Bicycling is an essential component of any transportation system. The successful promotion and growth of bicycling in a community improves the health of its residents, creates safer travel for all users, betters the environment, and improves the quality of life. A municipality can maximize economic competitiveness and return on transportation investment by creating bikeable communities that are accessible and attractive.

The benefits of bicycling cut across health, economics, the environment, and equity. Health and physical activity are particularly important elements of this plan. Between 1990 and 2011, the rate of obesity in North Carolina more than doubled from 13% to 28.6%.

Regular physical activity, such as through bicycling, can have a huge impact on the health and wellness of residents. Removing barriers to bicycling for transportation and recreation will improve health by increasing opportunities for physical activity.

This physical inactivity also costs the State a great deal. A recent report estimated the annual direct medical cost of physical inactivity in North Carolina at $3.67 billion, plus an additional $4.71 billion in lost productivity. However, not only can bicycling reduce these costs, it is also an economically efficient transportation mode for many North Carolinians who cannot afford to own a vehicle. In addition, bicycling and bicycle facilities can have huge impacts on local economies – a case study of the Northern Outer Banks found that an estimated 680,000 visitors were found...
Introduction

> Background, Trends and Types of Cyclists
Bicycling and the BiPed Plan
Infrastructure
Safety
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Summary

Many visitors come to the Outer Banks to bicycle, creating significant economic impacts.

Greensboro’s population bicycles to work.\(^8\) A word of caution with the above data, however – the ACS is limited in that it is survey data from a sample of the population, only records “journeys to work” or commuting, only counts the “primary” mode of transportation (does not count if someone occasionally bicycles to work), and provides estimates that can have large margins of error. Still, there is considerable opportunity for Greensboro to transition to a larger bicycle mode split, especially in commuting. The 2009 National Household Travel Survey reported approximately 40% of all trips taken by Americans are distances of 2 miles or less, a distance achieved by a 10-minute bike ride. With regards to commute trips, 42% of North Carolinians live within 10 miles of their place of work\(^9\) – longer than most residents would want to walk, but not an unreasonably long bicycle ride.

Despite the benefits described above, North Carolina and Greensboro residents bicycle in fairly low numbers. According to data from the 2009-2011 American Community Survey (ACS) of the Census Bureau, only 0.2% of North Carolina commuters bicycle to work, slightly above the average of its neighboring states (excluding Virginia) but lower than the nationwide average of 0.6%.\(^7\) This ranks North Carolina as the 41st state for bicycling commuting rates. The 2012 ACS estimates that 0.4% of Greensboro’s population bicycles to work.\(^8\)

In 2006, the Portland, OR, Office (now Bureau) of Transportation released a paper by Portland Bicycle Coordinator Robert Geller which identified “Four Types of Cyclists”, describing the population of Portland by their comfort with bicycling, based on his professional experience. Geller identified the “Interested but Concerned” group of people (the largest percentage) as the category of the population that transportation planners should be marketing to with regards to creating bicycle facilities for transportation. Table 2.1 describes these categories and their attributes. Jennifer Dill and Nathan McNeil of Portland State University confirmed the basic proportions of the different categories in the Portland area through research conducted in 2012. Although based on surveys conducted in Portland, OR, the same principles can be applied to understand the population of Greensboro that should be targeted for bicycle infrastructure.

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\(^1\)Institute for Transportation Research and Education at North Carolina State University. “The Economic Impact of Investments in Bicycle Facilities: A Case Study of the Northern Outer Banks.”


\(^3\)Ibid.


Recent studies and surveys have revealed that safety is one of the most common concerns that people have about bicycling more often. The Institute for Transportation Research and Education (ITRE) conducted a survey of North Carolina residents and found that 80% of respondents felt that bicycling for daily needs is currently somewhat dangerous or very dangerous.10 More than 70% of respondents agreed that accommodating cyclists as regular users and installing bike lanes with new roadway construction, as well as retrofitting existing roads to add bike lanes, were the top solutions cited to improve bicycle safety.11

Cities with a high bicycle mode split have successfully decreased the element of fear associated with bicycling in an urban environment. Their transportation systems are designed so bicycling is often the most logical, enjoyable and attainable choice for a large percentage of their population for trips of certain lengths. This is achieved through focusing on creating shorter trip distances, improving bicycle facilities, and better end-of-trip facilities. Many parts of this chapter will focus on creating the facilities and programs to attract the “Interested but Concerned” population to bicycling.

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**TABLE 2.1**

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>PERCENTAGE OF POPULATION</th>
<th>ATTRIBUTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong and Fearless</td>
<td>1%</td>
<td>Rides on any roadway (where legal) regardless of road conditions</td>
</tr>
<tr>
<td>Enthused and Confident</td>
<td>9%</td>
<td>Will ride on lower-stress facilities, and is attracted by an advanced bikeway network and supporting infrastructure</td>
</tr>
<tr>
<td>Interested but Concerned</td>
<td>60%</td>
<td>Likes cycling and would ride if they felt safer; need streets with less cars at slower speeds and paths without any cars</td>
</tr>
<tr>
<td>No Way No How</td>
<td>30%</td>
<td>Lacks ability to bicycle or interest in bicycling</td>
</tr>
</tbody>
</table>

**Bicycling and the BiPed Plan**

The 2006 BiPed Plan was the first document produced by the City of Greensboro or MPO to make specific bicycle facility recommendations and outline their implementation. Before the development of the BiPed Plan, there were no dedicated bike lanes in the City or MPO, and there was no plan for a systematically connected on-street bicycle network. The BiPed Plan Update and this chapter build upon the trailblazing work of the BiPed Plan to create a more bike-friendly MPO and connect the non-motorized network.

**Table 2.2** shows the recommendations proposed in the 2006 BiPed Plan, facilities and infrastructure implemented since 2006, and the new recommendations of the 2015 BiPed Plan Update. The methodology for the new recommendations is included in the Bicycle Infrastructure Recommendations section of this chapter. Facility mileage is calculated in centerline miles of roadway to be able to properly compare between the 2006 BiPed Plan and this 2015 BiPed Plan Update. Bike facilities that were proposed in the 2006 BiPed Plan and not implemented were reviewed carefully by planners and engineers for their feasibility. As a result, many recommendations were modified – some were not included in the 2015 BiPed Plan Update, and some new recommendations were added. This is discussed in more detail in Infrastructure – Bicycle Accommodations – Recommendation. It should also be noted that bicycle parking is reported by number of physical rack locations, not parking spaces, and only includes publicly installed bicycle parking.

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10Ibid, Pg. 2-29.
11Ibid, Pg. 2-30.
WHY PROTECTED BIKE LANEs?

Based on surveys conducted in Portland, OR

Reaching the “Interested but Concerned” segment of the population requires the development of more separated bicycle facilities such as protected bike lanes.
A considerable amount of progress has been made since BiPed was adopted in 2006. It reflects a real and significant shift in transportation system management approaches in the Greensboro area. New facilities are routinely being installed with new roadway construction, and will be included with the projects on Horse Pen Creek Road, Alamance Church Road, and Holts Chapel Road.

Since the 2006 Plan, some changes in thinking have occurred as to what comprises a bicycle facility and how bicycle facilities are measured. In particular, edgelines are no longer considered a bicycle facility, and therefore none are included in the list of proposed facilities. They are still included in the current facilities since they do serve the purpose of aiding bicycle transportation, but they are now recommended for conversion to full bicycle lanes where possible. For example, Cornwallis Avenue between Lawndale Drive and Elm Street was converted from an edgeline to a bicycle lane in 2014. Bicycle facilities will also be measured based on the length of each physical facility as opposed to the centerline of the roadway it falls on. Counting facilities in bike-lane miles (or simply lane-miles) instead of centerline miles is better for tracking maintenance and accounting for each type of facility, among other benefits. More information about these changes is found in the Bicycle Infrastructure Recommendations section of this chapter.

The Bicycle Chapter is the first of three BiPed modal chapters (bicycle, pedestrian, and trails and greenways). The Bicycle Chapter includes an overview of the existing network, an analysis of safety trends, a description of the different aspects of the bicycle infrastructure, a summary of implementation progress since 2006, a review of bicycle needs, and concludes with a discussion of recommended capital improvements, maintenance investment, and supportive programs.

The landscape of bicycle planning is changing rapidly and this plan maps out the City’s evolution to participate in these changes. This chapter will describe new frontiers in infrastructure, safety, policies, and programs to make bicycle transportation an everyday part of planning and engineering.

### TABLE 2.2
Bicycle Facilities in the Greensboro MPO

<table>
<thead>
<tr>
<th>STATUS OF BICYCLE FACILITIES (MEASURED IN CENTERLINE MILES)</th>
<th>BICYCLE LANES</th>
<th>PROTECTED BICYCLE LANES</th>
<th>BICYCLE PARKING LOCATIONS</th>
<th>PAVED SHOULDERS (4’ OR MORE)</th>
<th>OTHER ON-ROAD FACILITIES*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposed in 2006 BiPed Plan</td>
<td>131.8</td>
<td>0</td>
<td>Not Specified</td>
<td>532.7</td>
<td>54.3</td>
</tr>
<tr>
<td>Implemented since 2006 BiPed Plan</td>
<td>11.9</td>
<td>0</td>
<td>~100</td>
<td>0</td>
<td>45.1</td>
</tr>
<tr>
<td>New facilities proposed in 2015 BiPed Plan Update</td>
<td>134</td>
<td>10</td>
<td>100</td>
<td>498</td>
<td>20.5</td>
</tr>
</tbody>
</table>

*Other on-road facilities include edgelines, shared pavement markings, and signed bike routes.