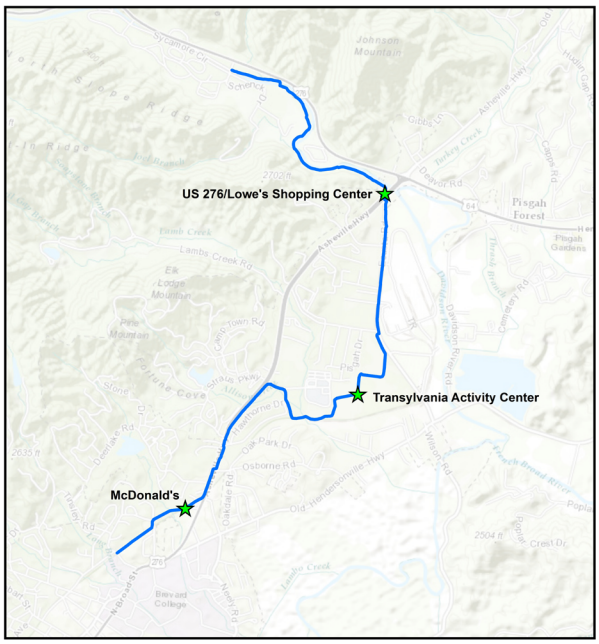
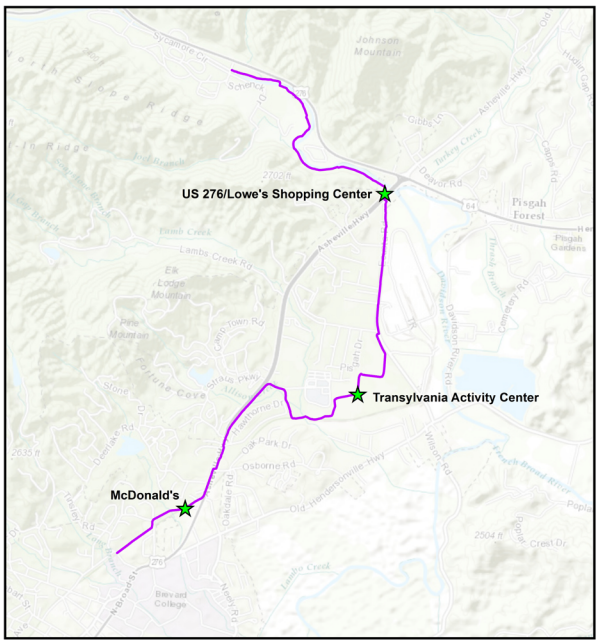


FIGURE 5: ROUNDTRIPS (LEFT) AND THROUGHTRIPS (RIGHT) FOR BICYCLISTS – *79% OF REPORTED BICYCLING TRIPS WERE ROUNDTRIPS AND 21% OF REPORTED BICYCLING TRIPS WERE THROUGHTRIPS; THE AVERAGE TRIP DURATION FOR BICYCLISTS WAS 57 MIN (59 MIN FOR MALES AND 39 MIN FOR FEMALES); THE AVERAGE DISTANCE TRAVELED BY BICYCLISTS WAS 5.3 MI*

Bike Roundtrips (79%)



Bike Throughtrips (21%)

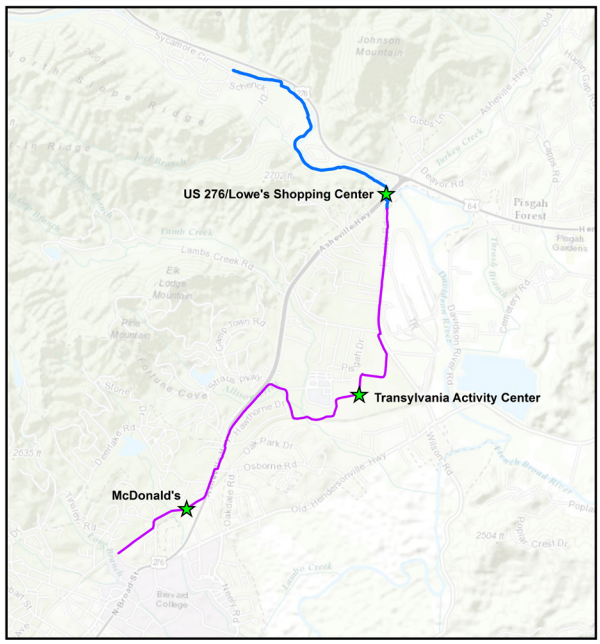


Number of Trips Reported
- >100
- 51 - 100
- 21 - 50
- 1 - 20
- 0

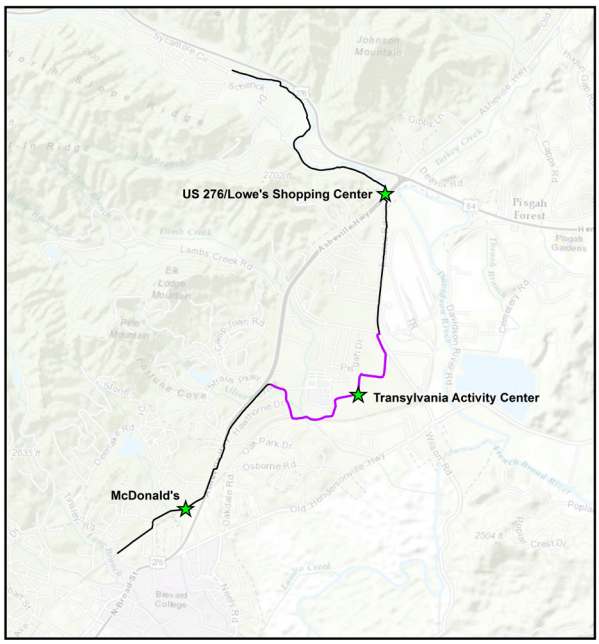
Average Trip Duration:
57 min
(Males: 59 min; Females: 39 min)
Average Distance Traveled:
5.3 mi

FIGURE 6: ROUNDTRIPS (LEFT) AND THROUGHTRIPS (RIGHT) FOR RUNNERS – *98% OF REPORTED RUNNING TRIPS WERE ROUNDTRIPS AND 2% OF REPORTED RUNNING TRIPS WERE THROUGHTRIPS; THE AVERAGE TRIP DURATION FOR RUNNERS WAS 48 MIN (44 MIN FOR MALES AND 53 MIN FOR FEMALES); THE AVERAGE DISTANCE TRAVELED BY RUNNERS WAS 3.7 MI*

Run Roundtrips (98%)



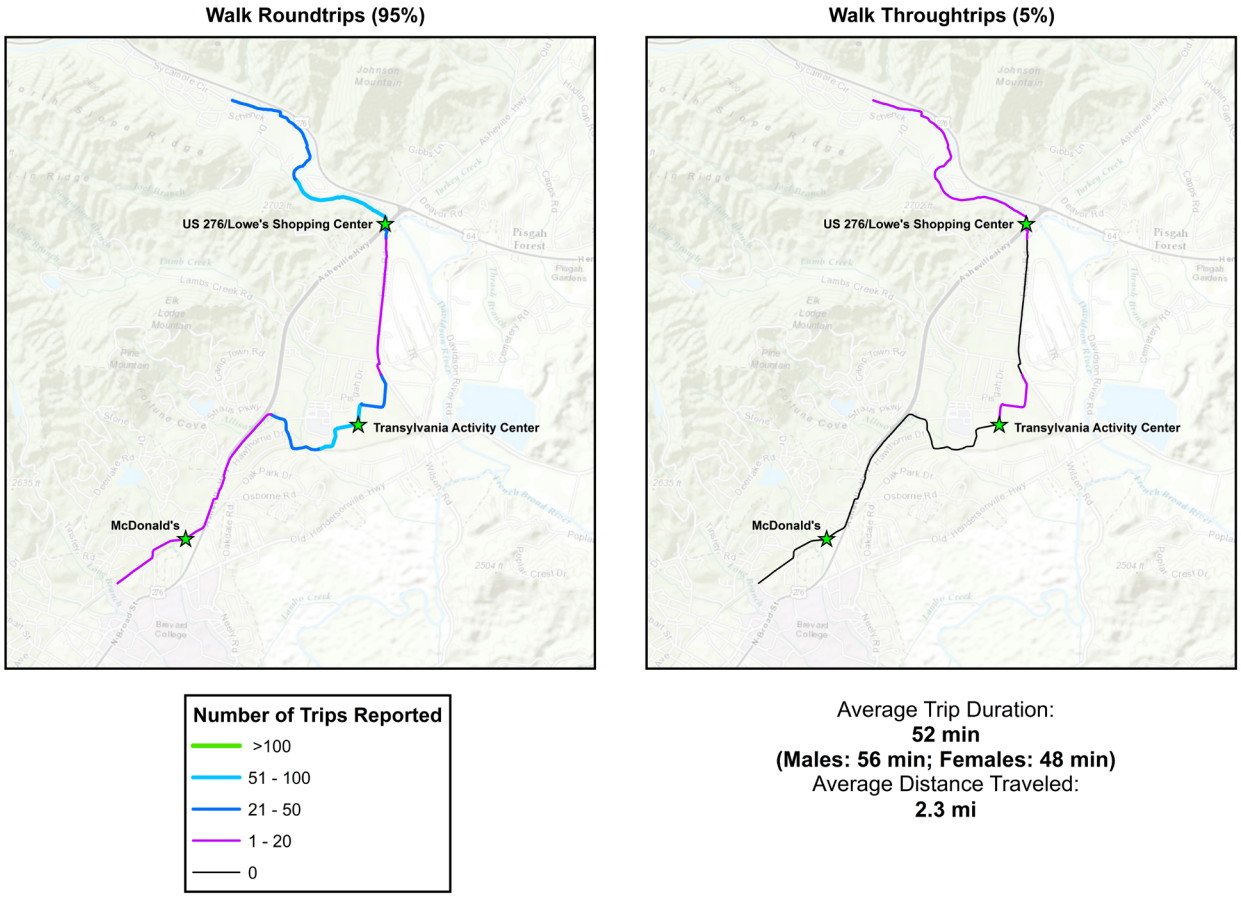
Run Throughtrips (2%)



Number of Trips Reported
- >100
- 51 - 100
- 21 - 50
- 1 - 20
- 0

Average Trip Duration:
48 min
(Males: 44 min; Females: 53 min)
Average Distance Traveled:
3.7 mi

FIGURE 7: ROUNDTRIPS (LEFT) AND THROUGHTRIPS (RIGHT) FOR WALKERS – *95% OF REPORTED WALKING TRIPS WERE ROUNDTRIPS AND 5% OF REPORTED WALKING TRIPS WERE THROUGHTRIPS; THE AVERAGE TRIP DURATION FOR WALKERS WAS 52 MIN (56 MIN FOR MALES AND 48 MIN FOR FEMALES); THE AVERAGE DISTANCE TRAVELED BY WALKERS WAS 2.3 MI*



BREVARD GREENWAY 2017

Results have been compiled for overall use of the trail based on the aggregated data collected at the ten survey/count stations. Findings include users' demographics, their usage of the trail, and transportation, economic, and health aspects of trail use. The preliminary findings provided have not been tested for statistical significance. These results will be further evaluated for significance and for comparative analysis once all years of data collection are complete.

Table 1 summarizes the data collection effort indicating the data collection period, survey/count location on the trail, the raw number of users counted, and the raw number of users intercepted to fill out a survey while using the trail. A total of 950 counts were collected during the survey period, and 230 surveys were completed.

TRAIL USER DEMOGRAPHICS

Table 2 shows the **percentages of surveyed trail users and counts by gender and age group** for Brevard Greenway users and counts overall:

- In general, about half of trail users were males and half were females.
- Over half of those surveyed were between 26-55

TABLE 1: DATA COLLECTION SCHEDULE AND SUMMARY STATISTICS

DAY OF WEEK	DATE	TIME PERIOD	STATION	LOCATION	2017 COUNTS	2017 SURVEYS
Sunday	8/13/2017	7AM to 7PM	1	US 64 Intersection	178	46
			2	Transylvania Activity Center	255	58
			3	McDonald's	106	27
Monday	8/14/2017	7AM to 7PM	1	US 64 Intersection	130	35
			2	Transylvania Activity Center	211	46
			3	McDonald's	70	18
				TOTALS	**950**	**230**

TABLE 2: SURVEYED TRAIL USER AND COUNT DEMOGRAPHICS – GENDER AND AGE

DEMOGRAPHIC	2017 SURVEYED USERS (N)	2017 COUNTS (N)
Male	52% (120)	54% (495)
Female	48% (109)	46% (427)
Age 18-25	3% (8)	4% (29)
Age 26-55	52% (120)	55% (428)
Age >55	44% (101)	41% (319)

Table 3 provides **additional demographic information for the surveyed trail users**, including education level, annual household income, and race.

- The majority of surveyed trail users completed college or earned an advanced degree (77%).
- Nearly all surveyed trail users were white (99%) and earned annual household incomes less than $75,000 (53%).

Survey user type data were compared to manual count user type data to determine if the survey responses could be considered representative of the population of trail users during the data collection period. Count data were adjusted based on the survey responses indicating the percentage of trips that were round trips and the number of survey/count stations passed according to user reported trail origin, turn-around, and destination points to avoid overestimating or 'double/multi-counting' unique users of the trail. A summary of the methods used to adjust the counts to unique users can be found in Chapter 5 of the Final Report.

TABLE 3: SURVEYED TRAIL USER DEMOGRAPHICS – EDUCATION, ANNUAL HOUSEHOLD INCOME, AND RACE

DEMOGRAPHIC	2017 SURVEYED USERS (N)
Some High School	<1% (1)
Completed High School	7% (15)
Some College	12% (27)
Completed Business/Technical School	4% (8)
Completed College	39% (85)
Advanced Degree	38% (83)
Less than $25,000	11% (22)
$25,000-$34,999	10% (20)
$35,000-$49,999	14% (27)
$50,000-$74,999	19% (37)
$75,000-$99,999	15% (29)
$100,000-$149,999	22% (44)
$150,000-$199,999	4% (8)
$200,000 or more	7% (13)
White	99% (217)
Black	1% (3)
Asian	0% (0)
Native Hawaiian or Pacific Islander	0% (0)
American Indian	0% (0)

Table 4 provides the **percentages of surveyed users, counts, and unique users by travel mode on the trail during the survey period.** Comparing data across the columns shows the degree to which those surveyed represent a proportionate sample of all those using the trail. Note that while children less than 18 years of age were counted, they were not surveyed.

- In general, surveyed user proportions are similar to unique user proportions by mode.

TABLE 4: ALL TRAIL USERS DURING SURVEY PERIODS – TRAVEL MODE ON TRAIL

MODE	DAY	2017 SURVEYED USERS (N)	2017 COUNTS (N)	2017 UNIQUE USERS (N)
Bike	Sun	39% (51)	48% (255)	44% (105)
	Mon	24% (24)	29% (115)	24% (45)
Walk	Sun	44% (57)	35% (186)	38% (91)
	Mon	49% (49)	54% (217)	59% (113)
Jog/Run	Sun	18% (23)	16% (86)	17% (41)
	Mon	26% (26)	17% (68)	17% (33)
All Other Modes	Sun	0% (0)	0% (0)	0% (0)
	Mon	0% (0)	0% (0)	0% (0)

Table 5 provides data separated by travel mode on the trail, gender, and age group for trail users intercepted during the survey period.

TRAIL USER PROFILES

Information was compiled to investigate the travel modes used both to travel to the trail as well as while traveling on the trail, where trail users live in relation to the trail, whether they used the trail for recreational/non-recreational purposes, the frequency of trail use, and the distance users traveled on the trail.

TABLE 5: COMPARATIVE PERCENTAGES/NUMBERS OF COUNTS AND THOSE SURVEYED, BY TRAVEL MODE ON TRAIL, GENDER, AND AGE

MODE, GENDER, AGE	2017 PERCENTAGE OF SURVEYED USERS (N)	2017 PERCENTAGE OF COUNTS (N)
Bicycle, M, 18-25	2% (5)	1% (8)
Bicycle, M, 26-55	9% (20)	13% (99)
Bicycle, M, >55	11% (24)	13% (97)
All Bicycle, Male	**21% (49)**	**27% (204)**
Bicycle, F, 18-25	0% (1)	<1% (3)
Bicycle, F, 26-55	5% (12)	7% (54)
Bicycle, F, >55	5% (12)	4% (30)
All Bicycle, Female	**11% (25)**	**12% (87)**
Walker, M, 18-25	0% (0)	1% (7)
Walker, M, 26-55	10% (23)	8% (62)
Walker, M, >55	10% (22)	9% (68)
All Walker, Male	**20% (45)**	**18% (137)**
Walker, F, 18-25	1% (2)	1% (5)
Walker, F, 26-55	13% (29)	14% (108)
Walker, F, >55	13% (29)	11% (80)
All Walker, Female	**27% (61)**	**26% (193)**
Jogger/Runner, M, 18-25	0% (0)	0% (1)
Jogger/Runner, M, 26-55	8% (18)	7% (49)
Jogger/Runner, M, >55	4% (8)	3% (23)
Jogger/Runner, Male	**11% (26)**	**10% (73)**
Jogger/Runner, F, 18-25	0% (0)	<1% (3)
Jogger/Runner, F, 26-55	8% (18)	5% (35)
Jogger/Runner, F, >55	2% (5)	2% (14)
Jogger/Runner, Female	**10% (23)**	**7% (52)**

Table 6 shows information on "Local" versus "Non-Local" point of trip origin by travel mode on the trail. "Local" is defined as zip code areas through which the Brevard Greenway passes (28768, 28712). "Non-Local" is defined as all other zip code areas.

- In general, more Local people used the trail, with the highest percentage being those who walk on the trail (70%).
- The highest proportion of Non-Local trail users was runners (41%).

Trail users were asked about their **frequency of use** of the trail. The figures shown in Table 7 are averages of the total trips taken in the past 14 days as reported by survey respondents. As shown in the table, most of those surveyed used the trail several times during the previous two week period.

- On average, use of the trail during the previous two weeks was similar across all modes, with an average of five trips in the past 14 days for all modes.

Table 8 provides information on the **distance traveled** on the Brevard Greenway by travel mode on the trail and Table 9 provides information on the **distance traveled** on the Brevard Greenway by gender and travel mode on the trail. The figures reported in the table are average trip distances in miles. Cases in which inadequate data was provided to compute trip distance were not included.

- Bicyclists traveled greater distances than those traveling by other modes. Distance traveled varied directly with the relative speed of each mode.
- Male bicyclists traveled the greatest distances on the trail.

TABLE 6: TRIP POINT OF ORIGIN BY TRAVEL MODE ON TRAIL

MODE	2017 LOCAL (N)	2017 NON-LOCAL (N)
Bike	68% (51)	32% (24)
Walk	70% (74)	30% (32)
Jog/Run	59% (29)	41% (20)
All Modes	67% (154)	33% (76)

TABLE 7: AVERAGE NUMBER OF TRIPS IN THE PAST 14 DAYS

MODE	AVERAGE NUMBER OF TRIPS	(N)
Bike	5	75
Walk	5	106
Jog/Run	5	49
All Modes	5	230

TABLE 8: AVERAGE TRIP DISTANCE (IN MILES) BY TRAVEL MODE ON TRAIL

MODE	2017 AVERAGE MILES TRAVELED (N)
Bike	4.8 mi (73)
Walk	2.2 mi (101)
Jog/Run	3.3 mi (45)
All Modes	3.3 mi (219)

TABLE 9: AVERAGE TRIP DISTANCE (IN MILES) BY GENDER AND TRAVEL MODE ON TRAIL

GENDER	MODE	2017 AVERAGE MILES TRAVELED (N)
Male	Bike	5.1 (49)
	Walk	2.2 (43)
	Jog/Run	3.2 (24)
	All Modes	3.6 (116)
Female	Bike	3.9 (23)
	Walk	2.2 (58)
	Jog/Run	3.4 (21)
	All Modes	2.8 (102)

TRANSPORTATION IMPACTS

Analysis of transportation-related factors included:

- Mode used to travel on the trail
- Primary trip purpose
- Frequency of round trips versus one-way trips
- Mode used to travel to the trail
- Trail access points

Analysis of survey responses found differences in **proportions of users by travel mode on the trail,** as shown in Figure 1.

- The majority of trail users traveled on the trail by foot (67%).

Given the relatively high use of the trail for exercise/recreational purposes (90% of trips, see Table 10), it is not surprising that most travel involved a roundtrip, not a one-way trip on the trail, as illustrated in Table 11.

- Across all modes, the majority of trips were roundtrips.

FIGURE 1: TYPE OF USER BY TRAVEL MODE ON TRAIL

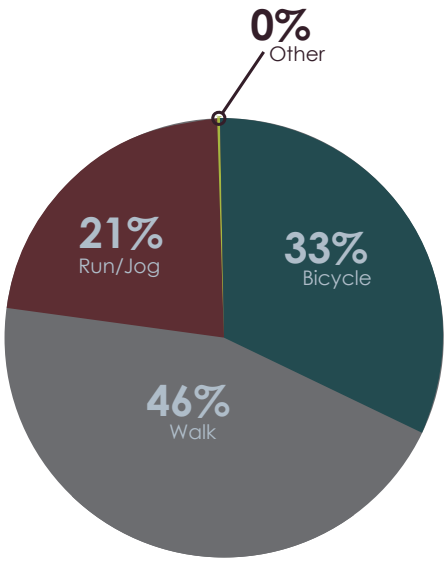


TABLE 10: PRIMARY TRIP PURPOSE

PRIMARY TRIP PURPOSE	2017 PERCENTAGE OF SURVEYED USERS (N)
For exercise/ recreation/ sightseeing	90% (208)
Travel to/from work or school	3% (6)
Travel to/from dining/shopping/ running errands	4% (9)
Travel to/from cultural attraction/ entertainment/ leisure activity	3% (7)

TABLE 11: TRIP TYPE

MODE	2017 ROUNDTRIP (N)	2017 THROUGHTRIP (N)
Bike	89% (67)	11% (8)
Walk	96% (102)	4% (4)
Jog/Run	94% (46)	6% (3)
All Modes	93% (215)	7% (15)

TABLE 12: MODE TO THE TRAIL BY MODE USED ON TRAIL

MODE ON TRAIL	MODE TO TRAIL		
	2017 by Bicycle (n)	2017 by Car (n)	2017 by Foot (n)
Bike	76% (57)	24% (18)	0% (0)
Walk	0% (0)	74% (78)	26% (27)
Jog/Run	0% (0)	83% (40)	17% (8)
All Modes	25% (57)	60% (136)	15% (35)

TABLE 13: TOP FIVE ACCESS POINTS ON THE BREVARD GREENWAY

ACCESS POINT DESCRIPTION	PERCENT SURVEYED (N)
Brevard Sports Complex Driveway	20% (42)
Lowe's Parking Lot Driveway North	18% (37)
Art Loeb Trailhead	11% (22)
Blue Ridge Community College	6% (12)
Trail Spur to Oskar Blues Brewery	5% (10)

The survey also revealed the **mode by which trail users traveled to the trail.** Table 12 provides information on the access modes used to travel to the trail by all survey respondents, sorted by mode of travel on the trail. The percentages shown are calculated by row to reflect the shares of travel to the trail according to the mode used on the trail.

- Nearly two-thirds of those using the trail traveled to the trail by car while the other third used a mode of active transportation. 77% of respondents traveling by foot on the trail accessed the trail by car compared to 24% of respondents traveling by bicycle.
- 40% of respondents used an active mode of transportation to access the trail.
- Bicyclists were more likely to bicycle to the trail than drive to the trail.

The survey also provided information on **where trail users were accessing the trail**. Table 13 includes the top five access points on the trail according to where survey respondents accessed the trail.

- A fifth of respondents accessed the trail from the Brevard Sports Complex driveway. Almost a fifth of respondents accessed the trail from the Lowe's parking lot driveway.

ECONOMIC IMPACTS

The users of the trail can have an impact on businesses through expenditures on a variety of goods and services. The survey asked trail users to list expenditures on goods or services directly related to their trip on the trail on the day of the survey. If a trail user was traveling with members of their household, estimates represent the total for their household.

The results are shown in the following table. Table 14 shows **trail users' expenditures related to their trip on the Brevard Greenway** categorized by the type of expenditure and separated by user group.

- Food-related expenditures were the most common among surveyed trail users. The largest percentage of respondents made purchases at a restaurant. 20% of respondents made a restaurant-related purchase with an average cost of $19, and 10% of respondents made a grocery-related purchase with an average cost of $32.
- Retail and entertainment purchases were less common. Only 4% of respondents made a retail-related purchase with an average cost of $43.

TABLE 14: TYPE OF AND AVERAGE EXPENDITURE BY USER GROUP

BREVARD USER GROUP	Respondents	Restaurant		Respondents	Grocery		Respondents	Retail		Respondents	Entertainment		Respondents	Bike Rental	
		% of Respondents	Average Expenses		% of Respondents	Average Expenses		% of Respondents	Average Expenses		% of Respondents	Average Expenses		% of Respondents	Average Expenses
Bicycle	75	28%	$17	75	9%	$20	75	3%	$20	75	1%	$3	75	0%	$-
Jog/Run	49	14%	$29	48	10%	$33	49	4%	$15	49	0%	$-	49	0%	$-
Walk	106	16%	$17	106	11%	$40	106	6%	$61	106	0%	$-	106	0%	$-
Total	230	20%	$19	229	10%	$32	230	4%	$43	230	0%	$3	230	0%	$-

PUBLIC HEALTH IMPACTS

Increasing physical activity among children and adults is a national health objective in the United States. Access to facilities, such as trails, is one of the factors positively associated with physical activity. Information compiled that relates to public health impacts from user of the Brevard Greenway included:

- The percentage of trail users who indicated exercise as their primary trip purpose
- The mode of activity users engaged in while on the trail
- The average duration of each activity by user type

Table 15 indicates users' **primary trip purpose**. Non-recreational trip purposes included work, school, shopping, restaurant, and entertainment trips. It is important to note that users on the trail whose purpose was not primarily exercise/recreation were still engaging in physical activity while on the trail.

- Overall, 90% of all users on the Brevard Greenway indicate their primary trip purpose as exercise/recreation.

Table 16 indicates the **duration of the active portion of a trail user's trip** (in minutes) by mode traveled on the trail. The total active portion of a trail user's trip was self-reported on the survey and may include time spent actively traveling to or from the trail. This table includes respondents who did not indicate gender so overall totals vary slightly from those reported in Table 17.

- The average duration of the active portion of the trip for all users surveyed on the trail was 55 minutes.
- Bicyclists reported the highest average duration of the active portion of the trip (71 minutes) compared to walkers (48 minutes) and joggers/runners (47 minutes).

TABLE 15: RECREATIONAL VERSUS NON-RECREATIONAL TRIP PURPOSES

PRIMARY TRIP PURPOSE	2017 PERCENTAGE OF SURVEYED USERS (N)
For exercise/recreation/ sightseeing	90% (208)
Non-recreational (all other trip purposes)	10% (22)

TABLE 16: AVERAGE DURATION (IN MINUTES) OF THE ACTIVE PORTION OF USER'S TRIP

MODE	2017 DURATION (N)
Bike	71 min (74)
Walk	48 min (105)
Jog/Run	47 min (49)
All Modes	55 min (228)

TABLE 17: AVERAGE DURATION (IN MINUTES) OF THE ACTIVE PORTION OF USER'S TRIP BY GENDER AND TRAVEL MODE ON TRAIL

GENDER	MODE	2017 DURATION (N)
Male	Bike	77 min (49)
	Walk	48 min (45)
	Jog/Run	45 min (26)
	All Modes	59 min (120)
Female	Bike	57 min (23)
	Walk	48 min (58)
	Jog/Run	50 min (23)
	All Modes	50 min (107)

Table 17 breaks out the **duration of the active portion of a user's trip by gender and travel mode on the trail**. Respondents that did not indicate gender are excluded from the data in the table.

- Male bicyclists reported spending an average of more than 19 minutes more traveling on the Brevard Greenway than female bicyclists.
- Male walkers and female walkers reported spending the same average time walking on the trail, while female joggers/runners reported spending an average of 5 minutes more traveling on the trail than male joggers/runners.

Table 18 presents information on the **duration of the active portion of a user's trip in relation to annual household income** to assess the activity of users of differing socio-economic status. Duration of the active portion of the trip may include active travel to/from the trail.

- Individuals with household incomes of less than $25,000 reported using the trail for an average of 44 minutes.

Table 19 presents information on the **percentage of exercise met by using the trail over the past 14 days by travel mode on the trail.**

- Respondents used the trail to meet 43% of their total exercise on average over the past 14 days.
- A slightly larger percentage of exercise was met by using the trail for joggers/runners compared to walkers and bicyclists.

Table 20 presents information on the **percentage of exercise met by using the trail over the past 14 days by gender and travel mode on the trail.**

- Overall, the average percentage of exercise met by using the trail over the past 14 days was similar for male and female trail users. The difference was the greatest for male bicyclists compared to female bicyclists.

TABLE 18: AVERAGE DURATION (IN MINUTES) OF THE ACTIVE PORTION OF USER'S TRIP BY ANNUAL HOUSEHOLD INCOME

HOUSEHOLD INCOME	2017 DURATION (N)
<$25,000	44 min (22)
$25,000-$34,999	62 min (20)
$35,000-$49,999	54 min (27)
$50,000-$74,999	49 min (37)
$75,000-$99,999	50 min (28)
$100,000-$149,999	52 min (44)
$150,000-$199,999	51 min (8)
>$200,000	57 min (13)

TABLE 19: AVERAGE PERCENTAGE OF EXERCISE MET BY USING THE TRAIL OVER THE PAST 14 DAYS BY TRAVEL MODE ON TRAIL

MODE	2017 PERCENT EXERCISE (N)
Bike	39% (73)
Walk	41% (106)
Jog/Run	56% (49)
All Modes	43% (228)

TABLE 20: AVERAGE PERCENTAGE OF EXERCISE MET BY USING THE TRAIL OVER THE PAST 14 DAYS BY TRAVEL MODE ON TRAIL

GENDER	MODE	2017 PERCENT EXERCISE (N)
Male	Bike	41% (47)
	Walk	38% (45)
	Jog/Run	57% (26)
	All Modes	43% (118)
Female	Bike	34% (25)
	Walk	43% (61)
	Jog/Run	54% (23)
	All Modes	43% (109)

TRAVEL ACTIVITY MAPS

The following maps provide a visualization of travel activity on the Brevard Greenway generated using the user reported trail origin, turnaround, and destination points taken from the surveys. Figure 3 shows where roundtrips for all modes (left) and one-way, throughtrips for all modes (right) occurred on the trail during the survey period. Roundtrips and throughtrips occurred on the entire length of the trail. Figure 4 shows where trips occurred on the trail during the survey period by primary trip purpose. The majority of trips were for exercise/recreation and these trips occurred on the entire length of the trail. Commuting trips occurred south of the US 276/ Lowe's Shopping Center intersection. Errands trips were reported at consistent levels along almost the entire trail. Figures 5-7 show travel activity on the trail by mode on the trail, and include the average trip duration and average miles traveled for each mode.

FIGURE 3: ROUNDTRIP (LEFT) AND THROUGHTRIP (RIGHT) TRAVEL ACTIVITY FOR ALL MODES – *93% OF REPORTED TRIPS WERE ROUNDTRIPS AND 7% OF REPORTED TRIPS WERE THROUGHTRIPS*

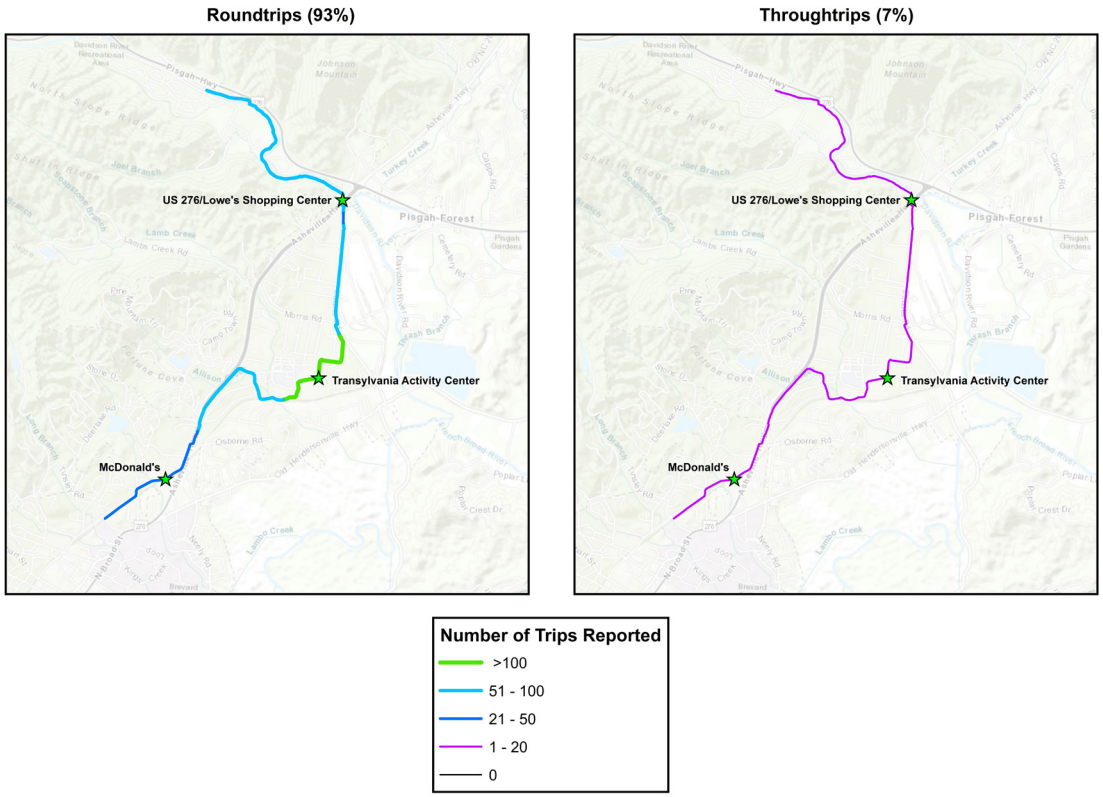


FIGURE 4: COMMUTE (TOP LEFT), ERRANDS (TOP RIGHT), AND EXERCISE/RECREATION (BOTTOM LEFT) TRAVEL ACTIVITY FOR ALL MODES – *3% OF REPORTED TRIPS WERE COMMUTE TRIPS, 4% OF REPORTED TRIPS WERE ERRANDS TRIPS, AND 90% OF REPORTED TRIPS WERE FOR EXERCISE/RECREATION*

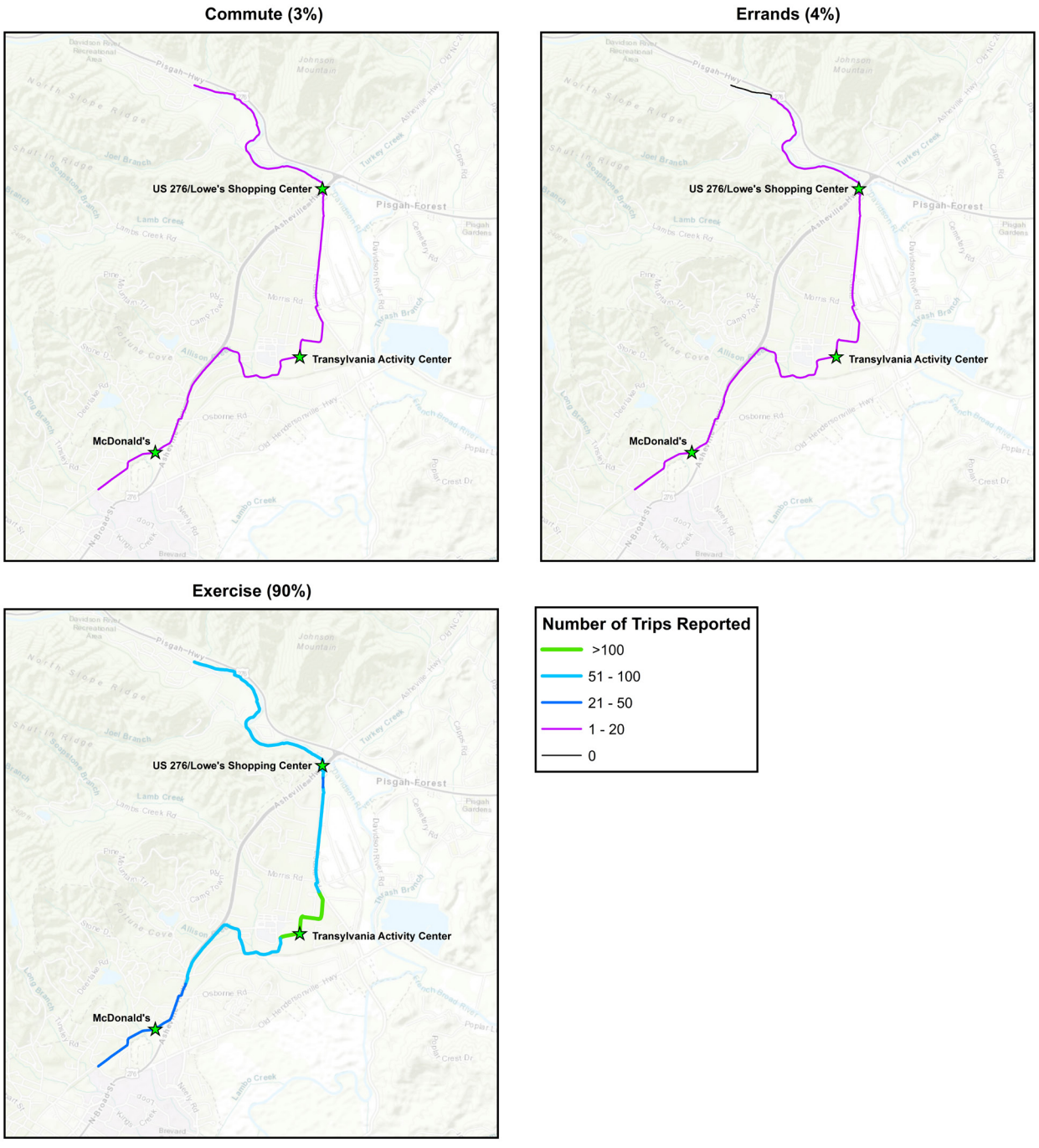


FIGURE 5: ROUNDTRIPS (LEFT) AND THROUGHTRIPS (RIGHT) FOR BICYCLISTS – *89% OF REPORTED BICYCLING TRIPS WERE ROUNDTRIPS AND 11% OF REPORTED BICYCLING TRIPS WERE THROUGHTRIPS; THE AVERAGE TRIP DURATION FOR BICYCLISTS WAS 71 MIN (77 MIN FOR MALES AND 57 MIN FOR FEMALES); THE AVERAGE DISTANCE TRAVELED BY BICYCLISTS WAS 4.8 MI*

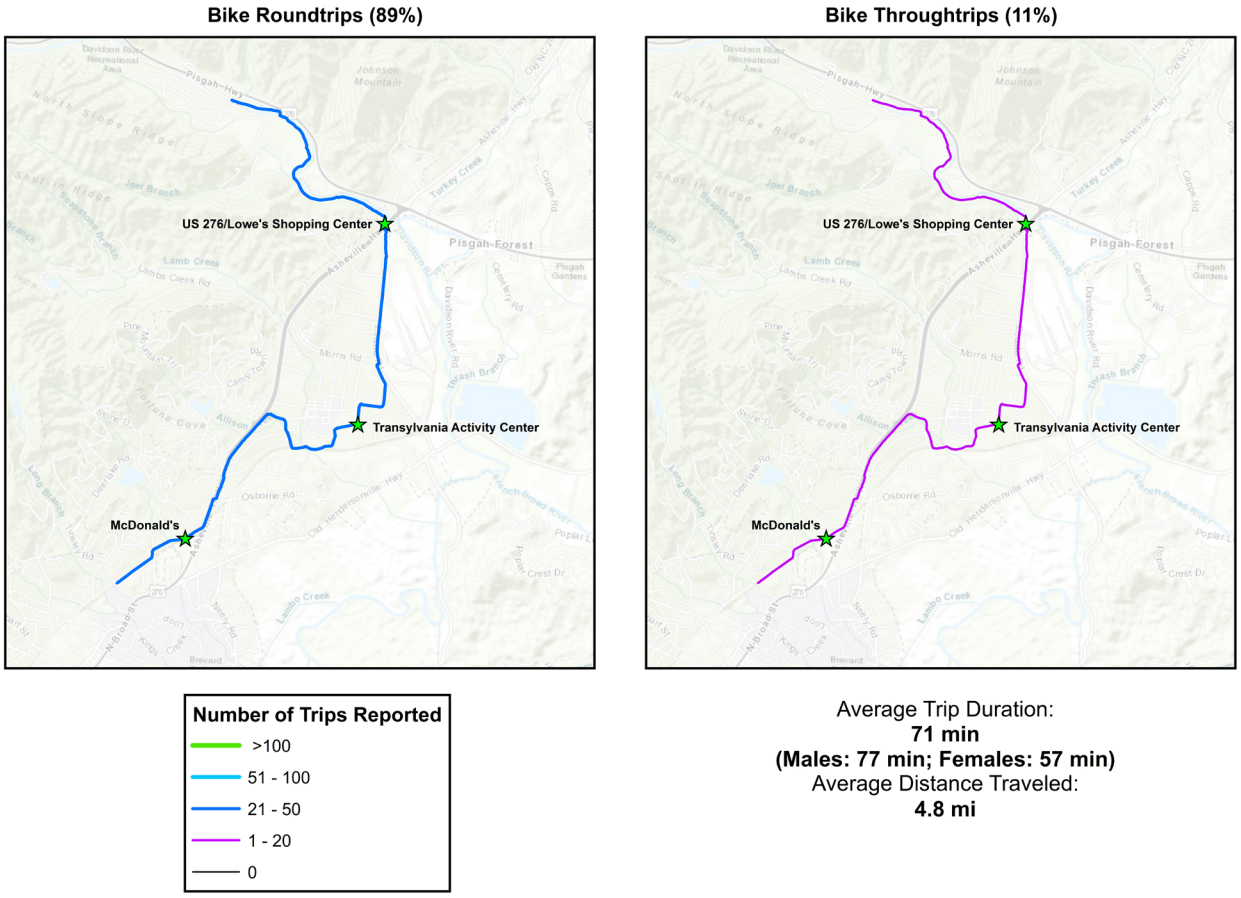
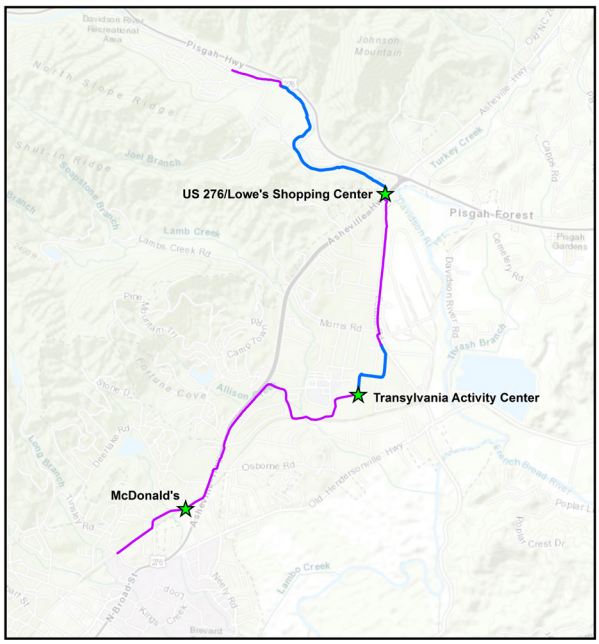
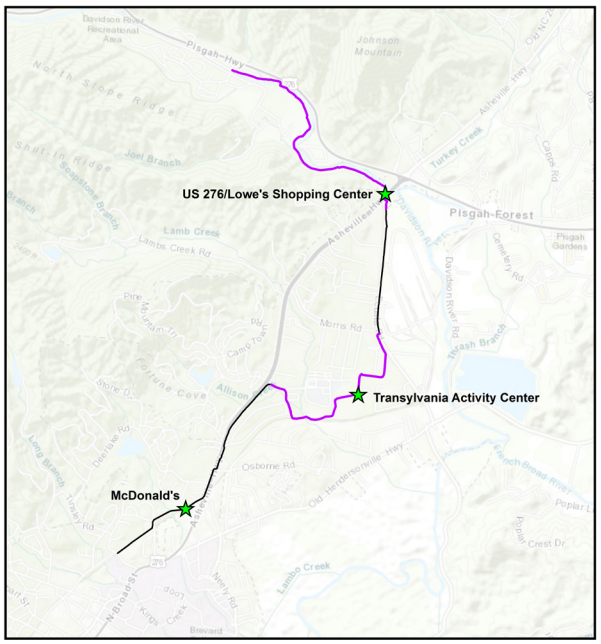


FIGURE 6: ROUNDTRIPS (LEFT) AND THROUGHTRIPS (RIGHT) FOR RUNNERS – *94% OF REPORTED RUNNING TRIPS WERE ROUNDTRIPS AND 6% OF REPORTED RUNNING TRIPS WERE THROUGHTRIPS; THE AVERAGE TRIP DURATION FOR RUNNERS WAS 47 MIN (45 MIN FOR MALES AND 50 MIN FOR FEMALES); THE AVERAGE DISTANCE TRAVELED BY RUNNERS WAS 3.3MI*

Run Roundtrips (94%)



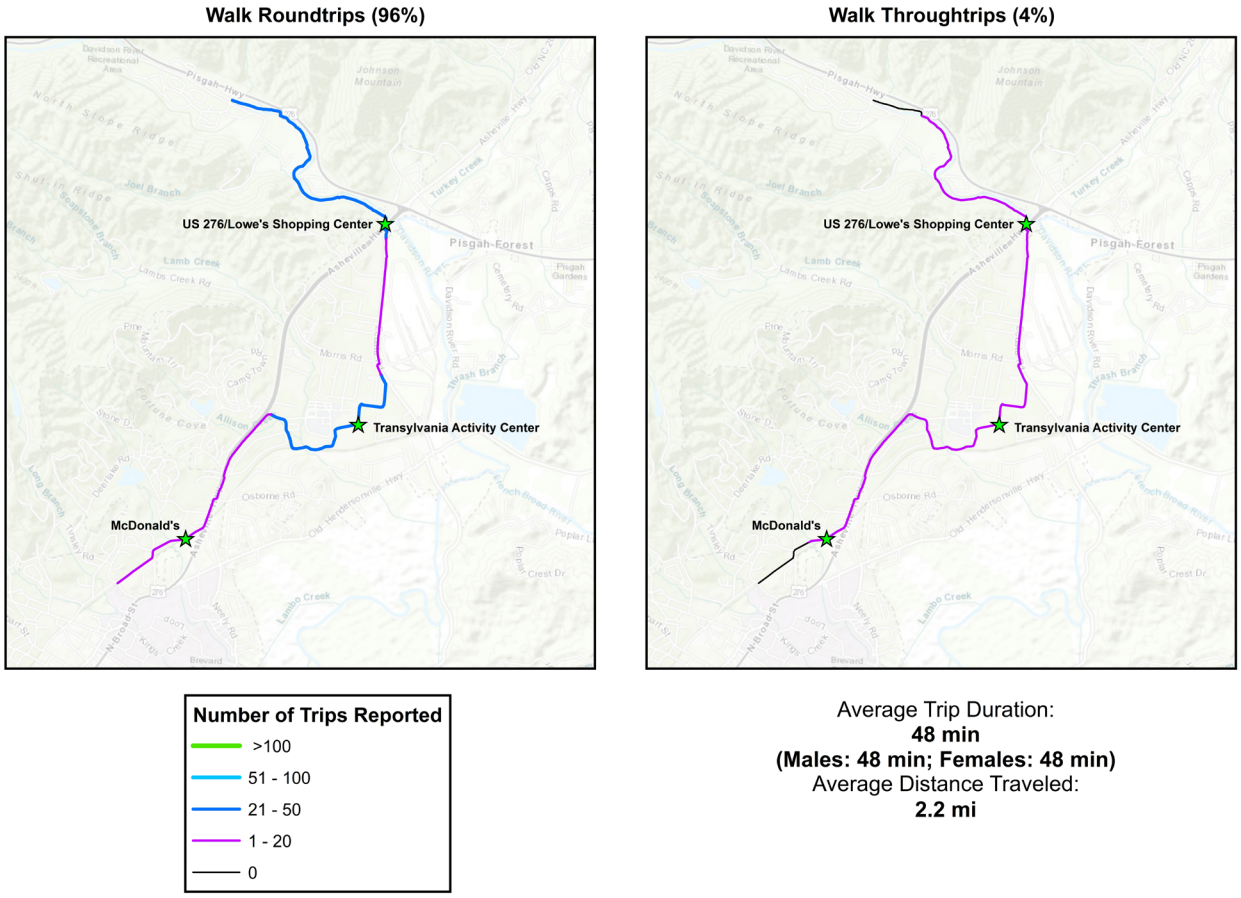
Run Throughtrips (6%)



Number of Trips Reported
- >100
- 51 - 100
- 21 - 50
- 1 - 20
- 0

Average Trip Duration:
47 min
(Males: 45 min; Females: 50 min)
Average Distance Traveled:
3.3 mi

FIGURE 7: ROUNDTRIPS (LEFT) AND THROUGHTRIPS (RIGHT) FOR WALKERS – *96% OF REPORTED WALKING TRIPS WERE ROUNDTRIPS AND 4% OF REPORTED WALKING TRIPS WERE THROUGHTRIPS; THE AVERAGE TRIP DURATION FOR WALKERS WAS 48 MIN (48 MIN FOR MALES AND 48 MIN FOR FEMALES); THE AVERAGE DISTANCE TRAVELED BY WALKERS WAS 2.2 MI*



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DUCK TRAIL 2016

Results have been compiled for overall use of the trail based on the aggregated data collected at the two survey/count stations. Findings include users' demographics, their usage of the trail, and transportation, economic, and health aspects of trail use. The preliminary findings provided have not been tested for statistical significance. These results will be further evaluated for significance and for comparative analysis once all years of data collection are complete.

Table 1 summarizes the data collection effort indicating the data collection period, survey/count location on the trail, the raw number of users counted, and the raw number of users intercepted to fill out a survey while using the trail. A total of 4,339 counts were collected during the survey period, and 524 surveys were completed.

TRAIL USER DEMOGRAPHICS

Table 2 shows the **percentages of surveyed trail users and counts by gender and age group** for Duck Trail users and counts overall:

- In general, a greater percentage of females than males used the trail.
- Nearly a third of those surveyed were over the age of 55.

TABLE 1: DATA COLLECTION SCHEDULE AND SUMMARY STATISTICS

DAY OF WEEK	DATE	TIME PERIOD	STATION	LOCATION	2016 COUNTS	2016 SURVEYS
Monday	6/20/2016	6:30AM to 7:30PM	1	Duck Trail North	727	109
			2	Duck Trail South	1,400	102
Tuesday	6/21/2016	6:30AM to 7:30PM	1	Duck Trail North	735	163
			2	Duck Trail South	1,477	150
				TOTALS	**4,339**	**524**

TABLE 2: SURVEYED TRAIL USER AND COUNT DEMOGRAPHICS – GENDER AND AGE

DEMOGRAPHIC	2016 SURVEYED USERS (N)	2016 COUNTS (N)
Male	45% (229)	48% (2,071)
Female	55% (281)	52% (2,227)
Age 18-25	5% (21)	13% (437)
Age 26-55	64% (295)	62% (2,144)
Age >55	31% (145)	25% (852)

Table 3 provides **additional demographic information for the surveyed trail users**, including education level, annual household income, and race.

- The majority of surveyed trail users (85%) completed college or obtained an advanced degree.
- The majority of surveyed trail users were white (95%) and earned annual household incomes greater than $74,999 (84%).

Survey user type data were compared to manual count user type data to determine if the survey responses could be considered representative of the population of trail users during the data collection period. Count data were adjusted based on the survey responses indicating the percentage of trips that were round trips and the number of survey/count stations passed according to user reported trail origin, turnaround, and destination points to avoid overestimating or 'double/multi-counting' unique users of the trail. A summary of the methods used to adjust the counts to unique users can be found in Chapter 5 of the Final Report.

TABLE 3: SURVEYED TRAIL USER DEMOGRAPHICS – EDUCATION, ANNUAL HOUSEHOLD INCOME, AND RACE

DEMOGRAPHIC	2016 SURVEYED USERS (N)
Some High School	0% (0)
Completed High School	6% (29)
Some College	8% (38)
Completed Business/Technical School	1% (7)
Completed College	38% (192)
Advanced Degree	47% (236)
Less than $25,000	1% (5)
$25,000-$34,999	2% (11)
$35,000-$49,999	2% (11)
$50,000-$74,999	10% (48)
$75,000-$99,999	16% (76)
$100,000-$149,999	23% (108)
$150,000-$199,999	19% (92)
$200,000 or more	26% (126)
White	95% (484)
Black	2% (11)
Asian	2% (12)
Native Hawaiian or Pacific Islander	<1% (2)
American Indian	<1% (1)

Table 4 provides the **percentages of Duck Trail surveyed users, counts, and unique users by travel mode on the trail during the survey period**. Comparing data across the columns shows the degree to which those surveyed represent a proportionate sample of all those using the trail. Note that while children less than 18 years of age were counted, they were not surveyed.

- Surveyed user proportions differ from unique user proportions for bicyclists and walkers. The greater unique user proportions on these modes is likely due to a high frequency of users traveling with members of the same household. Only one member per household is surveyed, but all members of the household are counted.
- The proportion of counted bicyclists is much greater than the proportion of surveyed and estimated unique bicyclists. This is likely due to the longer distances traveled by bicyclists on average, which allows an individual cyclist to be surveyed once per data collection day but counted multiple times along the trail.

TABLE 4: ALL TRAIL USERS DURING SURVEY PERIODS – TRAVEL MODE ON TRAIL

MODE	DAY	2016 SURVEYED USERS (N)	2016 COUNTS (N)	2016 UNIQUE USERS (N)
Bike	Mon	34% (91)	46% (985)	44% (447)
	Tues	35% (89)	46% (1,025)	45% (463)
Walk	Mon	38% (102)	35% (740)	37% (371)
	Tues	42% (105)	38% (838)	40% (406)
Jog/Run	Mon	27% (73)	18% (378)	18% (178)
	Tues	23% (58)	15% (323)	15% (151)
All Other Modes	Mon	2% (5)	1% (21)	1% (13)
	Tues	0% (0)	1% (26)	0% (0)

Table 5 provides data separated by travel mode on the trail, gender, and age group for trail users intercepted during the survey period.

TRAIL USER PROFILES

Information was compiled to investigate the travel modes used both to travel to the trail as well as while traveling on the trail, where trail users live in relation to the trail, whether they used the trail for recreational/non-recreational purposes, the frequency of trail use, and the distance users traveled on the trail.

TABLE 5: COMPARATIVE PERCENTAGES/NUMBERS OF COUNTS AND THOSE SURVEYED, BY TRAVEL MODE ON TRAIL, GENDER, AND AGE

MODE, GENDER, AGE	2016 PERCENTAGE OF SURVEYED USERS (N)	2016 PERCENTAGE OF COUNTS (N)
Bicycle, M, 18-25	1% (3)	3% (97)
Bicycle, M, 26-55	10% (43)	14% (484)
Bicycle, M, >55	7% (30)	6% (206)
All Bicycle, Male	**19% (97)**	**25% (1,081)**
Bicycle, F, 18-25	1% (4)	3% (102)
Bicycle, F, 26-55	11% (50)	12% (415)
Bicycle, F, >55	4% (17)	4% (132)
All Bicycle, Female	**16% (79)**	**22% (914)**
Walker, M, 18-25	<1%% (2)	2% (59)
Walker, M, 26-55	7% (30)	7% (234)
Walker, M, >55	6% (29)	5% (182)
All Walker, Male	**13% (66)**	**14% (591)**
Walker, F, 18-25	<1% (2)	3% (87)
Walker, F, 26-55	17% (78)	14% (481)
Walker, F, >55	11% (51)	7% (246)
All Walker, Female	**27% (136)**	**23% (966)**
Jogger/Runner, M, 18-25	1% (3)	1% (27)
Jogger/Runner, M, 26-55	8% (35)	7% (241)
Jogger/Runner, M, >55	3% (14)	2% (60)
Jogger/Runner, Male	**12% (60)**	**8% (353)**
Jogger/Runner, F, 18-25	1% (4)	1% (49)
Jogger/Runner, F, 26-55	12% (53)	8% (261)
Jogger/Runner, F, >55	<1% (2)	1% (19)
Jogger/Runner, Female	**13% (66)**	**8% (343)**

Table 6 shows information on **"Local" versus "Non-Local" point of trip origin** by travel mode on the trail. "Local" is defined as the zip code area through which Duck Trail passes (27949). "Non-Local" is defined as all other zip code areas.

- In general, more Non-Local people used the trail, with the highest percentage being those who walk on the trail (97%).
- The highest proportion of Local trail users is bicyclists (7%).

Table 7 shows information on living status as reported by surveyed trail users by travel mode. For those surveyed trail users who defined their living status as a visitor to the area, Table 8 summarizes their average stay in days by travel mode.

- The majority of surveyed users reported that they were visitors to the area (84%).
- The highest proportion of visitors is walkers (40%).
- The average stay in days for surveyed visitors is 8 days.

Table 9 provides information on the states that surveyed users were visiting from.

TABLE 6: TRIP POINT OF ORIGIN BY TRAVEL MODE ON TRAIL

MODE	2016 LOCAL (N)	2016 NON-LOCAL (N)
Bike	7% (12)	93% (168)
Walk	3% (7)	97% (200)
Jog/Run	4% (5)	96% (126)
All Modes	5% (24)	95% (499)

TABLE 7: LIVING STATUS BY TRAVEL MODE ON TRAIL

LIVING STATUS AND MODE	PERCENT OF SURVEYED USERS	(N)
Permanent Resident	**6%**	**29**
Bike	52%	15
Walk	24%	7
Run	17%	5
Seasonal Resident	**10%**	**52**
Bike	33%	17
Walk	44%	23
Run	23%	12
Visitor	**84%**	**441**
Bike	34%	148
Walk	40%	176
Run	26%	114
Total	**100%**	**522**

TABLE 8: AVERAGE STAY FOR VISITORS IN DAYS BY TRAVEL MODE ON TRAIL

LIVING STATUS AND MODE	AVERAGE STAY IN DAYS	(N)
Visitor	**8**	**411**
Bike	8	131
Walk	7	169
Run	7	108
Other	7	3

- The majority of surveyed users reported that they were visitors to the area from either Virginia (21%), Pennsylvania (20%), or Maryland (10%).
- Less than 10% of surveyed visitors reported that they were visitors to the area from other places in North Carolina.
- 78% of surveyed users and 91% of surveyed visitors came to the trail from a state other than North Carolina.

TABLE 9: STATES THAT SURVEYED USERS WERE VISITING FROM

STATE OF RESIDENCE	PERCENT OF SURVEYED USERS	PERCENT OF SURVEYED VISITORS	(N)
VA	21%	25%	110
PA	20%	24%	105
MD	10%	12%	52
NC	**7%**	**9%**	**38**
OH	6%	7%	30
NJ	3%	3%	14
CT	2%	2%	9
WV	2%	2%	9
IN	1%	2%	7
NY	1%	2%	7
IL	1%	1%	6
CA	1%	1%	5
DC	1%	1%	5
DE	1%	1%	5
KY	1%	1%	5
TN	1%	1%	5
FL	1%	1%	4
GA	1%	1%	4
MA	1%	1%	4
MI	1%	1%	3
TX	1%	1%	3
MN	0.4%	0.5%	2
SC	0.4%	0.5%	2
CO	0.2%	0.2%	1
MO	0.2%	0.2%	1
NE	0.2%	0.2%	1
NH	0.2%	0.2%	1
NV	0.2%	0.2%	1
WA	0.2%	0.2%	1

Trail users were asked about their **frequency of use** of the trail. The figures shown in Table 10 are averages of the total number of trips taken in the past 14 days as reported by survey respondents. Most of those surveyed used the trail several times during the previous two week period.

- On average, use of the trail during the previous two weeks was similar across all modes, with an average of four trips in the past 14 days for all modes.

Table 11 provides information on the **distance traveled** on Duck Trail by travel mode on the trail and Table 12 provides information on the **distance traveled** on Duck Trail by gender and travel mode on the trail. The figures reported in the table are average trip distances in miles. Cases in which inadequate data was provided to compute trip distance were not included.

- Bicyclists traveled greater distances than those traveling by other modes. Distance traveled varied directly with the relative speed of each mode.
- Male bicyclists traveled the greatest distances on the trail.

TRANSPORTATION IMPACTS

Analysis of transportation-related factors included:

- Mode used to travel on the trail
- Primary trip purpose
- Frequency of round trips versus one-way trips
- Mode used to travel to the trail
- Trail access points

TABLE 10: AVERAGE NUMBER OF TRIPS IN THE PAST 14 DAYS

MODE	AVERAGE NUMBER OF TRIPS	(N)
Bike	5	116
Walk	4	117
Jog/Run	4	78
All Modes	4	314

TABLE 11: AVERAGE TRIP DISTANCE (IN MILES) BY TRAVEL MODE ON TRAIL

MODE	2016 AVERAGE MILES TRAVELED (N)
Bike	5.2 mi (180)
Walk	2.2 mi (204)
Jog/Run	3.5 mi (130)
All Modes	3.5 mi (519)

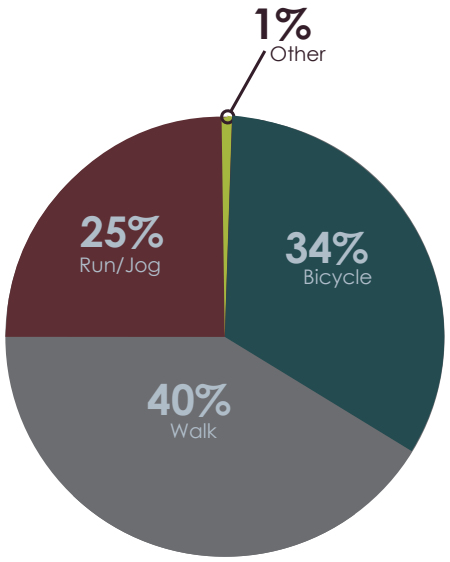
TABLE 12: AVERAGE TRIP DISTANCE (IN MILES) BY GENDER AND TRAVEL MODE ON TRAIL

GENDER	MODE	2016 AVERAGE MILES TRAVELED (N)
Male	Bike	5.5 mi (97)
	Walk	2.3 mi (63)
	Jog/Run	3.5 mi (60)
	All Modes	4.0 mi (225)
Female	Bike	4.7 mi (79)
	Walk	2.1 mi (136)
	Jog/Run	3.5 mi (65)
	All Modes	3.1 mi (280)

Analysis of survey responses found differences in **proportions of users by travel mode on the trail,** as shown in Figure 1.

- The majority of trail users traveled on the trail by foot (65%).

FIGURE 1: TYPE OF USER BY TRAVEL MODE ON TRAIL



Given the relatively high use of the trail for exercise/recreational purposes (74% of trips – see Table 13), it is not surprising that most travel involved a roundtrip, not a one-way trip on the trail, as illustrated in Table 14. However, a quarter of trips were for non-recreational purposes involving travel to/from work, school, dining, shopping, or running errands as their main purpose.

- Across all modes, nearly all trips were roundtrips.

The survey also revealed the **mode by which trail users traveled to the trail.** Table 15 provides information on the access modes used to travel to the trail by all survey respondents, sorted by mode of travel on the trail. The percentages shown are calculated by row to reflect the shares of travel to the trail according to the mode used on the trail.

TABLE 13: PRIMARY TRIP PURPOSE

PRIMARY TRIP PURPOSE	2016 PERCENTAGE OF SURVEYED USERS (N)
For exercise/ recreation/sightseeing	74% (389)
Travel to/from work or school	2% (13)
Travel to/from dining/ shopping/running errands	18% (96)
Travel to/from cultural attraction/entertainment/leisure activity	5% (26)

TABLE 14: TRIP TYPE

MODE	2016 ROUNDTRIP (N)	2016 THROUGHTRIP (N)
Bike	96% (172)	4% (8)
Walk	98% (201)	2% (5)
Jog/Run	98% (128)	2% (3)
All Modes	97% (505)	3% (17)

TABLE 15: MODE TO THE TRAIL BY MODE USED ON TRAIL

MODE ON TRAIL	MODE TO TRAIL		
	2016 by Bicycle (n)	2016 by Car (n)	2016 by Foot (n)
Bike	95% (166)	2% (4)	2% (4)
Walk	0% (0)	<1% (1)	100% (201)
Jog/Run	0% (0)	1% (1)	99% (127)
All Modes	33% (166)	1% (6)	66% (332)

- Two-thirds of those using the trail traveled to the trail by foot. Less than 1% of respondents traveling by foot on the trail and 2% of respondents traveling by bicycle on the trail accessed the trail by car.
- Nearly all respondents traveling by bicycle on the trail accessed the trail by bicycle (95%).
- 99% of respondents used an active mode of transportation to access the Duck Trail.

The survey also provided information on **where trail users were accessing the trail**. Table 16 includes the top five access points on the trail according to where survey respondents accessed the trail.

- The majority of respondents (15%) accessed the trail from the Jaycrest Road intersection.

ECONOMIC IMPACTS

The users of the trail can have an impact on businesses through expenditures on a variety of goods and services. The survey asked trail users to list expenditures on goods or services directly related to their trip on the trail on the day of the survey. If a trail user was traveling with members of their household, estimates represent the total for their household.

The results are shown in Table 17 and include **trail users' expenditures related to their trip on the Duck Trail** categorized by the type of expenditure and separated by user group.

- Food-related expenditures were the most common among surveyed trail users. The largest percentage of respondents made purchases at a restaurant.

TABLE 16: TOP FIVE ACCESS POINTS ON THE DUCK TRAIL

DUCK TRAIL ACCESS POINT DESCRIPTION	PERCENT SURVEYED (N)
Jaycrest Road	15% (78)
Four Seasons Lane	12% (62)
Scarborough Lane	7% (36)
Tides Drive/East Bias Lane/Charles Jenkins Lane	6% (33)
Plover Drive	5% (25)

TABLE 17: TYPE OF AND AVERAGE EXPENDITURE BY USER GROUP

DUCK USER GROUP	Restaurant			Grocery			Retail			Entertainment			Bike Rental		
	Respondents	% of Respondents	Average Expenses	Respondents	% of Respondents	Average Expenses	Respondents	% of Respondents	Average Expenses	Respondents	% of Respondents	Average Expenses	Respondents	% of Respondents	Average Expenses
Bicycle	179	36%	$35	177	22%	$52	178	12%	$51	179	1%	$150	178	8%	$60
Jog/Run	130	12%	$95	130	11%	$118	130	6%	$133	129	2%	$100	130	1%	$140
Walk	197	38%	$33	198	13%	$28	198	16%	$65	198	2%	$20	198	1%	$50
Total	510	31%	$40	509	16%	$70	510	12%	$68	510	2%	$73	510	3%	$63

31% of respondents made a restaurant-related purchase with an average cost of $40, and 16% of respondents made a grocery-related purchase with an average cost of $70.

- 12% of respondents made a retail-related purchase with an average cost of $68, while 2% of respondents made an entertainment-related purchase with an average cost of $73.
- 8% of bicyclists purchased a bike rental with an average cost of $63.

PUBLIC HEALTH IMPACTS

Increasing physical activity among children and adults is a national health objective in the United States. Access to facilities, such as trails, is one of the factors positively associated with physical activity. Information compiled that relates to public health impacts from user of the Duck Trail included:

- The percentage of trail users who indicated exercise as their primary trip purpose
- The mode of activity users engaged in while on the trail
- The average duration of each activity by user type

Table 18 indicates users' **primary trip purpose**. Non-recreational trip purposes included work, school, shopping, restaurant, and entertainment trips. It is important to note that users on the trail whose purpose was not primarily exercise/recreation were still engaging in physical activity while on the trail.

- Overall, 74% of all users on Duck Trail indicated their primary trip purpose as exercise/recreation.
- Over a quarter of all users on Duck Trail indicated their primary trip purpose as non-recreational.

Table 19 indicates the **duration of the active portion of a trail user's trip** (in minutes) by mode traveled on the trail. The total active portion of a trail user's trip was self-reported on the survey and may include time spent actively traveling to or from the trail. This table includes respondents who did not indicate gender so overall totals vary slightly from those reported in Table 18.

TABLE 18: RECREATIONAL VERSUS NON-RECREATIONAL TRIP PURPOSES

PRIMARY TRIP PURPOSE	2016 PERCENTAGE OF SURVEYED USERS (N)
For exercise/recreation/ sightseeing	74% (389)
Non-recreational (all other trip purposes)	26% (135)

- The average duration of the active portion of the trip for all users surveyed on the trail was 54 minutes.
- Bicyclists reported the highest average duration of the active portion of the trip (58 minutes) compared to walkers (52 minutes) and joggers/runners (51 minutes).

Table 20 breaks out the **duration of the active portion of a user's trip by gender**

TABLE 19: AVERAGE DURATION (IN MINUTES) OF THE ACTIVE PORTION OF USER'S TRIP

MODE	2016 DURATION (N)
Bike	58 min (178)
Walk	52 min (206)
Jog/Run	51 min (128)
All Modes	54 min (517)

and travel mode on the trail. Respondents that did not indicate gender are excluded from the data in the table.

- Male bicyclists reported a longer duration for the active portion of their trip than females.
- Female respondents spent twelve more minutes on average on their running trips than male respondents.

Table 21 presents information on the **duration of the active portion of a user's trip in relation to annual household income** to assess the activity of users of differing socio-economic status. Duration of the active portion of the trip may include active travel to/from the trail.

- Individuals with household incomes of less than $25,000 reported using the trail for an average of 46 minutes.
- The longest duration of activity on average (61 minutes) was reported by those in the $35,000-$49,999 household income bracket.

Table 22 presents information on the **percentage of exercise met by using the trail over the past 14 days by travel mode on the trail.**

- Respondents used the trail to meet 46% of their total exercise on average over the past 14 days.

TABLE 20: AVERAGE DURATION (IN MINUTES) OF THE ACTIVE PORTION OF USER'S TRIP BY GENDER AND TRAVEL MODE ON TRAIL

GENDER	MODE	2016 DURATION (N)
Male	Bike	62 min (96)
	Walk	53 min (66)
	Jog/Run	46 min (58)
	All Modes	55 min (225)
Female	Bike	52 min (78)
	Walk	50 min (136)
	Jog/Run	58 min (65)
	All Modes	52 min (279)

TABLE 21: AVERAGE DURATION (IN MINUTES) OF THE ACTIVE PORTION OF USER'S TRIP BY ANNUAL HOUSEHOLD INCOME

HOUSEHOLD INCOME	2016 DURATION (N)
<$25,000	46 min (5)
$25,000-$34,999	43 min (11)
$35,000-$49,999	61 min (11)
$50,000-$74,999	48 min (48)
$75,000-$99,999	50 min (73)
$100,000-$149,999	51 min (108)
$150,000-$199,999	58 min (92)
>$200,000	56 min (123)

TABLE 22: AVERAGE PERCENTAGE OF EXERCISE MET BY USING THE TRAIL OVER THE PAST 14 DAYS BY TRAVEL MODE ON TRAIL

MODE	2016 PERCENT EXERCISE (N)
Bike	47% (163)
Walk	44% (191)
Jog/Run	48% (126)
All Modes	46% (483)

TABLE 23: AVERAGE PERCENTAGE OF EXERCISE MET BY USING THE TRAIL OVER THE PAST 14 DAYS BY TRAVEL MODE ON TRAIL

GENDER	MODE	2016 PERCENT EXERCISE (N)
Male	Bike	41% (88)
	Walk	41% (62)
	Jog/Run	55% (58)
	All Modes	44% (211)
Female	Bike	55% (71)
	Walk	45% (125)
	Jog/Run	42% (63)
	All Modes	47% (259)

Table 23 presents information on the **percentage of exercise met by using the trail over the past 14 days by gender and travel mode on the trail.**

- Overall, the average percentage of exercise met by using the trail over the past 14 days was slightly larger for female trail users compared to male trail users; the difference was the greatest for female bicyclists compared to male bicyclists.

TRAVEL ACTIVITY MAPS

The following maps provide a visualization of travel activity on the Duck Trail generated using the user reported trail origin, turnaround, and destination points taken from the surveys.

Figure 3 shows where roundtrips for all modes (left) and one-way, throughtrips for all modes (right) occurred on the trail during the survey period. Roundtrips and throughtrips occurred on the entire length of the trail. Figure 4 shows where trips occurred on the trail during the survey period by primary trip purpose. The majority of trips were for exercise/recreation and these trips occurred on the entire length of the trail. Commuting trips occurred at a consistent level on most on the trail. Errands trips were concentrated around the Village of Duck, but were reported along the entire trail. Figures 5-7 show travel activity on the trail by mode on the trail, and include the average trip duration and average miles traveled for each mode.

FIGURE 3: ROUNDTRIP (LEFT) AND THROUGHTRIP (RIGHT) TRAVEL ACTIVITY FOR ALL MODES – *97% OF REPORTED TRIPS WERE ROUNDTRIPS AND 3% OF REPORTED TRIPS WERE THROUGHTRIPS*

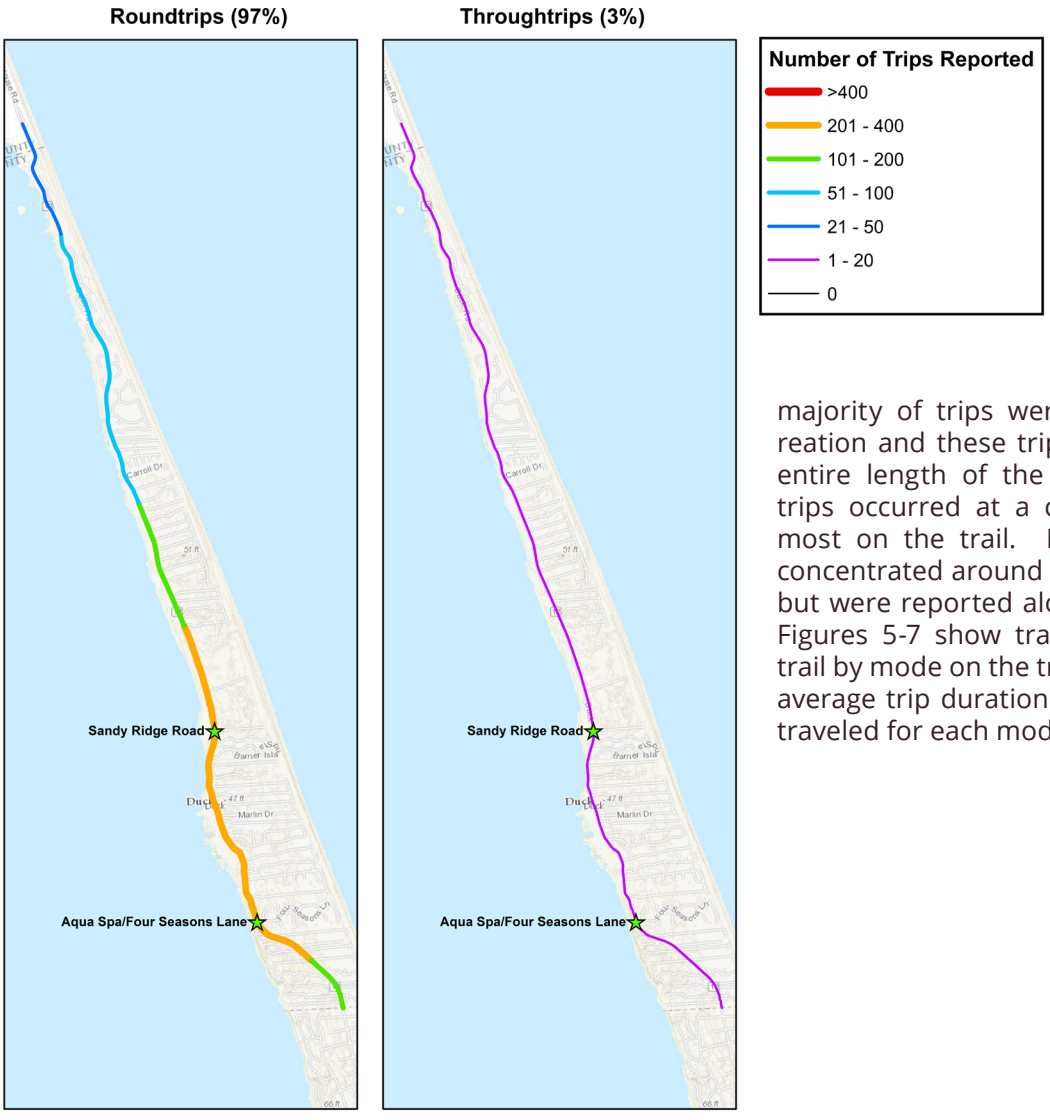


FIGURE 4: COMMUTE (TOP LEFT), ERRANDS (TOP RIGHT), AND EXERCISE/RECREATION (BOTTOM LEFT) TRAVEL ACTIVITY FOR ALL MODES – *2% OF REPORTED TRIPS WERE COMMUTE TRIPS, 18% OF REPORTED TRIPS WERE ERRANDS TRIPS, AND 74% OF REPORTED TRIPS WERE FOR EXERCISE/RECREATION*

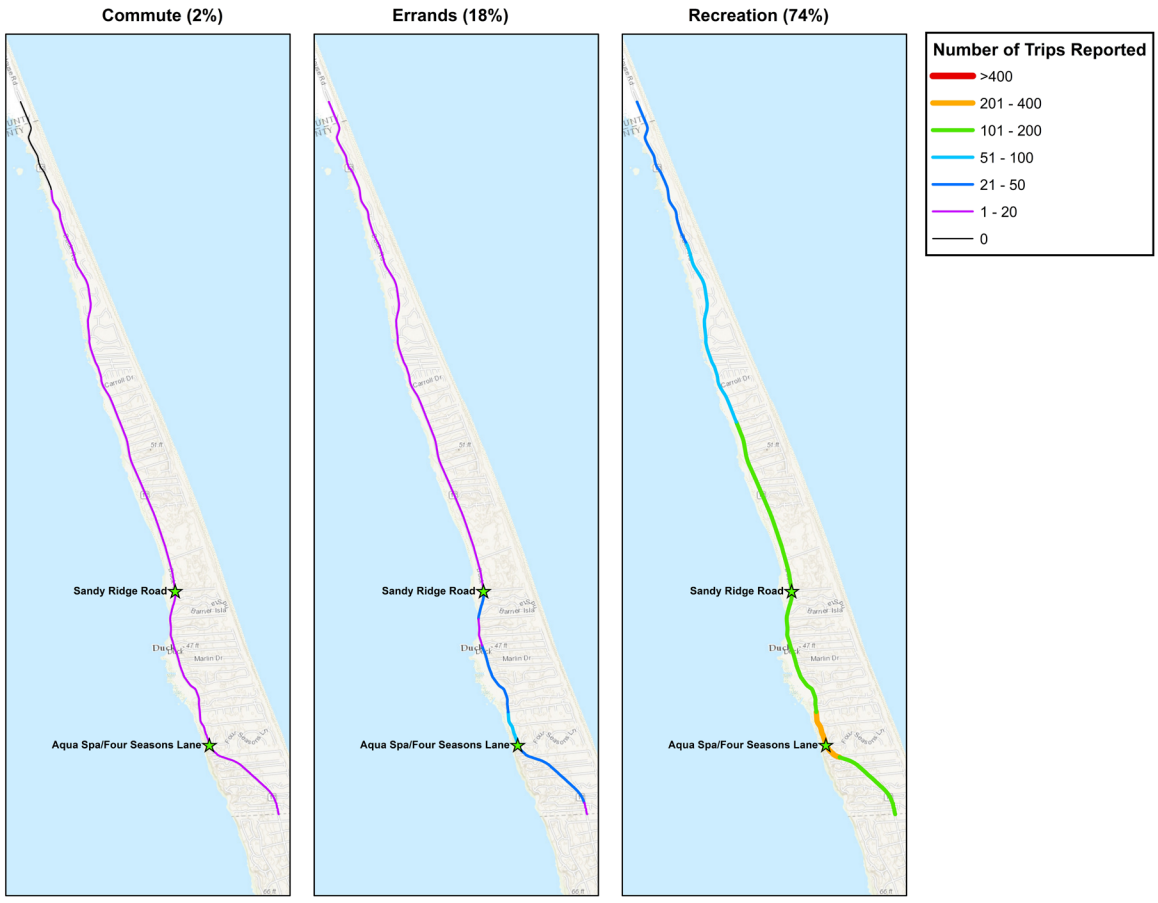


FIGURE 5: ROUNDTRIPS (LEFT) AND THROUGHTRIPS (RIGHT) FOR BICYCLISTS – *96% OF REPORTED BICYCLING TRIPS WERE ROUNDTRIPS AND 4% OF REPORTED BICYCLING TRIPS WERE THROUGHTRIPS; THE AVERAGE TRIP DURATION FOR BICYCLISTS WAS 58 MIN; THE AVERAGE DISTANCE TRAVELED BY BICYCLISTS WAS 5.2 MI*

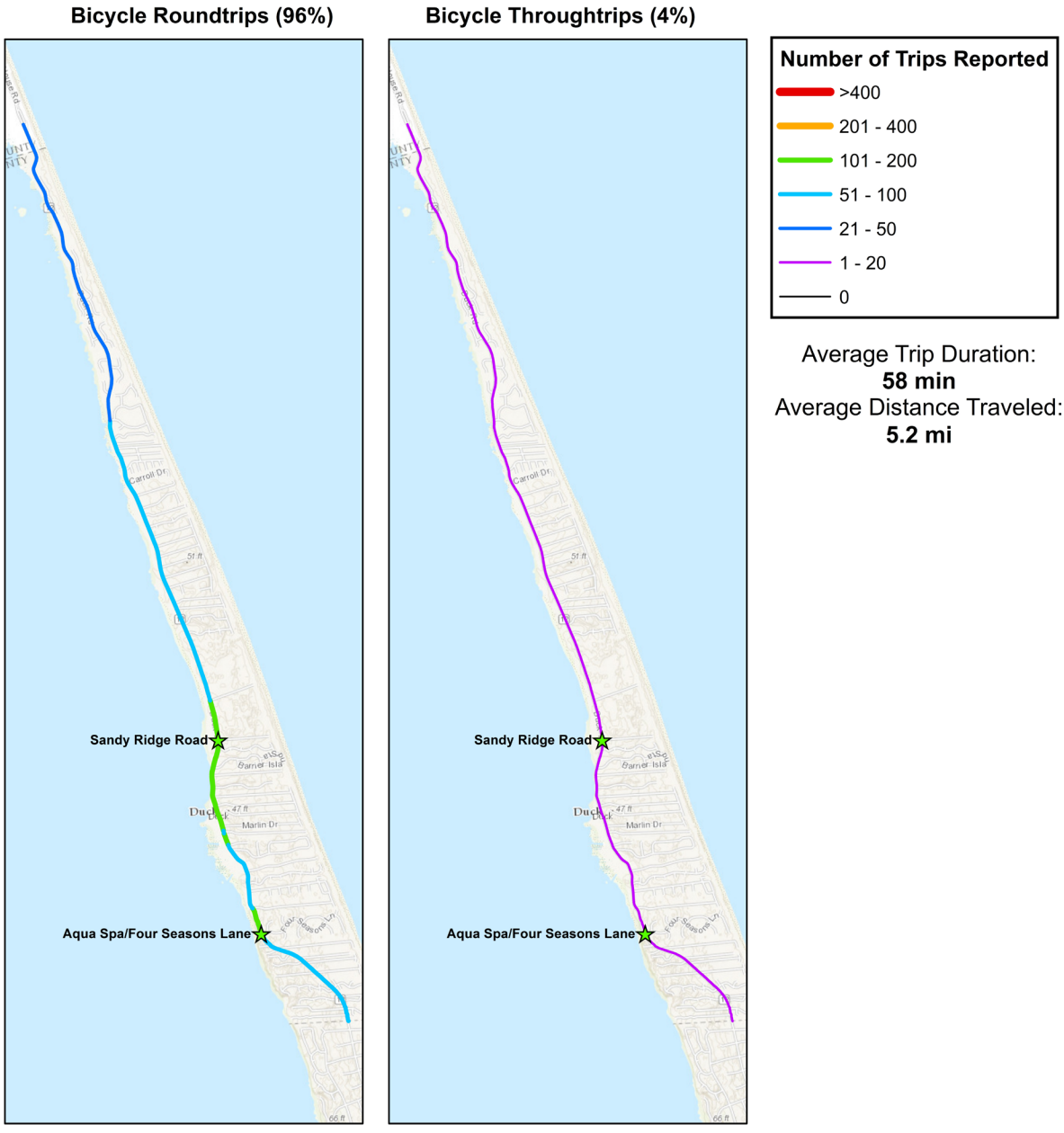


FIGURE 6: ROUNDTRIPS (LEFT) AND THROUGHTRIPS (RIGHT) FOR RUNNERS – *98% OF REPORTED RUNNING TRIPS WERE ROUNDTRIPS AND 2% OF REPORTED RUNNING TRIPS WERE THROUGHTRIPS; THE AVERAGE TRIP DURATION FOR RUNNERS WAS 51 MIN; THE AVERAGE DISTANCE TRAVELED BY RUNNERS WAS 3.5 MI*

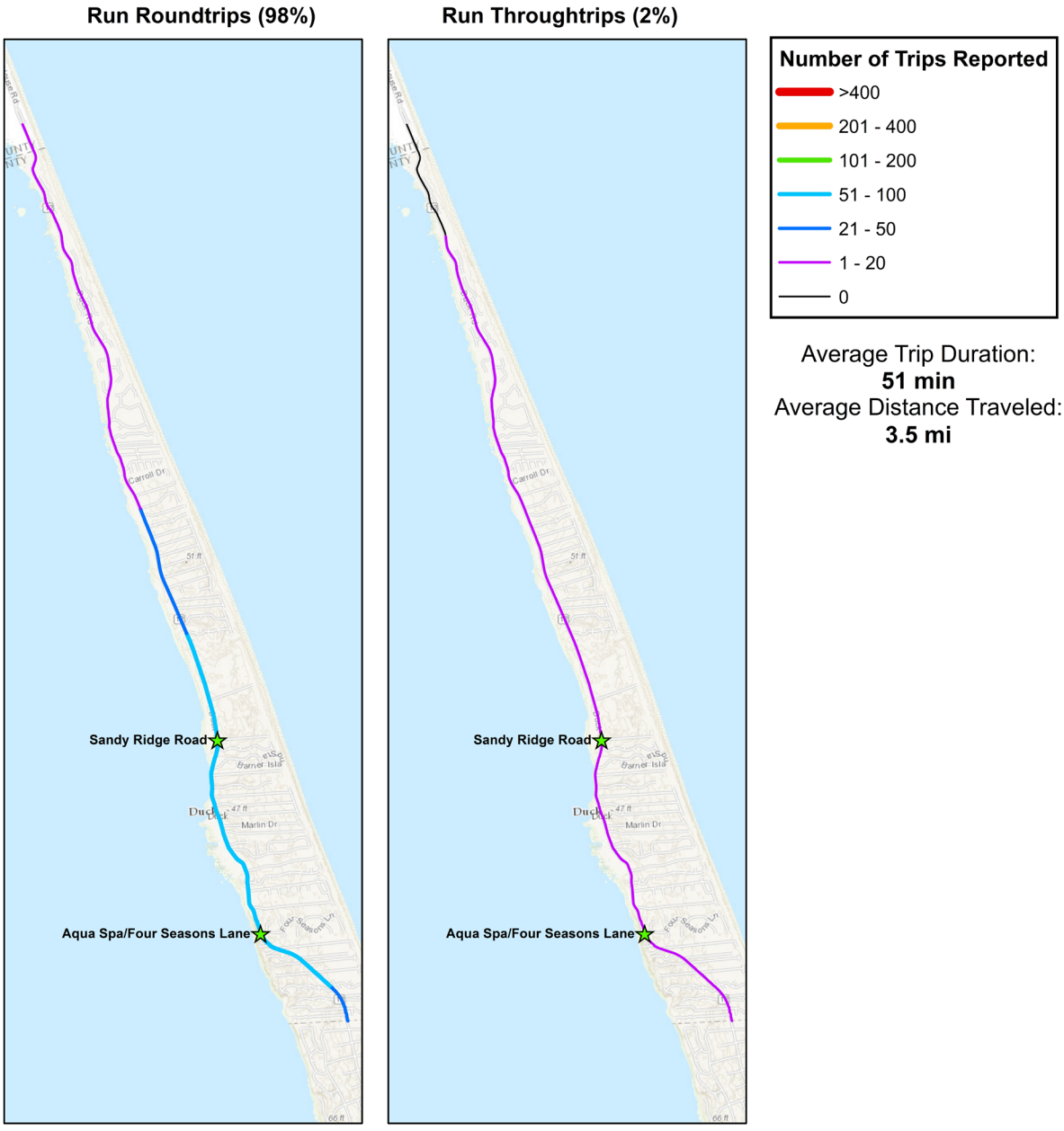
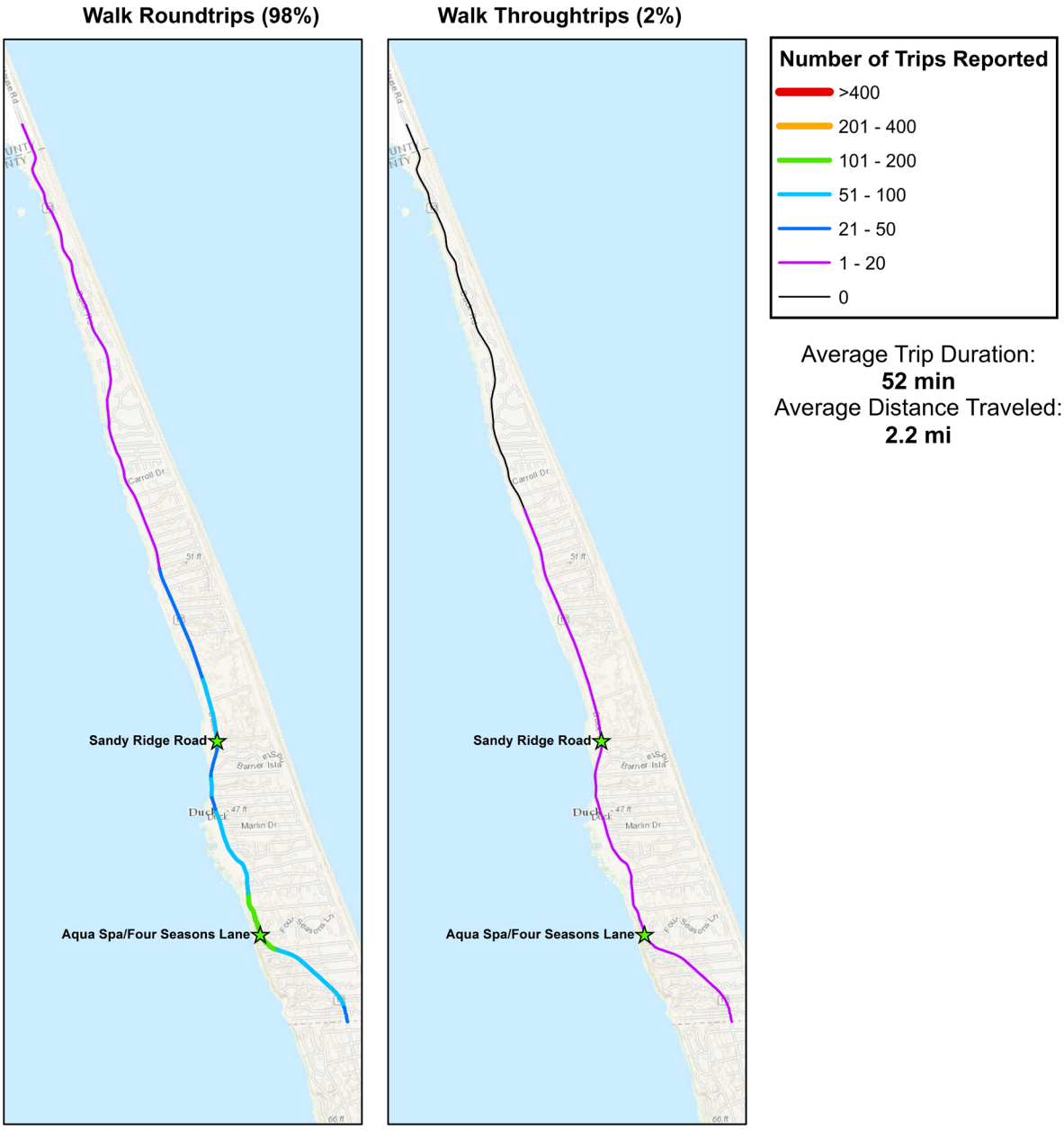


FIGURE 7: ROUNDTRIPS (LEFT) AND THROUGHTRIPS (RIGHT) FOR WALKERS – *98% OF REPORTED WALKING TRIPS WERE ROUNDTRIPS AND 2% OF REPORTED WALKING TRIPS WERE THROUGHTRIPS; THE AVERAGE TRIP DURATION FOR WALKERS WAS 52 MIN; THE AVERAGE DISTANCE TRAVELED BY WALKERS WAS 2.2 MI*



LITTLE SUGAR CREEK GREENWAY 2016

Results have been compiled for overall use of the trail based on the aggregated data collected at the four survey/count stations. Findings include users' demographics, their usage of the trail, and transportation, economic, and health aspects of trail use. The preliminary findings provided have not been tested for statistical significance. These results will be further evaluated for significance and for comparative analysis once all years of data collection are complete.

Table 1 summarizes the data collection effort indicating the data collection period, survey/count location on the trail, the raw number of users counted, and the raw number of users intercepted to fill out a survey while using the trail. A total of 6,135 counts were collected during the survey period, and 1,020 surveys were completed.

TRAIL USER DEMOGRAPHICS

Table 2 shows the **percentages of surveyed trail users and counts by gender and age group** for Little Sugar Creek Greenway users and counts overall:

- In general, a greater percentage of females than males used the trail.
- Nearly a quarter of those surveyed were over the age of 55.

TABLE 1: DATA COLLECTION SCHEDULE AND SUMMARY STATISTICS

DAY OF WEEK	DATE	TIME PERIOD	STATION	LOCATION	2016 COUNTS	2016 SURVEYS
Tuesday	10/18/2016	6:30AM to 7:30PM	1	Meyers Street	114	46
			2	Midtown Park	1,102	216
			3	Freedom Park	708	133
			4	Ridgewood Avenue	597	148
Saturday	10/22/2016	6:30AM to 7:30PM	1	Meyers Street	130	33
			2	Midtown Park	1,347	163
			3	Freedom Park	1,173	137
			4	Ridgewood Avenue	964	144
				TOTALS	**6,135**	**1,020**

TABLE 2: SURVEYED TRAIL USER AND COUNT DEMOGRAPHICS – GENDER AND AGE

DEMOGRAPHIC	2016 SURVEYED USERS (N)	2016 COUNTS (N)
Male	47% (470)	50% (3,042)
Female	53% (540)	50% (2,986)
Age 18-25	9% (89)	8% (456)
Age 26-55	69% (675)	76% (4,190)
Age >55	22% (218)	16% (881)

Table 3 provides **additional demographic information for the surveyed trail users**, including education level, annual household income, and race.

- The majority of surveyed trail users (87%) completed college, business/technical school, or obtained an advanced degree.
- The majority of surveyed trail users were white (85%) and earned annual household incomes greater than $74,999 (65%).

Survey user type data were compared to manual count user type data to determine if the survey responses could be considered representative of the population of trail users during the data collection period. Count data were adjusted based on the survey responses indicating the percentage of trips that were round trips and the number of survey/count stations passed according to user reported trail origin, turnaround, and destination points to avoid overestimating or 'double/multi-counting' unique users of the trail. A summary of the methods used to adjust the counts to unique users can be found in Chapter 5 of the Final Report.

TABLE 3: SURVEYED TRAIL USER DEMOGRAPHICS – EDUCATION, ANNUAL HOUSEHOLD INCOME, AND RACE

DEMOGRAPHIC	2016 SURVEYED USERS (N)
Some High School	<1% (4)
Completed High School	3% (33)
Some College	9% (90)
Completed Business/Technical School	2% (16)
Completed College	44% (438)
Advanced Degree	41% (406)
Less than $25,000	6% (54)
$25,000-$34,999	5% (43)
$35,000-$49,999	9% (78)
$50,000-$74,999	15% (139)
$75,000-$99,999	14% (128)
$100,000-$149,999	21% (188)
$150,000-$199,999	9% (85)
$200,000 or more	21% (194)
White	85% (804)
Black	10% (97)
Asian	4% (37)
Native Hawaiian or Pacific Islander	<1% (2)
American Indian	<1% (4)

Table 4 provides the **percentages of Little Sugar Creek Greenway surveyed users, counts, and unique users by travel mode on the trail during the survey period.** Comparing data across the columns shows the degree to which those surveyed represent a proportionate sample of all those using the trail. Note that while children less than 18 years of age were counted, they were not surveyed.

- In general, surveyed user proportions are similar to unique user proportions by mode.
- The proportions of counted joggers/runners and bicyclists are greater than the proportion of surveyed and estimated unique joggers/runners and bicyclists. This is likely due to the longer distances travelled by joggers/runner and bicyclists on average, which allows an individual jogger/runner or cyclist to be surveyed once per data collection day but counted multiple times along the trail.
- The proportion of counted walkers is less than the proportion of surveyed and estimated unique walkers. This is likely due to the shorter distances travelled by walkers on average coupled with a greater tendency to participate in the survey compared to other modes.

TABLE 4: ALL TRAIL USERS DURING SURVEY PERIODS – TRAVEL MODE ON TRAIL

MODE	DAY	2016 SURVEYED USERS (N)	2016 COUNTS (N)	2016 UNIQUE USERS (N)
Bike	Tues	16% (86)	20% (509)	18% (209)
	Sat	11% (52)	19% (691)	14% (248)
Walk	Tues	55% (293)	46% (1,166)	51% (606)
	Sat	60% (285)	45% (1,624)	55% (974)
Jog/Run	Tues	29% (157)	33% (825)	31% (372)
	Sat	28% (135)	35% (1,247)	30% (536)
All Other Modes	Tues	<1% (1)	1% (20)	<1% (1)
	Sat	1% (3)	1% (30)	1% (10)

Table 5 provides data separated by **travel mode on the trail, gender, and age group** for trail users intercepted during the survey period.

TRAIL USER PROFILES

Information was compiled to investigate the travel modes used both to travel to the trail as well as while traveling on the trail, where trail users live in relation to the trail, whether they used the trail for recreational/non-recreational purposes, the frequency of trail use, and the distance users traveled on the trail.

TABLE 5: COMPARATIVE PERCENTAGES/NUMBERS OF COUNTS AND THOSE SURVEYED, BY TRAVEL MODE ON TRAIL, GENDER, AND AGE

MODE, GENDER, AGE	2016 PERCENTAGE OF SURVEYED USERS (N)	2016 PERCENTAGE OF COUNTS (N)
Bicycle, M, 18-25	3% (8)	1% (39)
Bicycle, M, 26-55	10% (30)	9% (505)
Bicycle, M, >55	1% (4)	2% (134)
All Bicycle, Male	**13% (42)**	**14% (809)**
Bicycle, F, 18-25	1% (4)	0% (25)
Bicycle, F, 26-55	6% (18)	5% (249)
Bicycle, F, >55	0% (1)	1% (60)
All Bicycle, Female	**8% (25)**	**6% (377)**
Walker, M, 18-25	2% (6)	2% (89)
Walker, M, 26-55	14% (43)	12% (674)
Walker, M, >55	6% (17)	4% (236)
All Walker, Male	**22% (68)**	**19% (1,122)**
Walker, F, 18-25	2% (7)	2% (130)
Walker, F, 26-55	20% (61)	19% (1,047)
Walker, F, >55	7% (21)	6% (319)
All Walker, Female	**28% (89)**	**27% (1,608)**
Jogger/Runner, M, 18-25	1% (2)	1% (55)
Jogger/Runner, M, 26-55	14% (42)	16% (844)
Jogger/Runner, M, >55	1% (4)	1% (79)
Jogger/Runner, Male	**15% (48)**	**18% (1,067)**
Jogger/Runner, F, 18-25	4% (13)	2% (93)
Jogger/Runner, F, 26-55	8% (26)	15% (796)
Jogger/Runner, F, >55	1% (2)	1% (39)
Jogger/Runner, Female	**13% (42)**	**16% (981)**

Table 6 shows information on "Local" versus "Non-Local" point of trip origin by travel mode on the trail. "Local" is defined as the zip code area through which Little Sugar Creek Greenway passes (28206, 28205, 28202, 28204, 28207, 28203, and 28209). "Non-Local" is defined as all other zip code areas.

- In general, more Local people used the trail, with the highest percentage being those who bicycle on the trail (73%).
- The highest proportion of Non-Local trail users is walkers (43%).

Table 7 shows information on living status in the area as reported by surveyed trail users by travel mode. For those surveyed trail users who defined their living status as a visitor to the area, Table 8 summarizes their average stay in days by travel mode.

- The majority of surveyed users reported that they were permanent residents of the area (95%).
- The highest proportion of visitors is walkers (55%).
- The average stay in days for surveyed visitors is 3 days.

TABLE 6: TRIP POINT OF ORIGIN BY TRAVEL MODE ON TRAIL

MODE	2016 LOCAL (N)	2016 NON-LOCAL (N)
Bike	73% (100)	27% (37)
Walk	57% (325)	43% (247)
Jog/Run	63% (181)	37% (107)
All Modes	61% (610)	39% (391)

TABLE 7: LIVING STATUS BY TRAVEL MODE ON TRAIL

LIVING STATUS AND MODE	PERCENT OF SURVEYED USERS	(N)
Permanent Resident	95%	959
Bike	14%	132
Walk	57%	551
Run	29%	276
Seasonal Resident	1%	8
Bike	0%	0
Walk	63%	5
Run	38%	3
Visitor	4%	38
Bike	16%	6
Walk	55%	21
Run	29%	11
Total	100%	1,005

TABLE 8: AVERAGE STAY FOR VISITORS IN DAYS BY TRAVEL MODE ON TRAIL

LIVING STATUS AND MODE	AVERAGE STAY IN DAYS	(N)
Visitor	3	22
Bike	4	4
Walk	4	11
Run	3	7

Trail users were asked about their frequency of use of the trail. The figures shown in Table 9 are averages of the total number of trips taken in the past 14 days as reported by survey respondents. Most of those surveyed used the trail several times during the previous two week period.

- On average, use of the trail during the previous two weeks was similar across all modes, with an average of six trips in the past 14 days for all modes.
- Bicyclists and joggers/runners traveled comparable distances on average and greater distances than walkers.
- Distances travelled by males and females on every mode except bicycle were comparable; male bicyclists traveled a half a mile further than female bicyclists on average.

Table 10 provides information on the distance traveled on Little Sugar Creek Greenway by travel mode on the trail, and Table 11 provides information on the distance traveled on Little Sugar Creek Greenway by gender and travel mode on the trail. The figures reported in the table are average trip distances in miles. Cases in which inadequate data was provided to compute trip distance were not included.

TABLE 9: AVERAGE NUMBER OF TRIPS IN THE PAST 14 DAYS

MODE	AVERAGE NUMBER OF TRIPS	(N)
Bike	7	138
Walk	7	576
Jog/Run	6	288
All Modes	6	1,006

TABLE 10: AVERAGE TRIP DISTANCE (IN MILES) BY TRAVEL MODE ON TRAIL

MODE	2016 AVERAGE MILES TRAVELED (N)
Bike	3.8 (131)
Walk	2.0 (552)
Jog/Run	3.5 (282)
All Modes	2.7 (976)

TABLE 11: AVERAGE TRIP DISTANCE (IN MILES) BY GENDER AND TRAVEL MODE ON TRAIL

GENDER	MODE	2016 AVERAGE MILES TRAVELED (N)
Male	Bike	4.0 (87)
	Walk	1.9 (217)
	Jog/Run	3.6 (138)
	All Modes	2.8 (446)
Female	Bike	3.5 (44)
	Walk	2.0 (331)
	Jog/Run	3.4 (139)
	All Modes	2.5 (514)

TRANSPORTATION IMPACTS

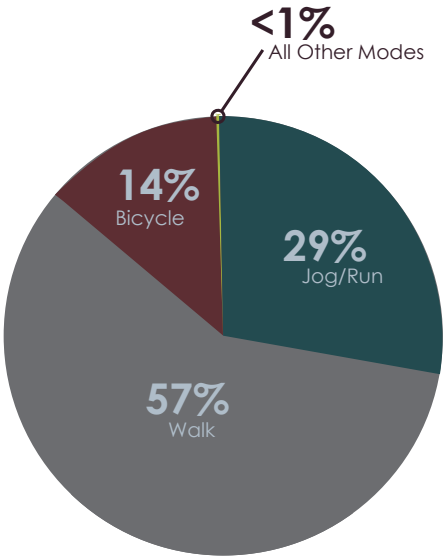
Analysis of transportation-related factors included:

- Mode used to travel on the trail
- Primary trip purpose
- Frequency of round trips versus one-way trips
- Mode used to travel to the trail
- Trail access points

Analysis of survey responses found differences in **proportions of users by travel mode on the trail,** as shown in Figure 1.

- The majority of trail users traveled on the trail by foot (86%).

FIGURE 1: TYPE OF USER BY TRAVEL MODE ON TRAIL



Given the relatively high use of the trail for exercise/recreational purposes (90% of trips – see Table 12), it is not surprising that most travel involved a roundtrip, not a one-way trip on the trail, as illustrated in Table 13. However, 10% of trips were for non-recreational purposes involving travel to/from work, school, dining, shopping, running errands, a cultural attraction, entertainment, or a leisure activity as their main purpose.

TABLE 12: PRIMARY TRIP PURPOSE

PRIMARY TRIP PURPOSE	2016 PERCENTAGE OF SURVEYED USERS (N)
For exercise/recreation/ sightseeing	90% (912)
Travel to/from work or school	4% (42)
Travel to/from dining/ shopping/running errands	4% (45)
Travel to/from cultural attraction/entertainment/leisure activity	2% (20)

TABLE 13: TRIP TYPE

MODE	2016 ROUNDTRIP (N)	2016 THROUGHTRIP (N)
Bike	82% (111)	18% (25)
Walk	81% (462)	19% (111)
Jog/Run	85% (249)	15% (43)
All Modes	82% (831)	18% (182)

TABLE 14: MODE TO THE TRAIL BY MODE USED ON TRAIL

MODE ON TRAIL	MODE TO TRAIL		
	2016 by Bicycle (n)	2016 by Car (n)	2016 by Foot (n)
Bike	79% (106)	17% (23)	4% (5)
Walk	0% (0)	48% (273)	52% (292)
Jog/Run	0% (0)	42% (121)	58% (169)
All Modes	11% (106)	42% (417)	47% (466)

TABLE 15: TOP FIVE ACCESS POINTS ON THE LITTLE SUGAR CREEK GREENWAY

ACCESS POINT DESCRIPTION	PERCENT SURVEYED (N)
Brandywine Road	12% (122)
Princeton Avenue	8% (84)
Freedom Park near playground	7% (74)
Freedom Park near baseball fields	7% (71)
Water fountain at Target/Wendy's	6% (56)

- Across all modes, most trips were roundtrips.

The survey also revealed the **mode by which trail users traveled to the trail.** Table 14 provides information on the access modes used to travel to the trail by all survey respondents, sorted by mode of travel on the trail. The percentages shown are calculated by row to reflect the shares of travel to the trail according to the mode used on the trail.

- Slightly less than half of those using the trail traveled to the trail by foot.
- The majority of respondents traveling by bicycle on the trail accessed the trail by bicycle (79%).
- 58% of respondents used an active mode of transportation to access the Little Sugar Creek Greenway.

The survey also provided information on where trail users were accessing the trail. Table 15 includes the top five access points on the trail according to where survey respondents accessed the trail.

- The majority of respondents (12%) accessed the trail from the Brandywine Road intersection.

ECONOMIC IMPACTS

The users of the trail can have an impact on businesses through expenditures on a variety of goods and services. The survey asked trail users to list expenditures on goods or services directly related to their trip on the trail on the day of the survey. If a trail user was traveling with members of their household, estimates represent the total for their household.

The results are shown in the following table. Table 16 shows **trail users' expenditures related to their trip on Little Sugar Creek Greenway** categorized by the type of expenditure and separated by user group.

- Food-related expenditures were the most common among surveyed trail users. The largest percentage of respondents made purchases at a restaurant - 18% of respondents made a restaurant-related purchase with an average cost of $20, and 7% of respondents made a grocery-related purchase with an average cost of $35.
- 5% of respondents made a retail-related purchase with an average cost of $45, while 1% of respondents made an entertainment-related purchase with an average cost of $71.

TABLE 16: TYPE OF AND AVERAGE EXPENDITURE BY USER GROUP

LSC USER GROUP	Respondents	Restaurant		Respondents	Grocery		Respondents	Retail		Respondents	Entertainment		Respondents	Bike Rental	
		% of Respondents	Average Expenses		% of Respondents	Average Expenses		% of Respondents	Average Expenses		% of Respondents	Average Expenses		% of Respondents	Average Expenses
Bicycle	135	25%	$23	136	12%	$21	136	9%	$42	136	1%	$75	135	1%	$13
Jog/Run	288	10%	$13	288	5%	$35	287	2%	$22	288	<1%	$180	288	0%	$-
Walk	568	20%	$20	567	8%	$39	566	5%	$51	568	<1%	$12	568	0%	$-
Total	991	18%	$20	991	7%	$35	989	5%	$45	992	1%	$71	991	0%	$13

- 1% of bicyclists purchased a bike rental with an average cost of $13.

PUBLIC HEALTH IMPACTS

Increasing physical activity among children and adults is a national health objective in the United States. Access to facilities, such as trails, is one of the factors positively associated with physical activity. Information compiled that relates to public health impacts from user of the Little Sugar Creek Greenway included:

- The percentage of trail users who indicated exercise as their primary trip purpose
- The mode of activity users engaged in while on the trail
- The average duration of each activity by user type

Table 17 indicates users' **primary trip purpose.** Non-recreational trip purposes included work, school, shopping, restaurant, and entertainment trips. It is important to note that users on the trail whose purpose was not primarily exercise/recreation were still engaging in physical activity while on the trail.

- Overall, 90% of all users on Little Sugar Creek Greenway indicated their primary trip purpose as exercise/recreation.
- 10% all users on Little Sugar Creek Greenway indicated their primary trip purpose as non-recreational.

Table 18 indicates the **duration of the active portion of a trail user's trip** (in minutes) by mode traveled on the trail. The total active portion of a trail user's trip was self-reported on the survey and may include time spent actively traveling to or from the trail. This table includes respondents who did not indicate gender so overall totals vary slightly from those reported in Table 19.

- The average duration of the active portion of the trip for all users surveyed on the trail was 51 minutes.
- Walkers reported the highest average duration of the active portion of the trip (52 minutes) compared to joggers/runners (51 minutes) and bikers (50 minutes).

TABLE 17: RECREATIONAL VERSUS NON-RECREATIONAL TRIP PURPOSES

PRIMARY TRIP PURPOSE	2016 PERCENTAGE OF SURVEYED USERS (N)
For exercise/recreation/ sightseeing	90% (912)
Non-recreational (all other trip purposes)	10% (107)

TABLE 18: AVERAGE DURATION (IN MINUTES) OF THE ACTIVE PORTION OF USER'S TRIP

MODE	2016 DURATION (N)
Bike	50 min (135)
Walk	52 min (570)
Jog/Run	51 min (289)
All Modes	51 min (998)

Table 19 breaks out the **duration of the active portion of a user's trip by gender and travel mode on the trail**. Respondents that did not indicate gender are excluded from the data in the table.

- Male bicyclists reported a longer duration for the active portion of their trip than females.
- Female respondents spent five more minutes on average on their walking trips than male respondents.

Table 20 presents information on the **duration of the active portion of a user's trip in relation to annual household income** to assess the activity of users of differing socio-economic status. Duration of the active portion of the trip may include active travel to/from the trail.

- Individuals with household incomes of less than $25,000 reported using the trail for an average of 54 minutes.
- The longest duration of activity on average (59 minutes) was reported by those in the $35,000-$49,999 household income bracket.

Table 21 presents information on the **percentage of exercise met by using the trail over the past 14 days by travel mode on the trail.**

- Respondents used the trail to meet 49% of their total exercise on average over the past 14 days.

TABLE 19: AVERAGE DURATION (IN MINUTES) OF THE ACTIVE PORTION OF USER'S TRIP BY GENDER AND TRAVEL MODE ON TRAIL

GENDER	MODE	2016 DURATION (N)
Male	Bike	53 min (90)
	Walk	49 min (226)
	Jog/Run	51 min (139)
	All Modes	50 min (459)
Female	Bike	45 min (45)
	Walk	54 min (339)
	Jog/Run	52 min (145)
	All Modes	52 min (529)

TABLE 20: AVERAGE DURATION (IN MINUTES) OF THE ACTIVE PORTION OF USER'S TRIP BY ANNUAL HOUSEHOLD INCOME

HOUSEHOLD INCOME	2016 DURATION (N)
<$25,000	54 min (51)
$25,000-$34,999	56 min (42)
$35,000-$49,999	59 min (76)
$50,000-$74,999	48 min (138)
$75,000-$99,999	54 min (124)
$100,000-$149,999	51 min (187)
$150,000-$199,999	52 min (85)
>$200,000	51 min (193)

TABLE 21: AVERAGE PERCENTAGE OF EXERCISE MET BY USING THE TRAIL OVER THE PAST 14 DAYS BY TRAVEL MODE ON TRAIL

MODE	2016 PERCENT EXERCISE (N)
Bike	47% (135)
Walk	48% (564)
Jog/Run	50% (287)
All Modes	49% (990)

Table 22 presents information on the **percentage of exercise met by using the trail over the past 14 days by gender and travel mode on the trail.**

- Overall, the average percentage of exercise met by using the trail over the past 14 days was larger for female trail users compared to male trail users; the difference was the greatest for female walkers compared to male walkers.

TABLE 22: AVERAGE PERCENTAGE OF EXERCISE MET BY USING THE TRAIL OVER THE PAST 14 DAYS BY TRAVEL MODE ON TRAIL

GENDER	MODE	2016 PERCENT EXERCISE (N)
Male	Bike	47% (91)
	Walk	43% (226)
	Jog/Run	51% (139)
	All Modes	46% (460)
Female	Bike	48% (44)
	Walk	52% (334)
	Jog/Run	50% (145)
	All Modes	51% (523)

TRAVEL ACTIVITY MAPS

The following maps provide a visualization of travel activity on the Little Sugar Creek Greenway generated using the user reported trail origin, turnaround, and destination points taken from the surveys. Figure 3 shows where roundtrips for all modes (left) and one-way, throughtrips for all modes (right) occurred on the trail during the survey period. Roundtrips and throughtrips occurred on the entire length of the trail. Figure 4 shows where trips occurred on the trail during the survey period by primary trip purpose. The majority of trips were for exercise/recreation and these trips occurred on the entire length of the trail. Commuting and errands trips were concentrated around Midtown Park, but were reported along the entire trail. Figures 5-7 show travel activity on the trail by mode on the trail, and include the average trip duration and average miles traveled for each mode.

FIGURE 3: ROUNDTRIP (LEFT) AND THROUGHTRIP (RIGHT) TRAVEL ACTIVITY FOR ALL MODES – *82% OF REPORTED TRIPS WERE ROUNDTRIPS AND 18% OF REPORTED TRIPS WERE THROUGHTRIPS*

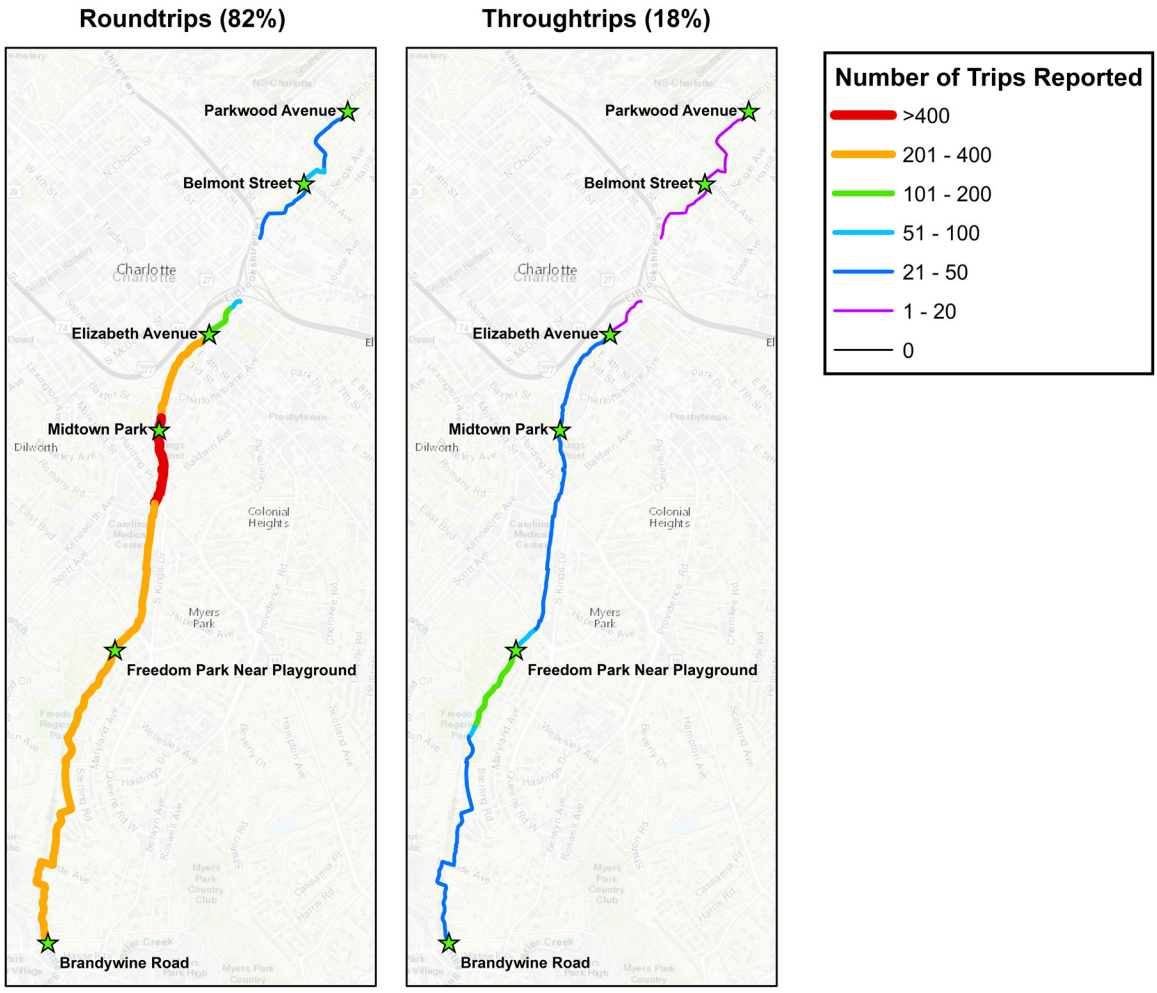


FIGURE 4: COMMUTE (LEFT), ERRANDS (CENTER), AND EXERCISE/RECREATION (RIGHT) TRAVEL ACTIVITY FOR ALL MODES – *4% OF REPORTED TRIPS WERE COMMUTE TRIPS, 4% OF REPORTED TRIPS WERE ERRANDS TRIPS, AND 90% OF REPORTED TRIPS WERE FOR EXERCISE/ RECREATION*

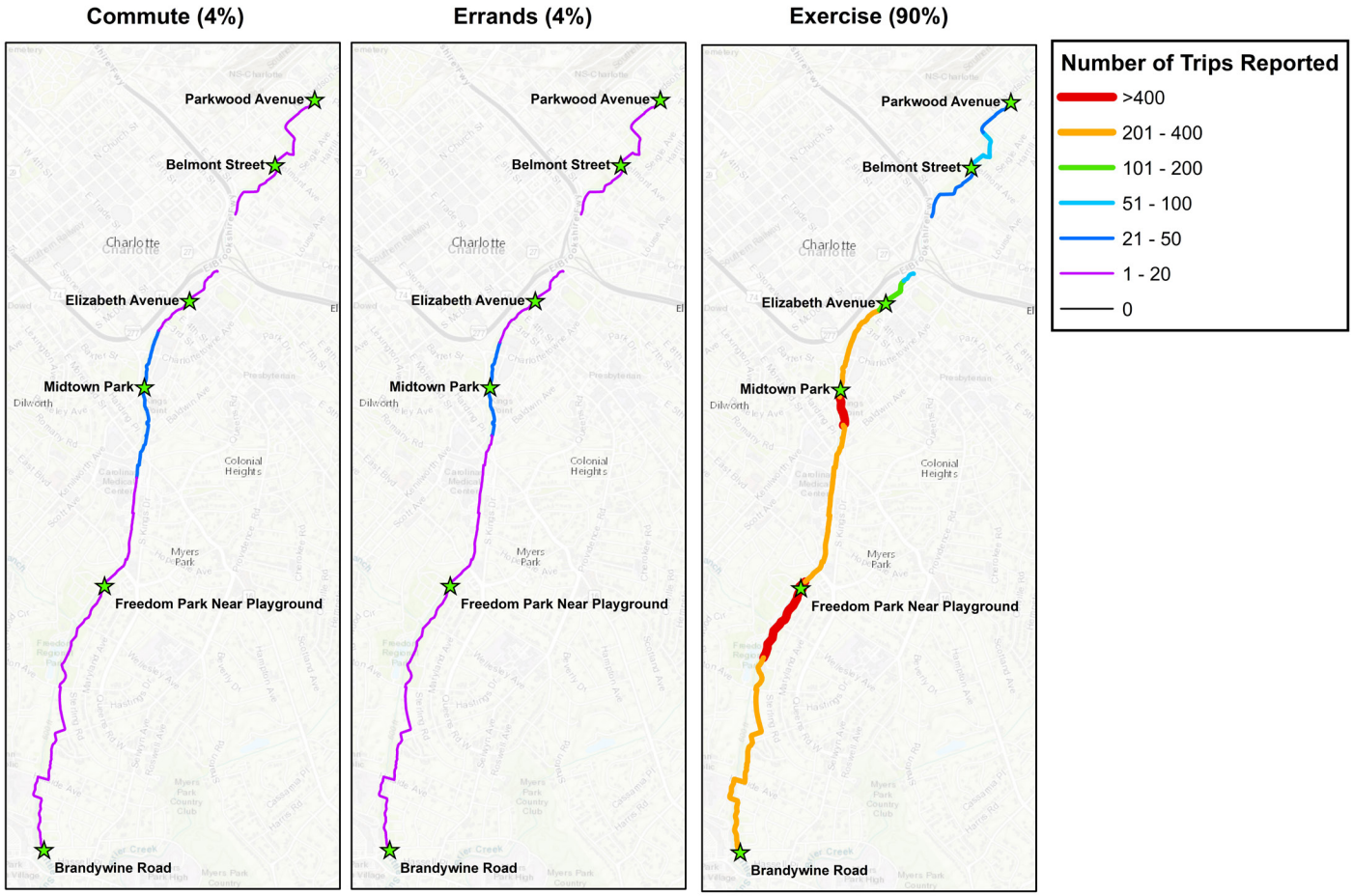


FIGURE 5: ROUNDTRIPS (LEFT) AND THROUGHTRIPS (RIGHT) FOR BICYCLISTS – *82% OF REPORTED BICYCLING TRIPS WERE ROUNDTRIPS AND 18% OF REPORTED BICYCLING TRIPS WERE THROUGHTRIPS; THE AVERAGE TRIP DURATION FOR BICYCLISTS WAS 50 MIN; THE AVERAGE DISTANCE TRAVELED BY BICYCLISTS WAS 3.8 MI*

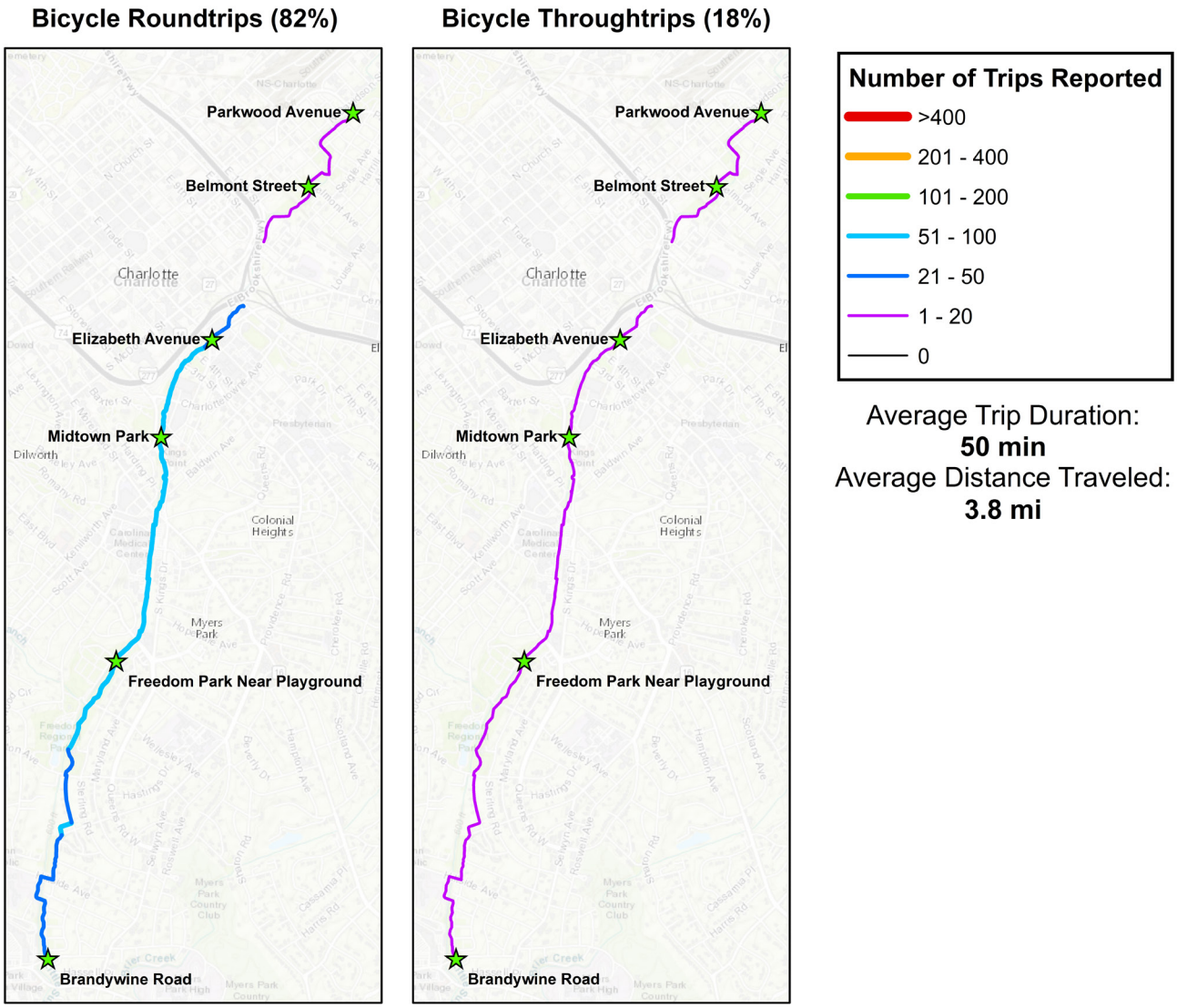


FIGURE 6: ROUNDTRIPS (LEFT) AND THROUGHTRIPS (RIGHT) FOR RUNNERS – *85% OF REPORTED RUNNING TRIPS WERE ROUNDTRIPS AND 15% OF REPORTED RUNNING TRIPS WERE THROUGHTRIPS; THE AVERAGE TRIP DURATION FOR RUNNERS WAS 51 MIN; THE AVERAGE DISTANCE TRAVELED BY RUNNERS WAS 3.5 MI*

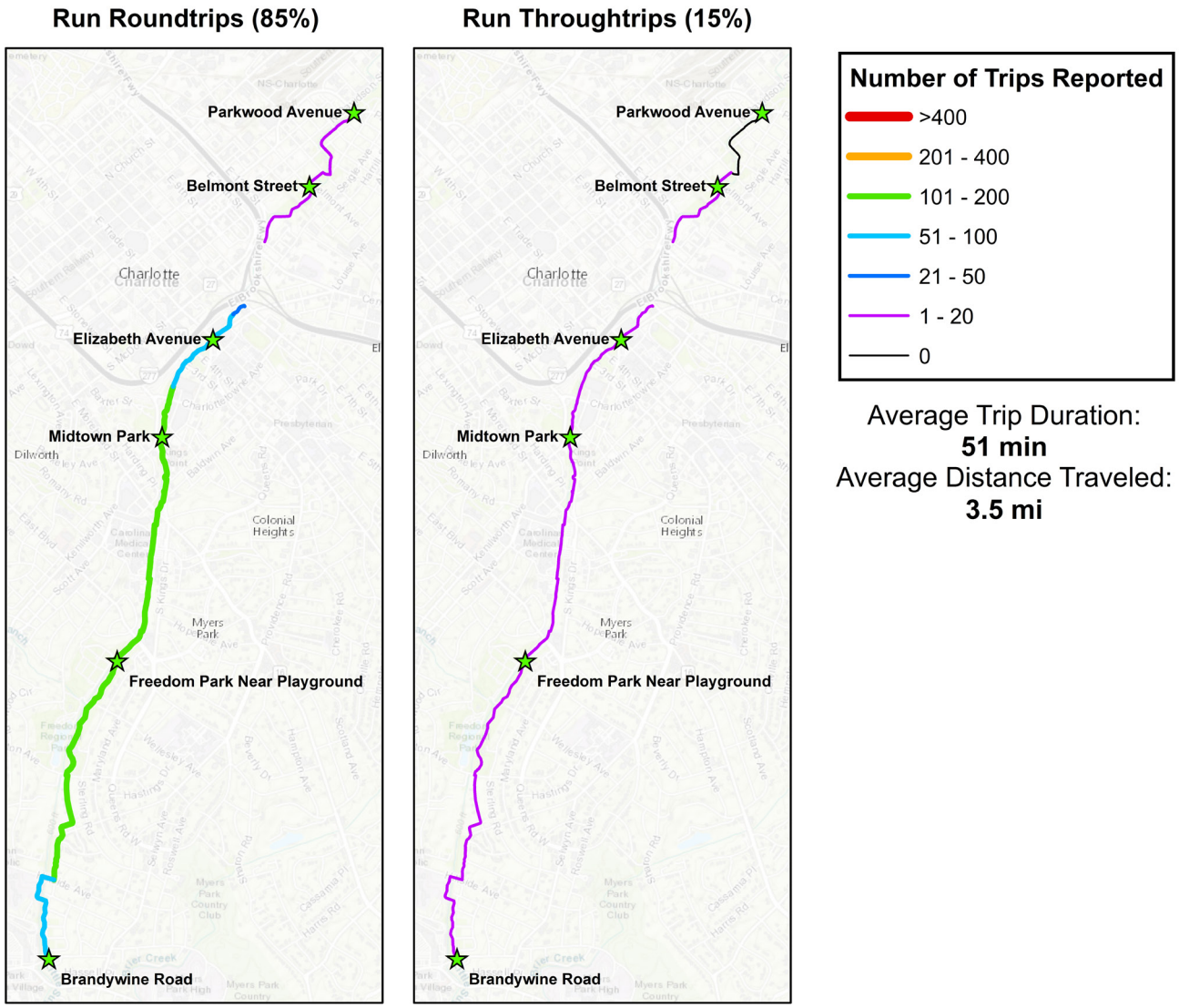
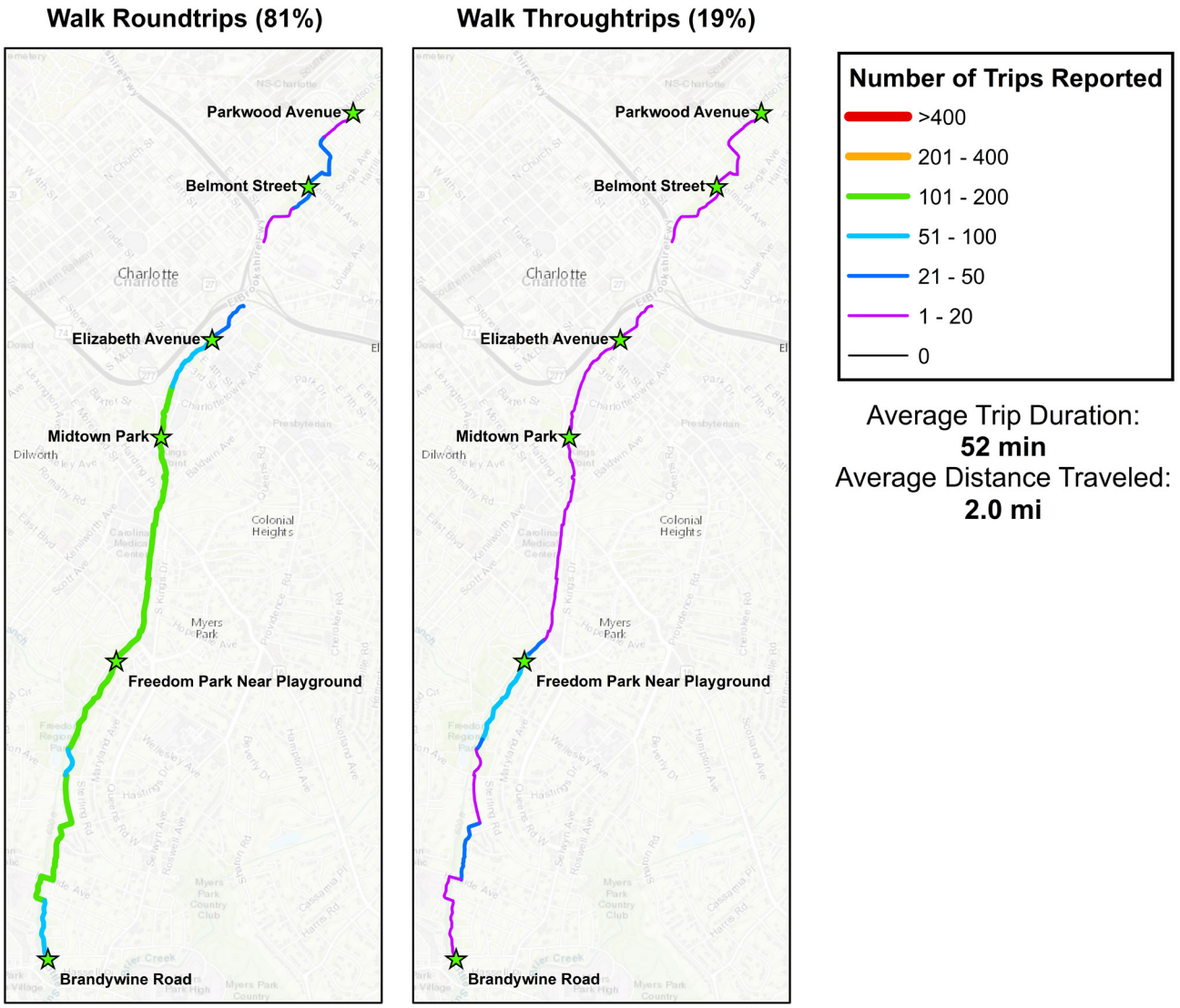


FIGURE 7: ROUNDTRIPS (LEFT) AND THROUGHTRIPS (RIGHT) FOR WALKERS – *81% OF REPORTED WALKING TRIPS WERE ROUNDTRIPS AND 19% OF REPORTED WALKING TRIPS WERE THROUGHTRIPS; THE AVERAGE TRIP DURATION FOR WALKERS WAS 52 MIN; THE AVERAGE DISTANCE TRAVELED BY WALKERS WAS 2.0 MI*



Site No. _____

Date _____

Shared Use Path User Survey

(to be completed by persons 18 or older – one per household)

1. Trip Diagram

Trail Access Point

[Auto] [Bike] [Foot] [Bus] [Other]

Trail

Trail Access/ Turnaround Point

Start: _____

(street address, nearby intersection, name of place, business, or neighborhood name)

[Walk] [Run] [Bike] [Other]

Destination:

(street address, nearby intersection, name of place, business, or neighborhood name)

Trail Access Point

Trail

[Auto] [Bike] [Foot] [Bus] [Other]

End: _____

2. How many minutes on this trip will you be walking/running/bicycling/etc?

_____ **Minutes**

Trip Purpose	**3. What is the main purpose of <u>today's</u> trip? (check one)**	**4. What is the secondary purpose of <u>today's</u> trip? (check all that apply)**
Travel to/from work or school	☐	☐
Travel to/from dining/shopping/running errands	☐	☐
Travel to/from cultural attraction/entertainment/leisure activity	☐	☐
For exercise/recreation/sightseeing	☐	☐

5. For these trip purposes: If this trail were not available, would you travel to your destination in an automobile?

☐ Yes ☐ No

☐ I would not make the trip

6. Related to <u>today's</u> trip on the trail, approximately how much did (will) you spend on the following goods or services? If traveling with members of your household, estimates should represent the total for your household.

Expenditure Type	Amount	At what business did (will) you make these purchases?
Restaurant meals and drinks	**$**	
Groceries/convenience items	**$**	
Retail shopping	**$**	
Entertainment/admissions	**$**	
Bike rental	**$**	
Other (specify): _____	**$**	

Survey Continues on Back

7. When was the first time you used this trail (month and year)?

_____

☐ This is my first trip on the trail

8. How many trips have you made on this trail in the last 14 days, including today?

_____

9. Allocate those total trips by the following primary purposes (total should sum to answer in #8):

Primary Purpose	No. of Trips by Purpose
Travel to work or school	
Travel to dining/shopping/running errands	
For exercise/recreation/sightseeing	
Travel to cultural attraction/entertainment/ leisure activity	

10. Over the past 14 days, what percentage of your exercise was met by using this trail?

_____**%**

11. How do you define your living status in the area?

☐ Permanent Resident
☐ Seasonal Resident
☐ Visitor - If checked, my stay is _____ days

Visitors ONLY: How important was this trail in your decision to visit the area?

☐ Not important
☐ Somewhat important
☐ Very important

Visitors ONLY: How much will your household spend on your entire visit, excluding transportation to/from the area? (include all spending on lodging, food, retail items, entertainment, etc.)

$_____

12. Where is your permanent residence (i.e., where is home)?

City/Town: _____

State/Province: _____ ZIP: _____

13. Including yourself, how many people are traveling in your group today?

_____ Check if with you on today's trip: ☐ Stroller ☐ Pet

14. Including yourself, how many people <u>from your household</u> are traveling with you today? _____

15. Tell us about who is on the trail with you today <u>from your household</u> or those in your responsible care:

	You	**Person 2**	**Person 3**	**Person 4**	**Person 5**	**Person 6**	**Person 7**
Age	_____	_____	_____	_____	_____	_____	_____
Gender	☐ Male ☐ Female	☐ Male ☐ Female	☐ Male ☐ Female	☐ Male ☐ Female	☐ Male ☐ Female	☐ Male ☐ Female	☐ Male ☐ Female
Travel Mode	☐ Walk ☐ Run/Jog ☐ Bicycle ☐ Other:	☐ Walk ☐ Run/Jog ☐ Bicycle ☐ Other:	☐ Walk ☐ Run/Jog ☐ Bicycle ☐ Other:	☐ Walk ☐ Run/Jog ☐ Bicycle ☐ Other:	☐ Walk ☐ Run/Jog ☐ Bicycle ☐ Other:	☐ Walk ☐ Run/Jog ☐ Bicycle ☐ Other:	☐ Walk ☐ Run/Jog ☐ Bicycle ☐ Other:

16. Household Income:
- ☐ less than $25,000
- ☐ $25,000-$34,999
- ☐ $35,000-$49,999
- ☐ $50,000-$74,999
- ☐ $75,000-$99,999
- ☐ $100,000-$149,999
- ☐ $150,000-$199,999
- ☐ $200,000 and more

17. Education Level:
- ☐ Some high school
- ☐ Completed high school
- ☐ Some college
- ☐ Completed college
- ☐ Completed business/ technical school
- ☐ Advanced degree

18. Race:
- ☐ White
- ☐ Black or African-American
- ☐ American Indian or Alaskan Native
- ☐ Asian
- ☐ Native Hawaiian or Other Pacific Islander
- ☐ _____

Conducted by:

ITRE Institute for Transportation Research and Education NC STATE UNIVERSITY

alta PLANNING + DESIGN

On behalf of:

Division of Bicycle & Pedestrian Transportation NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

Thank you for taking the time to fill out this survey!

Trail User Count Form

Name: _____ Date: _____

Location: _____ Time Period: _____

User Type / Mode (circle all that apply)	Circle Dots for Group Members	Direction (check for towards North)	Gender		Approximate Age				Notes
			M	F	<18	18-25	26-55	>55	
B W R O / C D	▪								
B W R O / C D	▪								
B W R O / C D	▪								
B W R O / C D	▪								
B W R O / C D	▪								
B W R O / C D	▪								
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B W R O / C D	▪								

User Type / Mode

B = Bicycle
W = Walker
R = Runner/Jogger
O = Other (Skater, Scooter, etc.)
If applicable, select D = Dog
C = Child in Stroller

Shared Use Path Study Count and Survey Procedures

Screen Line Count Procedures

Count all people who pass your station—if someone passes your counting point and turns around and then comes back in the other direction, that person should be counted on a separate row each time they pass you (in this case, twice).

Using the Form:
Each form sheet represents a 15-minute interval. A new sheet should be started every 15 minutes to log the people who pass the count station within that 15-minute period.

1. Write your **name**, the **date**, and the **count location** on the top of the form. **Write the time when you start to use** the form. Write the end-time as well. The end-time should be 15 minutes after the start-time. For example, if you start using the form at 8:00 am, then enter 8:14 am as the end-time. The next form should cover 8:15 am – 8:29 am, and so on.
2. Start a new form every 15 minutes.
3. Complete **one line (record) for each independently mobile person**. If there are three people in a group, use three lines.
    a. Use a separate row for **any child actively contributing to his/her travel.** This includes children who may be walking/biking/skating on their own, as well as any child riding a tandem or '*tag-along'* bicycle.
    b. Persons using wheelchairs, electric scooters, golf carts or 'gators' to traverse the trail are still considered 'independently mobile'. Use the Notes field to indicate the personal assistive device being utilized by the person of record.
    c. People riding a *tandem* bicycle should each be recorded on separate lines, marked as "Bicycle" mode, with an indication in the Notes field that they were on a tandem.
4. **USER TYPE/MODE:** Circle the appropriate "**User Type / Mode**" for each person. For example, in a group of three people, two adults may be "Walkers" and one may be a child on a "Bicycle". If an adult is pushing a "Child in a Stroller", circle both "W" for the adult walking, and "C" for the child in the stroller. Similarly, if a jogger passes with a dog, you would circle "R" for the jogger/runner, and "D" for the dog.
    a. **"Child in Stroller" = Any dependent child who is not traveling on the trail through his/her own physical exertion.** This includes children being conveyed in strollers or bike trailers, or children being carried either in a contraption (like a Baby Bjorn, sling, or other device) or in someone's arms. If an adult has more than one dependent child (like a double stroller), use the Notes field to indicate the number of dependent children.
5. **GROUP MEMBERS:** If there is **more than one person in a group**, circle the appropriate number of dots. For example, if there is a group of three people, you would enclose three dots on successive rows within one circle.
6. **DIRECTION:** Put a **check if a person is travelling toward Durham** (i.e. north). Leave that space **blank** if the person is travelling away from Durham (i.e. south).
7. **GENDER:** Put a **check** in the appropriate space to indicate each person's **gender**. Do not mark gender for dependent children—just for the adult conveying the child.
8. **AGE**: Put a **check** in the box that you think best indicates each person's **age**. If unsure of which age category to use, you can discuss with another in your crew. You can make a note in the "Notes" column to that effect.
9. **If you need more than one sheet per 15-minute interval,** start another page and indicate the same date, location, and time period to which the additional page belongs. Number pages sequentially as they are filled in within the interval. For example, if a counter needed 2 sheets to capture all the people counted between 4:30-4:44 pm, then at the bottom of the first page, the counter will record "Page 1 of 2" and at the bottom of the second page, he/she will record "Page 2 of 2".
10. If you can include only a **part of a group at the bottom of a page**, leave the circle around the dots open at the bottom to indicate that the group continues on the next page (i.e. mark it with an "n" shape). At the top of the next page,

complete the circle for the remaining group members by leaving it open at the top of the dots (i.e. mark it with a "u" shape).

11. **Store pages in the weather-resistant plastic file case**. Keep them together and chronologically organized.
12. If you need to take a bathroom (or other) **break**, notify the lead person for your crew. That person will make arrangements to cover your station.

Example Form:

Trail User Count Form

Name: *John Doe* Date: *October 10, 2015*

Location: *St 8 - New Hope Church Rd* Time Period: *11:30 am - 11:44 am*

User Type / Mode (circle all that apply)	Circle Dots for Group Members	Direction (check for towards Durham)	Gender		Approximate Age				Notes
			M	F	<18	18-25	26-55	>55	
B W R O / C D	▪	✓	✓				✓		
B W R O / C D	▪	✓		✓			✓		
B W R O / C D	▪		✓				✓		new counter starting here - Jane Smith
B W R O / C D	▪		✓			✓			
B W R O / C D	▪		✓					✓	2 children in stroller
B W R O / C D	▪	✓		✓			✓		
B W R O / C D	▪	✓		✓	✓				on tag along
B W R O / C D	▪	✓	✓				✓		1 child in bike trailer
B W R O / C D	▪	✓	✓					✓	golf cart
B W R O / C D	▪								
B W R O / C D	▪								
B W R O / C D	▪								

Thanks for your help!!!

Shared Use Path Study Count and Survey Procedures

Survey Procedures

Surveys should be provided **only to those 18 and older**!!! If you can't tell if someone is 18 or older, ask them politely if they are 18 or older, explaining that we are surveying only people who meet that qualification.

Distribute **one survey per household**. For example, if two parents are travelling with a child, only one survey should be distributed to that group. However, if three friends are travelling together, three surveys should be distributed—one to each adult age 18 or over.

Soliciting Respondents:

1. One surveyor should approach an individual or group to request that they complete a survey. You may use the following script:

   Hi! Will you fill out a survey about your use of the [insert trail name] today? We are conducting a survey to understand how people use shared use paths in North Carolina. It will only take a few minutes to complete the survey, and your information will be kept anonymous.

   Tips to get folks to stop:
   - Most people are making round trips on the trail. *Ask if they can fill it out when they pass back through* at the end of their run/walk/bike ride.
   - For bicyclists, stand 15 or so feet in advance of the table. Make clear eye contact, and yell your introduction as they approach. This gives time for them to either slow down, or for you to continue probing whether you can catch them on their way back before they've passed and can no longer hear you.
   - Be "aggressively polite." Even though the table and signage may make it appear self-evident that we want people to stop and fill out a survey, don't rely on the physical cues to entice people to actually do so. People like to be personally invited to engage, so speak up and ask them to!

2. If respondent appears to be part of a group, ask:
   - *Are you traveling with a group today? Are you all members of the same household?*

     If not in same household, encourage individuals to fill out separate survey forms.

Using the Form:

3. **Enter the site number and date** in the top right corner of the survey. You may fill this out prior to giving the form to the respondent or after the person turns in the completed survey.

4. **Fill in the travel trip diagram by asking respondents a series of questions:**
   - *Where did you get on the [insert trail name] today?*
     - Use the map to verify trail entrance indicated and write the numeric code associated with the access point in the top **Trail Access Point** circle.
   - *How did you get to the trail today? Did you come on foot, by bike, via auto, transit, or other?*
     - Circle the **mode** of transport **to the trail**. (Auto/Bike/Foot/Bus/Other)
   - *Where did you [walk/bike/drive] from to get to the trail? If you don't know or don't want to give the street address for that location, just provide the names of the cross streets at the closest intersection to the place where you started your trip, like Main St. at Broad St.*
     - "Home", "Starbucks", or "NC 54" are not helpful answers. Probe for more clarifying information like the address, or which Starbucks location (eg. which shopping center or neighborhood, etc.) Write response as the **Start.**

- *Where are you traveling to? If you don't know or don't want to give the street address for that location, just provide the names of the cross streets at the closest intersection to the place where you started your trip, like Main St. at Broad St.*
    - You may need to probe to determine if the respondent is turning around on the trail or making a through trip to a location.
        - *Will you turn around on the trail? If you're turning around on the trail, where will you turn around?*
            - Use the map to verify trail turnaround location indicated and write the numeric code associated with the access point, mile marker or other feature in the middle **Trail Access / Turnaround** circle. If the respondent turns around after traveling a set distance, record the number of miles for each leg of the trip (eg. 2.5 miles there and 2.5 miles back for a turnaround trip.)
            - For mile marker turnaround points, record it as MM #, to distinguish the number from the access point codes.
        - *Will you exit the trail at the same place you got on?*
            - If yes, the top and bottom **Trail Access Point** circles should have same code.
                - *Upon exiting the trail, will you go back to the same place you started from or go somewhere else?*
                    - If returning to Start location, write "same" as the **End.** Otherwise, record address, cross-streets, business, and/or other location where they will go when leaving the trail as the **End.**
            - *If not, where will you exit the trail?*
                - Use the map to verify the location indicated and write the numeric code associated with the access point in the bottom **Trail Access Point** circle.
    - Write the **destination** location in the box on the right. "my office", "Starbucks", or "Apex" are not helpful answers. Probe for more clarifying information like the name of business, neighborhood, address, or cross streets of closest intersection to destination.
- *Will you make a return trip on the trail today? (Or, Did you travel earlier on the trail today?)*
    - If the respondent plans to make a return trip later the SAME DAY, capture the entrance/exit points, and mode for the return trip.
    - If the respondent is on the return trip when intercepted, capture the entrance/exit points, and mode for the departure trip.

5. **Ask respondent Question 2.** Record response in minutes. Time should include the active portions of the trip explained in the diagram, including any walking/biking/etc. to and/or from the trail as well as the active travel time on the trail.

6. **Ask respondent Questions 3, 4, and 5** and give some description for how to record that information (i.e. check only one box for main purpose; check all that apply for secondary purpose.)
    - Note: if respondent indicates one of the first 3 trip purposes (i.e. some type of utilitarian or "transportation-type" trip where they are going to/from a destination), then ask Question 5. If they answer otherwise, skip it.

Shared Use Path Study Count and Survey Procedures

7. **Ask respondent Question 6.** If no money was spent, draw a line through the Amount column or write in 0's for each – do not leave blank as that indicates the person chose not to respond. Try to capture the businesses at which purchases were made.

8. **Ask respondent Question 7.** Sometimes people best remember when considering other life changes, like when they may have moved to the area. Probe where you can.

9. **Ask respondent Questions 8 and 9.** The number of trips answered in the column of question 9 should add up to the response to question 8.

10. **Ask respondent Question 10.** Another way to ask is, "*When you think about all the exercise you did over the last 14 days, what percentage was met using the trail?"*

11. **Ask respondent Questions 11 and 12.** *"Are you a permanent resident, seasonal resident, or visitor in this area?"*
    - NOTE: For Visitors: Make sure to mark the number of days of the visit, ask how important the trail is in the decision to visit, and how much their visit expenses are.
    - For people with 2nd home or vacation homes, make sure they use their 1st home or their primary residence as their permanent residence.

12. **Ask respondent Questions 13, 14, and 15.** The first one is to understand how large the group is, regardless of whether they are in the same household. If multiple members of the group fill out the survey, the answer to Question 13 should be the same for each.
    - Question 14 is specific to the number of household members – these answers may be the same if the group is the household. Responses must be at least 1 or greater, since each includes the person filling out the survey.
    - For Question 15, only gather info on household members (NOT group) who are on the trail. If their household is larger, but not all are on the trail, then don't include them.

13. **Ask respondent Questions 16, 17 and 18.** Remind them the survey is anonymous. Share the survey with them as you ask the questions and use your pen to point to responses or ask them to point to the correct response. If they prefer not to respond, write in "999".

14. If you get really busy, give the individual the survey on a clipboard and ask them to fill in the rest AFTER administering the first page.
    - Briefly *point out that the survey is 2-sided*.
    - Point out that you (or other surveyors) are available in case they have any questions.

15. When people give you their completed survey:
    - **Thank** people for having taken the time to complete a survey.
    - **Check the survey for completion**. Commonly overlooked questions are the entire back side, especially the right column. If anything is missing, politely point it out and *ask them to complete the unanswered questions*. **Thank them again**.
    - **Check** that the *For internal use only* section is complete.
    - **Write the weekday/date at the top.**
    - Take the completed survey from the clipboard and put it in the container.
    - **Refill** the clipboard with a new questionnaire.

16. If you have **questions**, ask the lead person for your crew (or another surveyor).

Shared Use Path Study Count and Survey Procedures

17. If you need to take a bathroom (or other) **break**, notify the lead person for your crew. That person will make arrangements to cover your station.

Thanks for your help!!!

Institute for Transportation Research and Education – N.C. State University

Shared Use Path Data Collection

Fall 2016

ITRE https://itre.ncsu.edu/

Outline

- General information/instructions
- Intercept Survey Procedures
- Counts Procedures
- Questions/Wrap-up

ITRE https://itre.ncsu.edu/

Charlotte

Little Sugar Creek Greenway

4 Survey Locations

ITRE

Reporting to Your Station

- Site leader + 2 staff
- Plan to be at your station by **6:15AM**. Data collection begins promptly at 6:30AM.
- Lead Staff: Rotates duties among the crew, help troubleshoot on-site issues, and directs station crew as needed.
- See your data collection schedule email for your site, shift times, parking information, site leader cell phone number, etc.

ITRE https://itre.ncsu.edu/

Plan to Be On the Trail

What to Bring:

- Sunscreen/Hat
- Bug spray
- Camping chair
- Snacks, lunch, refreshments
- Water Bottle
- Charged cell phone
- Bike (optional – useful for bathroom breaks)
- Dress for being outdoors in fall (coat, gloves, hat, layers)

Lead Staff:

- Water Cooler
- Tables
- Tote
- Tent

Inclement Weather Plans

- Check email the night before.
- Be flexible.
- Bring rain gear!
- If intermittent rain showers, we may temporarily suspend collection rather than cancel an entire day.
- Hotel rooms are booked for the entire time.

Intercept Survey Procedures

1. Approach trail users- big smiles!
2. Entire survey administered by surveyor, using map locations for reference.
3. Thank respondent!
4. Refill clipboard.

Approach Trail Users

- Survey only those 18 and older.
- Distribute 1 per household.
- Manage 'clumping'.
  - Have those being surveyed move off to the side to avoid blocking the trail.

Approach Trail Users - Tips

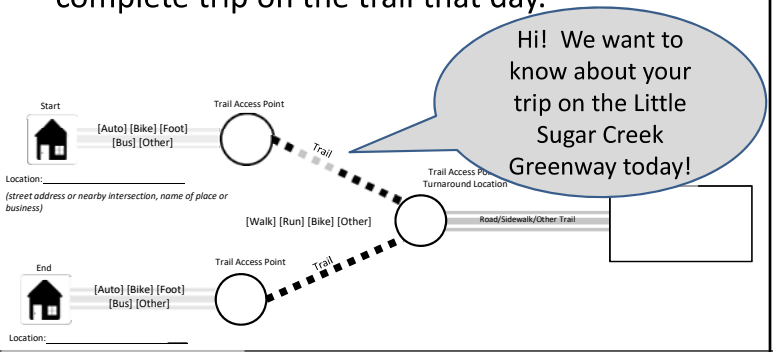
- Highlight:
  - It's anonymous.
  - It's quick.
- Round-trippers are more likely to stop on their return trip.
- Be "aggressively polite" – people like to be personally invited to engage.

Approach Trail Users - Tips

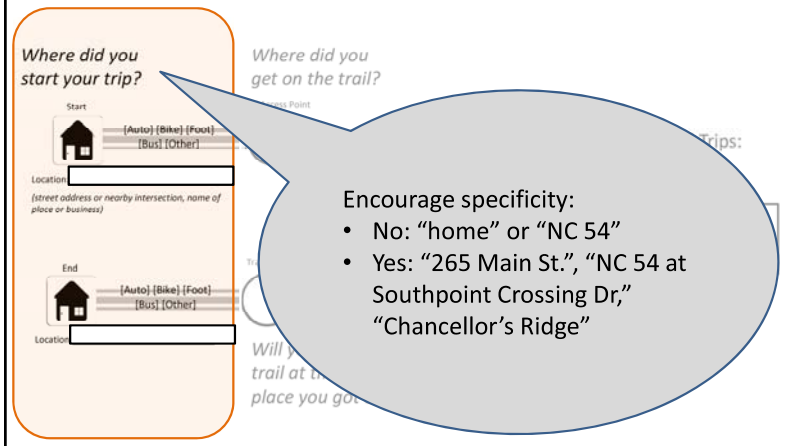
- Don't wait until they're at the table! (esp. cyclists)
  - Stand 15 ft or so in advance.
  - Make clear eye contact and use body language.
  - Use a loud, friendly voice as they approach.
  - Smile!
- Trail users need time to slow down and refocus.
- Offer trail users water from the cooler.

Q1 – Information about Today's Trip

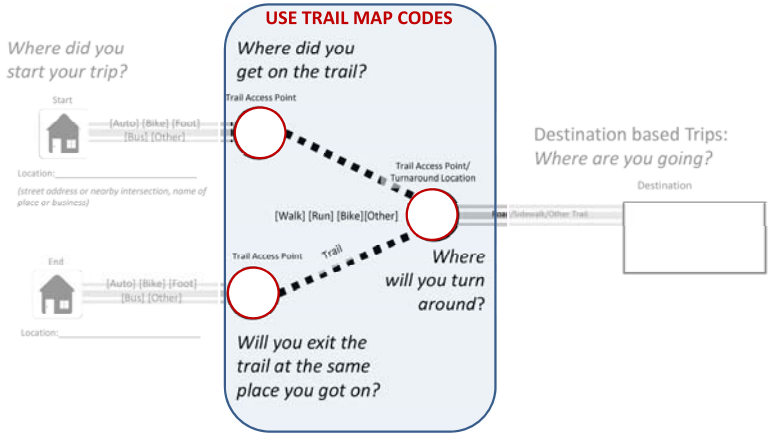
- The purpose of Q1 is to gather access point and exit/turn around points to understand the user's complete trip on the trail that day.



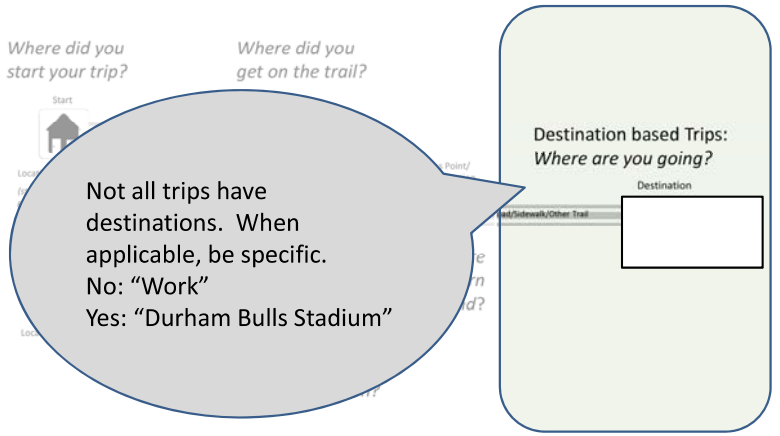
Q1 – Information about Today's Trip



Q1 – Information about Today's Trip

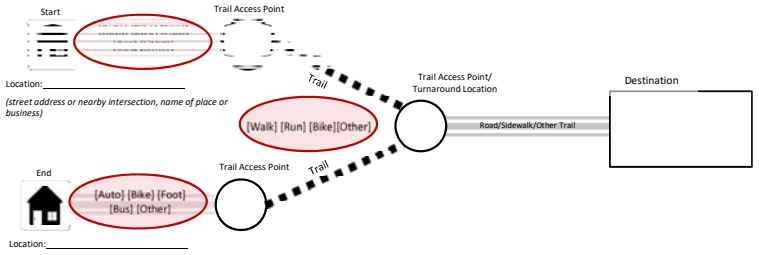


Q1 – Information about Today's Trip



Q1 – Information about Today's Trip

- Q1 is also used to gather mode information
- Circle the correct mode TO the trail, FROM the trail and ON the trail.



Q2 – Active Portion of Trip

- How long will the respondent be walking, running, biking, other?
- Responses should be given in minutes.
- This includes the time it took them to run, walk, or bike to the trail in addition to active time spent on the trail.

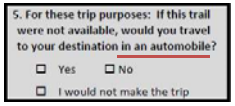
Q3 – Q5: Trip Purpose

- Subjective- try not to influence/bias response
- Q5 only relevant based on trip purpose

Trip Purpose	3. What is the main purpose of today's trip? (check one)	4. What is the secondary purpose of today's trip? (check all that apply)
Travel to/from work or school	☐	☐
Travel to/from dining/shopping/running errands	☐	☐
Travel to/from cultural attraction/entertainment/leisure activity	☐	☐
For exercise/recreation/sightseeing	☐	☐

5. For these trip purposes: If this trail were not available, would you travel to your destination in an automobile?
☐ Yes ☐ No
☐ I would not make the trip

Q5 Clarification



- "Yes" = I would drive to/from my destination
- "No" = I would still walk/bike/run to get to/from my destination
- "I would not make the trip" = self-explanatory, but clarify if commuting: "so, you wouldn't go to work/school/the library today if the trail were not here?"

Survey Questions

- Q6: Clarify if money spent doesn't align with destination.
- Q7: LSCG opened April 2012.
- Q8-Q10 cover the last 14 days INCLUDING today's trip.
- Q13: who they came with that day (never 0).
- Q14: Household = only people in household.
  - Q15 total responses should match Q14. Mode should match Q1.

Demographic Questions

- Q15 – Q18 provide valuable demographic info.
- Some people are uncomfortable providing this info- that's ok.
- Anonymous- only used in aggregate, nothing personally identifying on entire survey
- Ask them to point to household income range.

Ask, Listen, & Clarify

- Try to capture all trail activity for the day (e.g., commute there & back on one form)
- Ask the questions as written.
- Cross-check answers for consistency
  - Purpose is travel to work/school, but no destination
  - spent money but no destination given
  - Destination is Kroger but no money to be spent
  - trip purpose is shopping but no destination

Tips for Surveying Groups

- Pull group aside & Pass out extra clipboards
- You fill out one person's; get them to fill in theirs as you go
- Note that much of the front page will be same answer for all
  - Verify that they each made the same trail trip / same time / same purchases
- Much of back will be individual, except Q13.

Finalize Survey

- Write weekday and Station Number at top
  - "Station 1"
  - "Tue 10/18"
- File completed surveys in container.
- Refill clipboard

Count Procedures

Trail User Count Form

Name: John Doe Date: October 18, 2016

Location: St 1 - Myers St Time Period: 11:30am - 11:44am

User Type / Mode (circle all that apply)	Circle Dots for Group Members	Direction (check for towards North)	Gender		Approximate Age				Notes
			M	F	<18	18-25	26-55	>55	
B (W) R O / C D	•	✓	✓				✓		
B (W) R O / C D	•	✓		✓			✓		
(B) W R O / C D	•		✓				✓		new counter starting - Same Smith
B W (R) O / C (D)	•		✓			✓			
B (W) R O / (C) D	•		✓					✓	2 children in stroller
(B) W R O / C D	•	✓		✓			✓		
(B) W R O / C D	•	✓		✓	✓				on tagalong
(B) W R O / (C) D	•	✓	✓				✓		1 child in bike trailer
B (W) R O / (C) D	•	✓	✓				✓		1 child in stroller
B W R (O) / C D	•	✓	✓					✓	golf cart
B W R O / C D	•								

Count Procedures

- Start new form every 15 minutes
- Fill out top of form (Name, Location, Date, Time)
  - 6:30 – 6:44 AM -- 6:45 – 6:59 AM
  - 7:00 – 7:14 AM -- 7:15 – 7:29 AM
- If you need new form within same 15-min period:
  - Fill out top with same Time **AND**
  - Number pages at bottom (e.g. “1 of 2”, “2 of 2”)

Count Procedures

- Count everyone who passes your “line”

Count Procedures

- 1 row (record) for each independently mobile person

User Type/Mode	Gender	Age Range
B = Bicycling	M = Male	1 = less than 18
W = Walking	F = Female	2 = 18-25
R = Running or Jogging		3 = 26-55
O = Other (Skater, Scooter, etc.)		4 = more than 55
C = Child in stroller or otherwise being conveyed		
D = Traveling with dog		

Dependent or Independent?

Dependent or Independent?

Independent: separate records

Dependent or Independent?

Independent: Separate Record

Dependent or Independent?

Dependent: Circle "C"

Dependent or Independent?

Dependent: Circle "C"

Dependent or Independent?

Dependent: Circle "C"

(Note if more than 1 child in trailer)

Dependent or Independent?

Independent: Separate Records

Dependent or Independent?

Independent: separate record

Dependent or Independent?

Credit: www.pedbikeimages.org / Dan Burden

Independent: separate record for child on Tag-A-Long

Dependent or Independent?

Tandem bike =
2 records

Dependent or Independent?

Dependent: Circle "C"
(note # of children in trailer)

Independent: Use separate records

Dependent or Independent?

It Depends!

Dependent or Independent?

7 records!

Noting Groups

Trail User Count Form

Name: John Doe Date: October 18, 2016

Location: St 1 - Myers St Time Period: 11:30am - 11:44am

User Type / Mode (circle all that apply)	Circle Dots for Group Members	Direction (check for towards North)	Gender		Approximate Age				Notes
			M	F	<18	18-25	26-55	>55	
B (W) R O / C D	•	✓	✓				✓		
B (W) R O / C D	•	✓		✓			✓		
(B) W R O / C D	•		✓				✓		new counter starts here - Jane Smith
B W (R) O / C (D)	•		✓			✓			
B (W) R O / (C) D	•		✓					✓	2 children in stroller
(B) W R O / C D	•	✓		✓			✓		
(B) W R O / C D	•	✓		✓	✓				on foot along
(B) W R O / (C) D	•	✓	✓				✓		1 child in bike trailer
B (W) R O / (C) D	•	✓	✓				✓		1 child in stroller
B W R (O) / C D	•	✓	✓					✓	golf cart

Noting Direction

Trail User Count Form

Name: John Doe Date: October 18, 2016

Location: St 1 - Myers St Time Period: 11:30am - 11:44am

User Type / Mode (circle all that apply)	Circle Dots for Group Members	Direction (check for towards North)	Gender		Approximate Age				Notes
			M	F	<18	18-25	26-55	>55	
B (W) R O / C D	•	✓	✓				✓		
B (W) R O / C D	•	✓		✓			✓		
(B) W R O / C D	•		✓				✓		new counter starts here - Jane Smith
B W (R) O / C (D)	•		✓			✓			
B (W) R O / (C) D	•		✓					✓	2 children in stroller
(B) W R O / C D	•	✓		✓			✓		
(B) W R O / C D	•	✓		✓	✓				on foot along
(B) W R O / (C) D	•	✓	✓				✓		1 child in bike trailer
B (W) R O / (C) D	•	✓	✓				✓		1 child in stroller
B W R (O) / C D	•	✓	✓					✓	golf cart

Other Notes

Trail User Count Form

Name: John Doe Date: October 18, 2016

Location: St 1 - Myers St Time Period: 11:30am - 11:44am

User Type / Mode (circle all that apply)	Circle Dots for Group Members	Direction (check for towards North)	Gender		Approximate Age				Notes
			M	F	<18	18-25	26-55	>55	
B (W) R O / C D	•	✓	✓				✓		
B (W) R O / C D	•	✓		✓			✓		
(B) W R O / C D	•		✓				✓		new counter starts here - Jane Smith
B W (R) O / C (D)	•		✓			✓			
B (W) R O / (C) D	•		✓					✓	2 children in stroller
(B) W R O / C D	•	✓		✓			✓		
(B) W R O / C D	•	✓		✓	✓				on foot along
(B) W R O / (C) D	•	✓	✓				✓		1 child in bike trailer
B (W) R O / (C) D	•	✓	✓				✓		1 child in stroller
B W R (O) / C D	•	✓	✓					✓	golf cart

Wrap-up/Questions

Thank you for helping to Make the Trail Count!

Sarah O'Brien
Bicycle and Pedestrian Program Manager
ITRE – NCSU
skworth@ncsu.edu
919-515-8703 (work)
919-949-4489 (cell)

SUP Project Survey Data Cleaning Protocol - 2016

Cleaning or Modifying Data

General Procedures

- Assign an ID number to each survey, beginning with 1. Write the number on the lower right corner of the front of the survey, and enter it as the SurveyID.
- In general, questions where there is no response, responses are illegible, or the data is incorrect or undefined and it cannot be appropriately corrected or clarified through the below data cleaning process, code it as "999."
- In general, if a response is correctly left blank, leave the field blank.

Q1

- In general, leave information for Start, Destination, and End "as is" for data entry if a street address, nearby intersection, name of place, business, or neighborhood name is provided. If Start or End fields are blank, code as "999." If Destination field is blank, leave "as is." If End field is marked as "same," leave "as is."
- Trail Access Point(s) and Trail Access/Turnaround Point must correspond with existing map numbers for the particular site that was surveyed. If a trip distance or mile marker number is provided instead of a map number, flag the survey for further review.
- If mode used to travel **from** the trail is not circled, cross-check with mode used to travel **to** the trail.
- If mode used to travel **on** the trail is not circled, cross-check field with Q15.
- **If multiple Trail Access/Turnaround Points are provided that indicate multiple turnarounds during a single trip, flag the survey for further review.**
- *For data entry, if the starting Trail Access Point equals the ending Trail Access Point and a Turnaround Point is provided, code TripEnd_Cleaned as "777."*
- *For data entry, if a starting Trail Access Point/Turnaround Point is provided with an end destination that is different from the starting Trail Access Point, code ATT_Turnaround as "888."*

Q2

- Convert any responses given in hours to minutes.
- Round responses given in minutes and seconds to the nearest whole minute.
- If a range is provided, enter the average of the range.

Q3

- If more than one main purpose is selected, cross-check the response with Q9.

Q4

- If a secondary purpose matches the main trip purpose, clean the secondary purpose response by marking through it with a single line.
- If more than one secondary purpose is selected, cross-check with Q9 to see that all purposes are represented in previous trips on the trail if it was not the respondent's first trip on the trail.

Q5

- If the primary trip purpose provided is “exercise/recreation/sightseeing,” clean any response to Q5 by marking through it with a single line.

Q6

- If a range is given for expenditure amounts (e.g. $2-$4), enter the average of the range (e.g. $3).
- Do not round any cents to whole dollars.
- If all expenditure amounts and corresponding business names are left blank, code all fields as “999.”
- If a response is provided for at least one item, but the remaining goods or services expenditure amounts are left blank, code them as “0” and leave the corresponding business name fields as blanks.
- If a response is provided for at least one item, but the corresponding business name is left blank, code the business name as “999.”
- If a respondent fills in expenditure amounts with dashed lines, empty sets, or marks of any kind, code each good or service as “0” and leave the corresponding business name fields as blanks.
- *For data entry, if a respondent identifies an “other” cost item, record the description of the good or service in “Other_Cost_Desc” and enter the value in “Other_Cost_Amt.”*

Q7

- If it was the first time the respondent used the trail, put the month and year the survey was taken if the field is blank.
- If the respondent wrote “when it/the trail first opened” or any response other than the month and year of their first trip to the trail, leave the response “as is.”

Q8

- If it was the first time the respondent used the trail, the response should be “1.”
- If a range is provided, enter the average of the range.

Q9

- If it was the first time the respondent used the trail, the response should be “1” in the field that corresponds to the primary purpose indicated in Q3.
- The sum of trips should equal Q8. Invalid responses such as percentages and descriptions should be coded as “999” if the number of trips cannot be determined from Q8 and additional cross-checking.

Q10

- If a fraction is provided, convert to percentage (e.g. 1/7 = 14%)
- If no reponse is provided, code as “999.”

Q11

- If Country is blank but State/Providence is identified, enter the corresponding Country.

- If State/Providence is blank, but a readily recognizable town from NC is identified in City/Town or a Zip is filled in, enter "NC" or the appropriate State/Providence for the corresponding zip code.
- *For Proximity column for data entry, proximity types include: Local or Non-Local.*
    - *Code as Local if the given zip code is one that is adjacent to or surrounds the SUP under study*
    - *Code Non-Local if the given zip code is one that is not adjacent to or surround the SUP under study*

Q12

- If permanent resident is checked, cross-check with Q11. If visitor is check, but duration of stay is blank, code duration of stay as "999."

Q13, Q14

- If a "0" response is given for Q13 and Q14, recode both as "1."
- Cross-check Q14 with Q15. If the number of persons included in Q15 does not match the number provided in Q14, code the field for each additional person other than the respondent in Q15 as "999."

Q15, Q16, Q17, Q18

- Cross-check travel mode with Q1.
- Cross-check total number of listed persons with Q13 and Q14.
- If only the respondent is traveling on the trail, responses should be provided in the "You" fields in Q15. If responses are provided in one of the additional "Person" fields, mark through the "Person" fields with a single line and transfer the responses to the "You" fields.