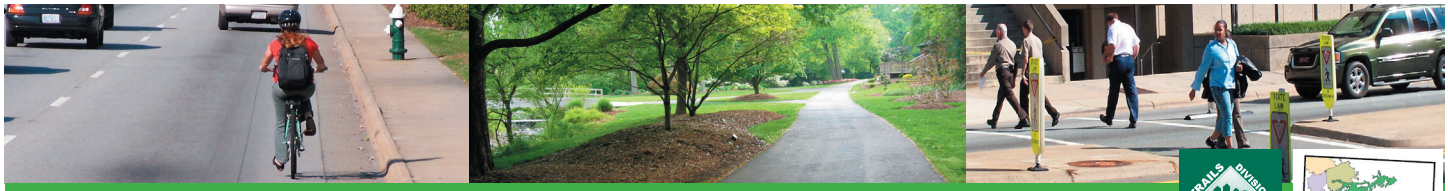


Chapter 3: Needs Assessment

3.1 Overview

The need and demand for a more accessible, safe and functional bicycle, pedestrian and greenway system is paramount throughout the Greensboro Urban Area. This is clearly articulated by community residents who attended open house meetings, and is more strongly evident in surveys conducted by the University of North Carolina at Greensboro Department of Public Health Education and through additional interest based surveys conducted by Greenways Incorporated.

This chapter defines the specific needs of area residents. The issue of health and wellness is addressed from national, state, and Greensboro perspectives. Next, transportation safety, accessibility, and enhanced mobility are discussed with a detailed look at bicycle/pedestrian crash data. Then, a Level of Service (LOS) is provided for existing bicycle facilities and greenways. Finally, a summary is given of public input and need.

3.2 Health and Wellness Issues

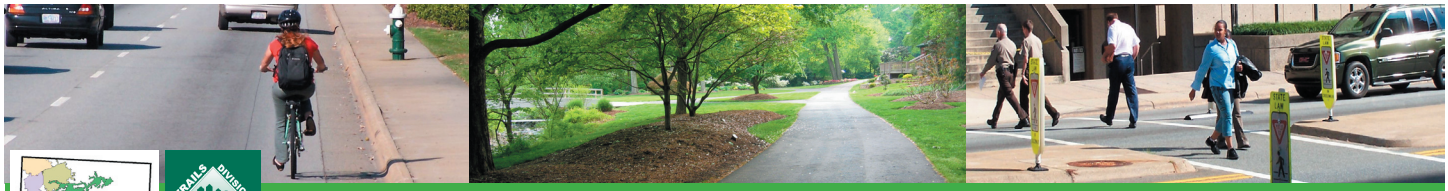
It is well documented that an active community is a healthy community. The declining health of America's population is alarming. Study after study affirms that sedentary lives and prolonged periods of inactivity are major deterrents to health. Land use and transportation are quickly becoming areas of focus as communities strive to become more walkable, bikeable and accessible. Transportation safety and enhanced mobility along with the pattern and density of development are proven corollaries to community health and wellness. In 1996, a report released by the U. S. Surgeon General, entitled "Physical Activity and Health," concluded that a sedentary lifestyle is a primary factor in more than 200,000 deaths each year, equivalent to 25 percent of all deaths from chronic disease in the United States. The Surgeon General has declared obesity an epidemic in our nation. The rise in the occurrence of cardiovascular disease, hypertension, diabetes, osteoporosis and some cancers are clearly linked to lack of physical activity.

Figure 3(a). Walking just 30 minutes a day can enhance healthy living.

The declining health (both in terms of physical fitness and in some cases longevity) of the American population is a critically important issue that is rightfully receiving a substantial amount of attention. For many health professionals across the nation, the lack of ready access to environments that support physical activity is considered an important factor in solving health and wellness problems. While the links between environment and physical activity and the role of factors such as socioeconomics, climate, and culture is ongoing, the basic fact that walkable and bikeable communities induce more physical activity appears beyond dispute.

Communities can take action to improve public health by making increased physical activity both attractive and available. Specific to North Carolina and the Greensboro Urban Area, steps are already being taken to address public health issues and define the role that community organizations, as well as national, state and local governments, can play in promoting healthy living.

Health statistics for residents of the Greensboro Urban Area and the Triad Region show that the overall well



being of these local populations is in decline, mirroring the national picture. Health problems within the area and region are due in part to patterns of growth and development that have encouraged an increasingly sedentary lifestyle by failing to offer access to outdoor resources.

One of the actions that the Greensboro community is taking is to develop and provide access to bikeways, sidewalks, greenways and trails that encourage people to venture outside and enjoy the outdoors. The community is also promoting both programmed and unprogrammed activities. Where these activities take place and how residents achieve access to these landscapes are central to the success of public health initiatives.

Within Greensboro, the link between health, wellness and greenways is just beginning to be documented but historically, the health programs in the City have been linked with parks and recreation efforts. The City of Greensboro operates a parks system that includes more than 170 sites, encompassing 3,545 acres of land. Additionally, the city protects as open space an estimated 2,000 acres of land around water supply reservoirs, some of which support greenway trail development. Within this system of parks and protected lands are approximately 81 miles of greenway trails that offer residents access to the outdoors. Most of these trails are located in the north and northwestern sections of the city, away from its most densely populated areas.

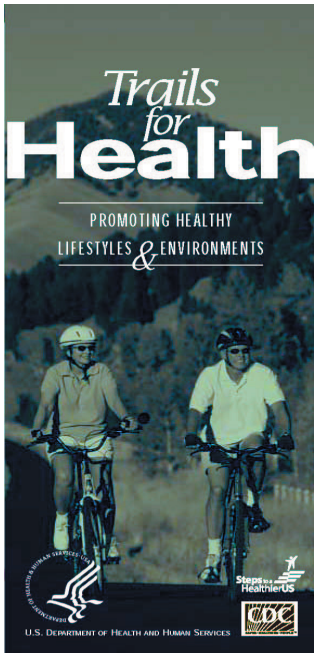
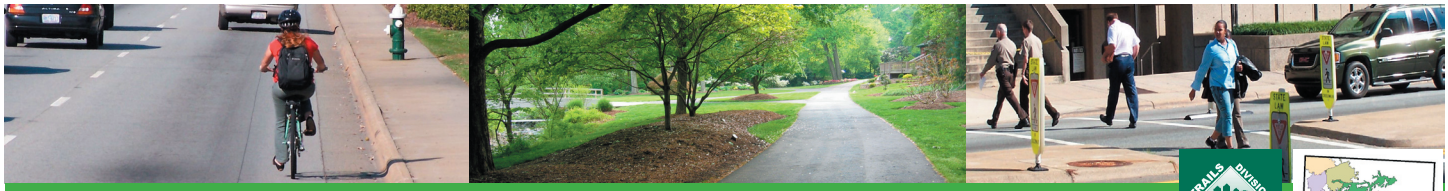


Figure 3(b). *Trails for Health* is a tremendous resource for the City of Greensboro.

A collaborative effort of the Guilford County Department of Public Health, High Point Regional Health System, and the Moses Cone-Wesley Long Community Health Foundation is the Guilford Health Partnership, the certified local Healthy Carolinians initiative in Guilford County. Guilford Health Partnership (GHP), a community partnership aimed at improving health of people in Guilford County, includes the talents and resources of over 200 partnership members, representing over 70 organizations and groups. GHP's role is to regularly assess the community's health, engage in strategic health planning, and encourage collaborative efforts to address health concerns. Based on the 2005 Community Health Assessment, GHP and partners are encouraging positive action to address the following priority issues: Chronic diseases (specifically cancer, cardiovascular disease, respiratory conditions, and diabetes), HIV/AIDS, sexually transmitted diseases, mental health, unintentional and intentional injury, and infant mortality. Equally important are the associated risk factors that influence these health issues, specifically: Access to care, health disparities, physical inactivity, unhealthy diet, obesity/overweight, tobacco use, unsafe sexual behavior, substance abuse, air quality, and water quality. By working together, the goal is to create a healthy community. The Greensboro Parks and Recreation Department is one of the partners in the Guilford Health Partnership.

There are numerous health and wellness programs available to the residents of the Greensboro Urban Area. In an assets inventory completed in 2001, the Guilford Health Partnership lists 36 different programs that are currently addressing physical activity. These programs range from offerings at the Moses Cone Heart Center, to the YWCA of Greensboro, to the Four Seasons Walking Club. These health and



wellness programs target different populations and serve various interests, such as the developmentally disabled, persons with osteoporosis, senior citizens and immigrants. What they share in common is the desire to ensure that residents of the city and county have access to programs that promote a healthy lifestyle. Foremost among many of the programs is the opportunity to simply get out and take a walk.

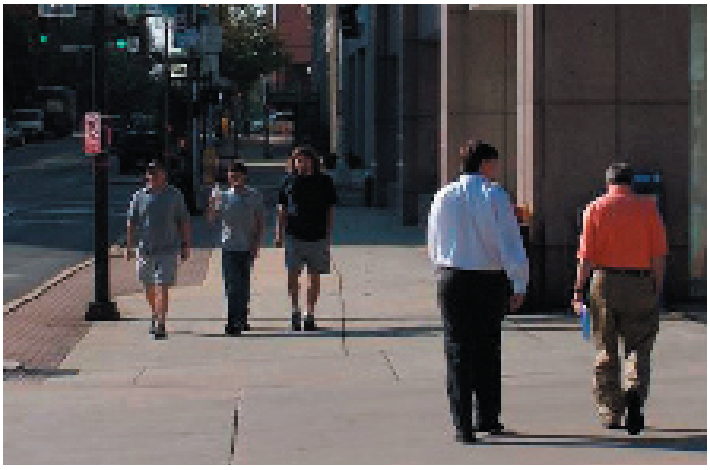


Figure 3(c). People walking in Downtown Greensboro.

The Guilford County Department of Public Health sponsors the Reach For Health program, directed at promoting good health through exercise, diet, and stress management and Walking Adventures which takes place in the spring and fall. In the downtown areas of both Greensboro and High Point and at the Piedmont Centre in Guilford County, residents are encouraged to walk a different route each day. Sponsors in Greensboro include the Greensboro Parks and Recreation, Guilford Health Partnership, City of Greensboro's Employee Wellness, and the Heart and Stroke Health Partnership. Sponsors in High Point include: City of High Point, YWCA of High Point, and the Heart and Stroke Health Partnership. There are also plans to expand this effort to other areas. These and other similar health and wellness programs within the Partnership offer opportunity for residents to be linked with outdoor resources to participate in self directed health and wellness activities.

Based on a technical review and inventory of the Greensboro Urban Area environment, it is clear that one of the greatest deterrents to a healthy lifestyle is the lack of an accessible, safe, convenient and functional network of bicycle, pedestrian and greenway facilities. As will be shown later in this report, it is one of the most notable deterrents in motivating metro residents to get outside and take a walk, or ride a bike.

3.2.1 Chronic Disease

More than two-thirds of all deaths in Guilford County are due to chronic degenerative diseases, such as heart disease, cancer, diabetes and obesity. These diseases are caused by a host of factors, including the environment, genetics, and also lifestyle choice. Increasing physical activity, as mentioned previously, can help prevent these diseases in many cases.

Heart Disease

Heart disease remains the number one cause of death in Guilford County. Figure 3(d) below illustrates the prevalence of heart disease throughout the County along with the general accessibility to greenways.

Cancer

Cancer is the second leading cause of death in Guilford County. Figure 3(e) below illustrates where cancer is most prevalent in Guilford County along with the general accessibility to greenways.

Obesity

Obesity is on the rise throughout Guilford County, increasing at the rate of 30% over a four year period. Obesity rates are higher among minorities throughout Guilford County.

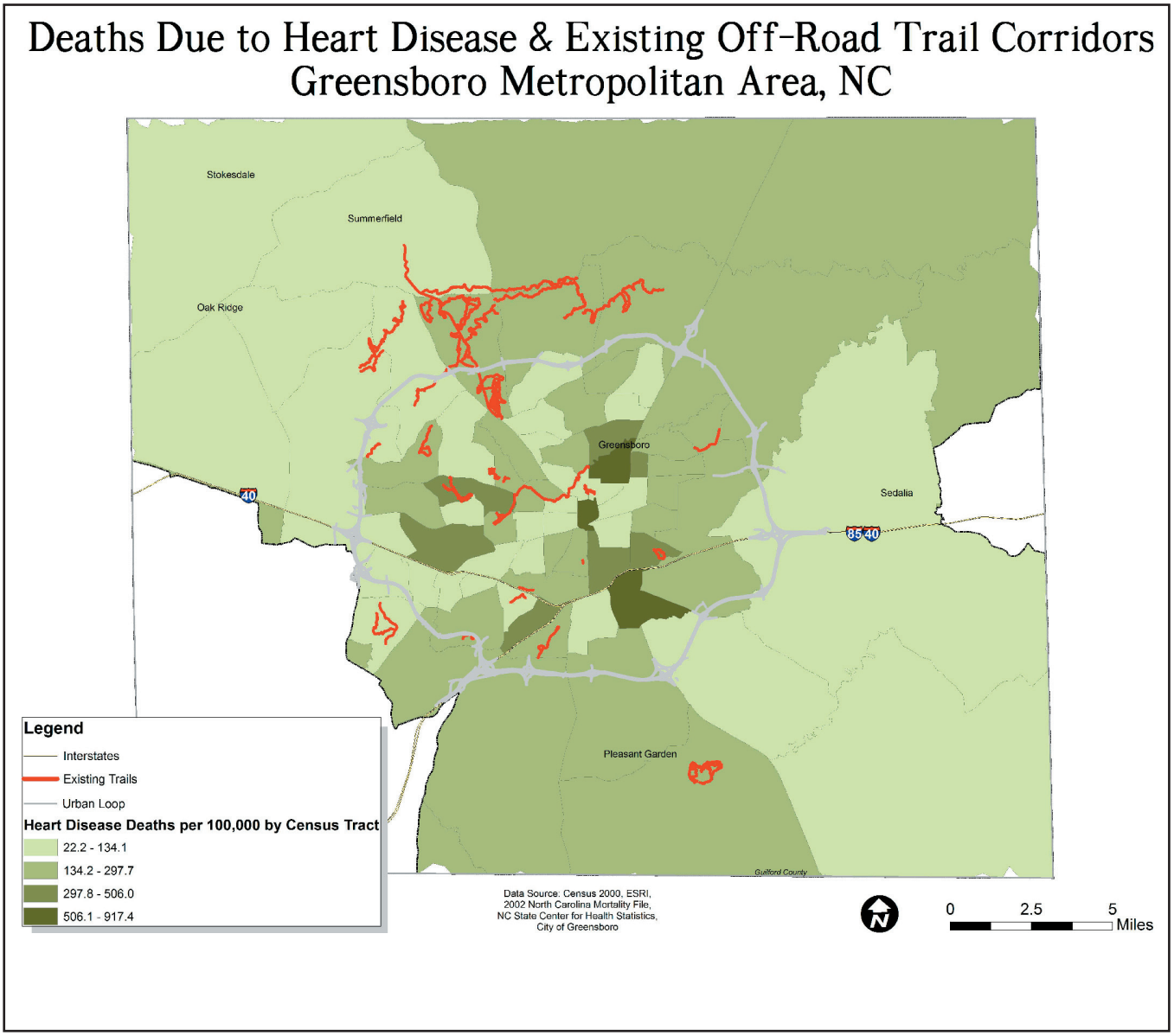


Figure 3(d). Map of Heart Disease Death Frequency and the Existing Trail System.

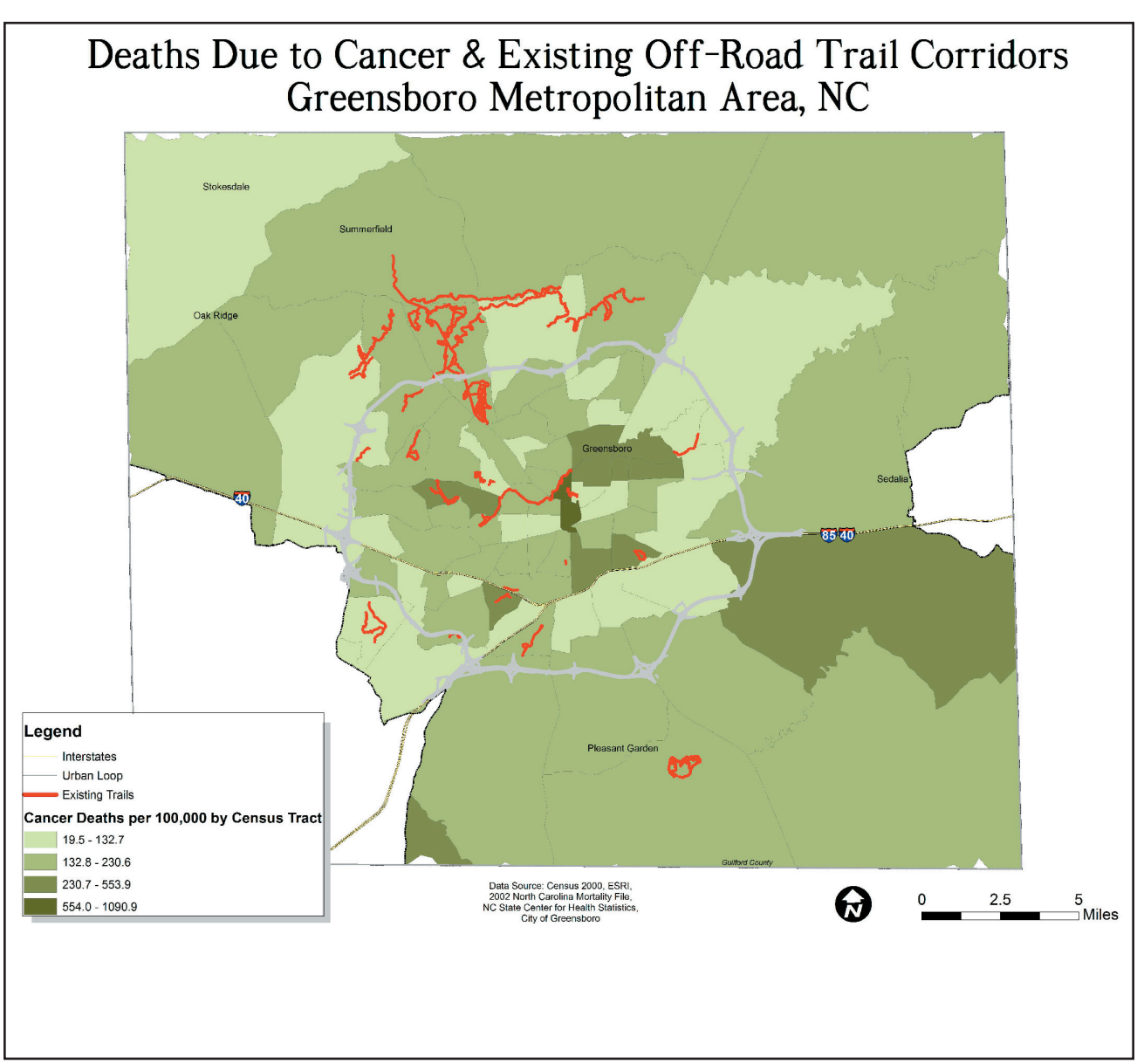
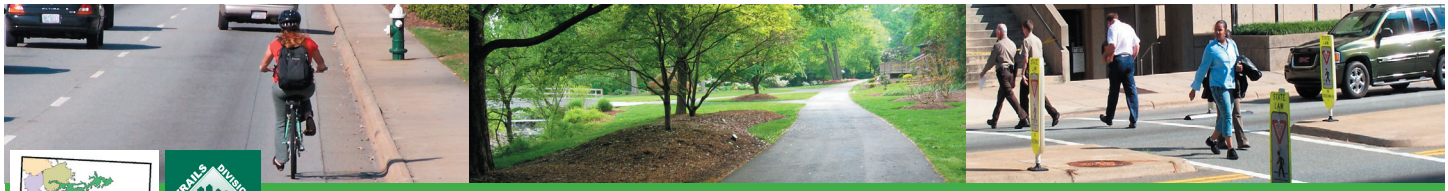


Figure 3(e). Map of Cancer Death Frequency and the Existing Trail System.



3.3 Non-Motorized Transportation Safety, Accessibility, and Mobility

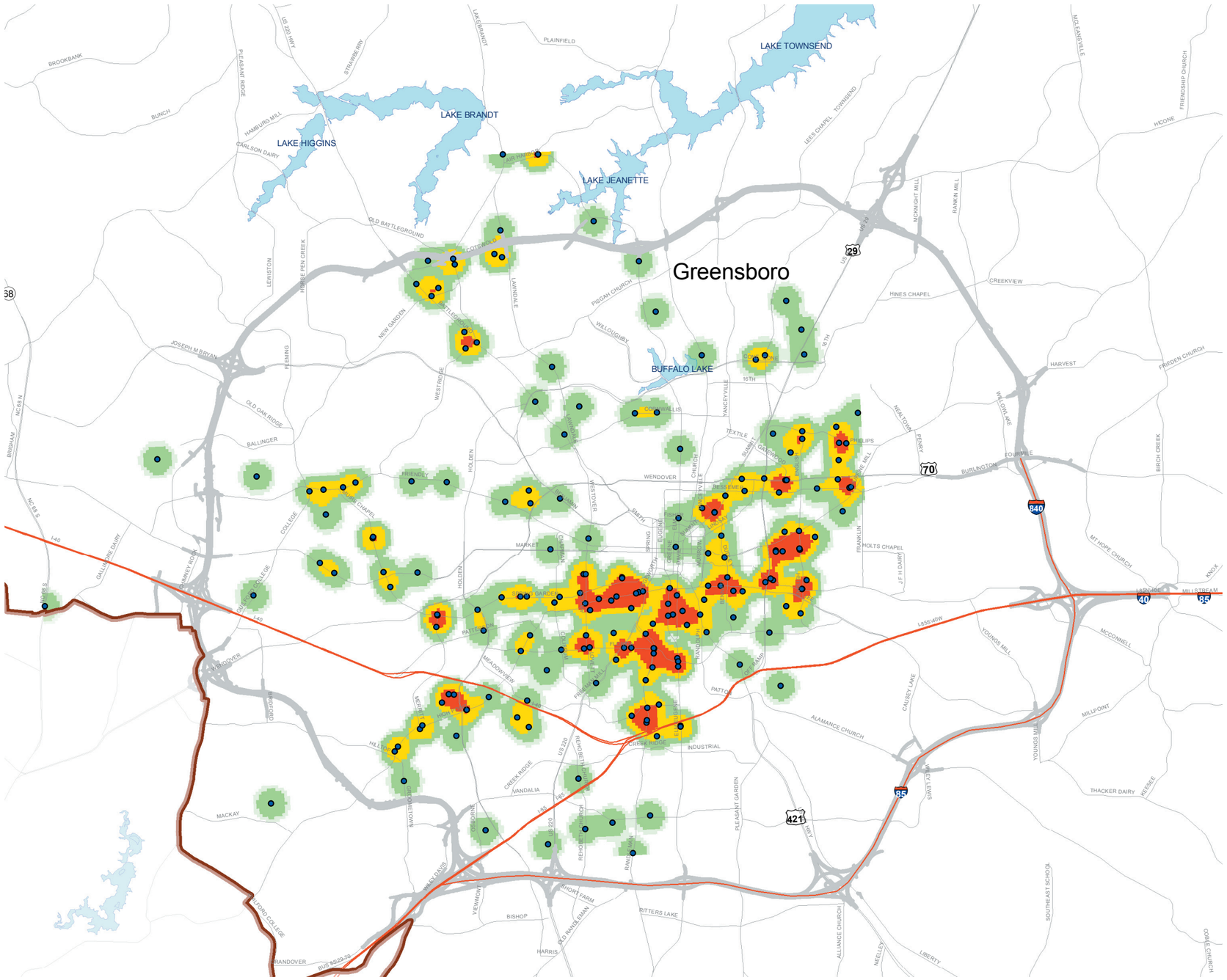
Health and wellness issues can be further addressed by analyzing other areas of need in the Greensboro Urban Area. Improving safety, increasing accessibility, and enhancing mobility are all goals of this Plan and needs of the community. There is a need to not only accommodate existing non-motorized travel but also to facilitate and increase levels of non-motorized travel and improve safety. As discussed in Chapter 2, recent land use, comprehensive, and transportation planning efforts call for mixed use, higher density development and increased walkability which are complementary strategies. There is a need for development, land use, and transportation decisions that consider the scale of human movement and design for safe everyday non-motorized travel throughout the Greensboro Urban Area.

Figure 3(f). Student pedestrians along Spring Garden Rd. at UNC-Greensboro. This is a case of land use development and non-motorized facilities that support and increase bikeability and walkability.

3.3.1 Bicycle and Pedestrian Crash Data

A central goal of this plan is to increase the safety of pedestrian and bicycle activity in the Greensboro Urban Area. To assess the current level of safety for non-motorized transportation, information about pedestrian and bicyclist crashes was gathered from police reports for the City of Greensboro[1]. This analysis did not look at crash data outside of the City because of data limitations at the time. Greensboro MPO staff will collect information about pedestrian and bicycle crashes outside of the City during the Plan implementation phase. Pedestrian crash reports were analyzed for a 5-year period, 2000-2004, and bicycle crash reports were analyzed for 6-year period, 1997-2002. Key findings about pedestrian and bicycle crashes in Greensboro are listed below.

- There were an average of 94 pedestrian crashes and 37 bicycle crashes reported in the City of Greensboro each year. The number of reported crashes was relatively stable during the years examined.
- There were 17 pedestrians killed on Greensboro streets during the five year period (more than 3 pedestrians per year). An additional 42 pedestrian crashes resulted in a disabling injury (more than 8 per year).
- There were 3 bicyclists killed in Greensboro over the six year period (one every other year). An additional 14 bicycle crashes resulted in a disabling injury (more than 2 per year).
- 55% of all pedestrian crashes involved pedestrians who were Black; 38% involved pedestrians who were White.
- 63% of all bicycle crashes involved bicyclists who were Black; 32% involved bicyclists who were White.
- 60% of pedestrian crashes and 88% of bicycle crashes involved males.
- 29% of pedestrian crashes and 47% of bicycle crashes involved children and teenagers under age 20.
- 17% of pedestrian crashes and 16% of bicycle crashes were hit-and-run.
- While 61% of pedestrian crashes and 71% of



Greensboro Urban Area

Comprehensive Bicycle, Pedestrian, and Greenway Plan

Map 3.1

Bicycle Crash Density

Legend

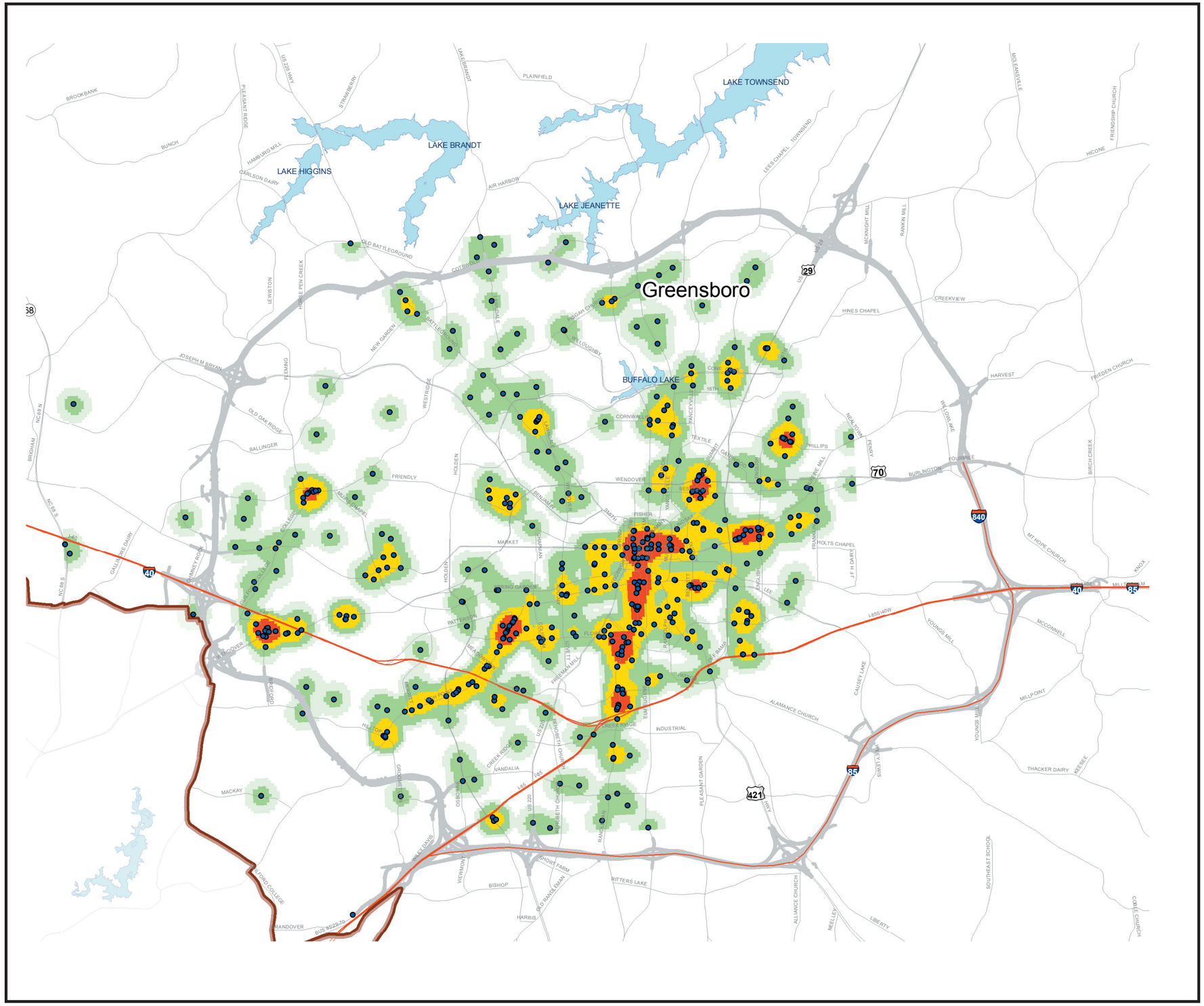
- Bicycle Crash

Density (Crashes per sq.mile)

- 1 - 3
- 3 - 8
- 8 - 15
- 15 - 28
- Interstates
- Urban Loop
- Major Roads
- Greensboro MAB
- Lakes

1 Miles

Data Source: City of Greensboro, Police Department based on records within City of Greensboro from 2000-2004



Greensboro Urban Area

Comprehensive Bicycle, Pedestrian, and Greenway Plan

Map 3.2

Pedestrian Crash Density

Legend

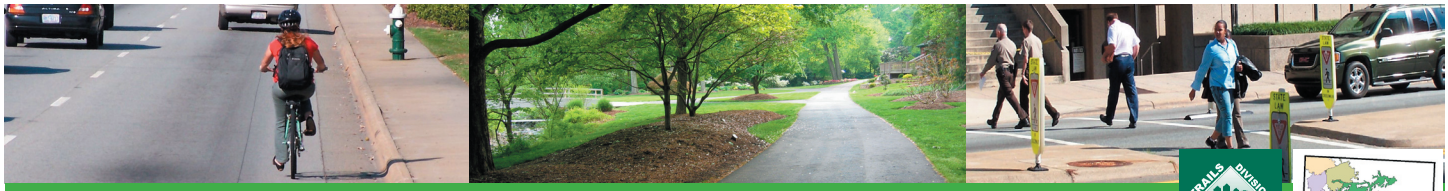
- Pedestrian Crash

Density (Crashes per sq.mile)

- 1 - 5
- 5 - 15
- 15 - 40
- 40 - 103
- Interstates
- Urban Loop
- Major Roads
- Greensboro MAB
- Lakes

1 Miles

Data Source: City of Greensboro, Police Department
based on records within City of Greensboro from 2000-2004



bicycle crashes occurred during daylight, many crashes were also reported at night. 33% of pedestrian and 22% of bicycle crashes occurred during darkness.

- 70% of the pedestrian and 76% of bicycle crashes between 2000 and 2004 involved pedestrians and bicyclists either traveling in or crossing roadway travel lanes (the other crashes were on shoulders, sidewalks, parking lots, and in other off-road locations)[1]

In general, the pedestrian and bicycle crashes were concentrated in parts of the City with higher levels of pedestrian and bicycle activity, such as in Downtown Greensboro, near the colleges and universities, along bus routes, and in lower-income areas where fewer people have access to automobiles. More specifically, these non-motorized crashes tended to occur more often on multi-lane roadways with high volumes of traffic. Therefore, many of the pedestrian and bicycle facility improvements listed in the recommendations chapter are for these roadway corridors.

Other areas in need of bicycle and pedestrian facility improvements may not be reflected as problematic on the following crash analysis maps, because they are not conducive to bicycle and pedestrian traffic. However, that does not mean those areas are safe and will not be the location of bicycle or pedestrian crashes in the future.

Maps 3.1 and 3.2 show the locations of bicycle crashes and pedestrian crashes respectively. A simple surface layer was developed on these maps in order to present the general densities of crashes as well.

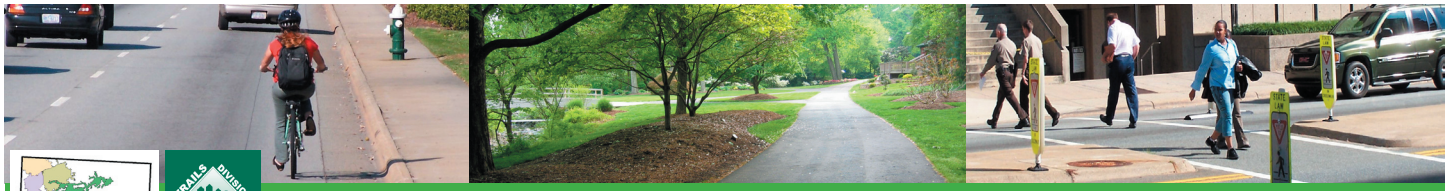
3.4 Level of Service Assessment

How does the Greensboro Urban Area compare when it comes to providing bicycle, pedestrian and greenway facilities? During the past several decades, the National Recreation and Park Association (NRPA) has recommended standards for the provision of open space, park and recreation facilities in communities. Using these and other standards, planning professionals often define a "level of service" or "LOS" to calibrate how well the needs of a community are met by existing and planned greenspace facilities.

For purposes of this Greensboro Urban Area Bicycle, Pedestrian and Greenways Plan, LOS can be described as a measurement of supply versus demand for greenspace, trail and other "passive" recreational facilities that serve residents of the area. ("Passive" generally refers to non-competitive and non-team sports activities such as walking, bicycling, picnicking, horseback riding, wildlife viewing and enjoying open space.)

Clearly the distance to, and availability of, bicycle, pedestrian and greenway trails is an important factor in determining whether a community adequately serves its population. Factors such as actual physical distance; amount and type of bike and pedestrian facilities; and the level of accessibility to users of all ages, income groups and abilities are typically considered.

While optimal distances and population ratios for active parks have been fairly well defined by national standards, access to greenspace has been less specific, though this is changing. Recent surveys by the American Association of Home Builders and National Association of Realtors, for example, (see www.nahb.com/news/smartsurvey2002.htm) suggest a high demand for readily-accessible trail and open space facilities. Walking, jogging and bike trails ranked 2nd from the top of the "important to very important" list of amenities and a 1994 Survey by American Lives, Inc. showed that 77% of consumers ranked natural open space as a "must" for successful communities. American Trails, Inc., a national trails and greenway



advocacy organization recommends accessible trails within 15 minutes of every American home. The implication from these and other national studies is that there is a strong desire for trails and open space within convenient walking distance from home and work.

A typical LOS analysis tabulates a classification list of types of parks, open space and recreation facilities by distance in miles from users and the size of the population served within the service radius. Using NRPA guidelines for LOS can be helpful in measuring how well community needs are met and in defending planned future investment in facilities. However, it should be pointed out these guidelines have limitations. First, the standards address only a limited range of classifications of park, recreational and open space amenities. Second, the standards do not differentiate by community, demographics, climate, region of the country, market and other factors. For example, there may be myriad types of greenspace and lifestyle activities that are popular in the Greensboro Urban Area that may not enjoy the same popularity in the urban areas of Charlotte, Atlanta or Orlando. Third, the LOS standards do not offer measurable quantities of several kinds of facilities such as natural resource areas, greenways and trails. In addition, the 1995 NRPA Park, Recreation, Open Space and Greenway Guidelines publication, the latest standards guideline in use, does not list specific LOS ratios for open space.

For this and other reasons, the NRPA has more recently taken the stance that fixed numerical standards may be too limited to be applied across the board as a sole determinant of LOS. Rather, NRPA recommends that the unique demographic, market preferences, trends and environment factors of each community be considered as well. Therefore, NRPA guidelines and similar LOS standards should be taken as only one benchmark for comparison and a number of other factors should be considered. Some of these include:

- Demographic and leisure activity trends
- Opinion surveys
- Comments at public forums by user groups and stakeholders
- Input from planning professionals and public officials
- Market reckoning
- Studies on the benefits of open space, natural parks and trails
- Comparisons to other communities regionally and nationwide

Some communities around the nation have recommended numerical standards that might be useful as a starting point for determining additional LOS figures for the Greensboro Urban Area Bicycle, Pedestrian and Greenway system. For example, the National Park Service standards (dating back to 1966) recommend 0.5-miles of bike trail and 0.5 miles of foot trails per 1000 population, though it should be noted that urban trail use has increased substantially since 1966. Studies in San Diego suggest a minimum baseline of 0.84 miles of trail per 1000 residents within 15 minutes travel time. Given Greensboro's Census 2004 population of 231,543, this suggests that a minimum of 195 miles of trail should comprise the greenways network for the City of Greensboro.

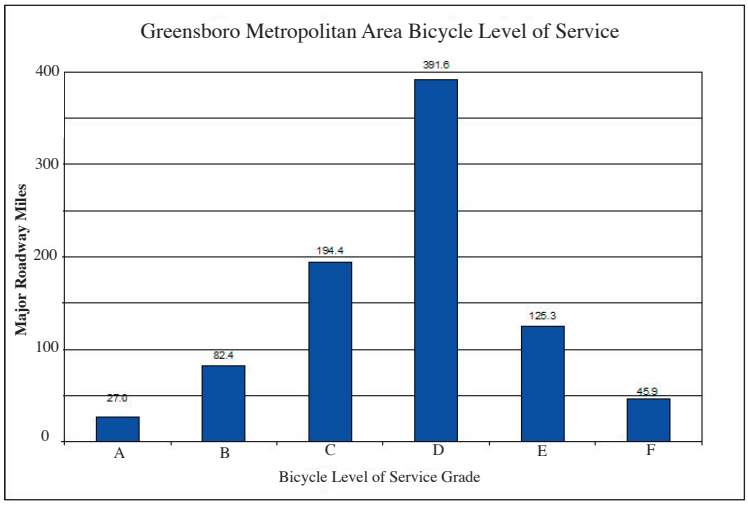
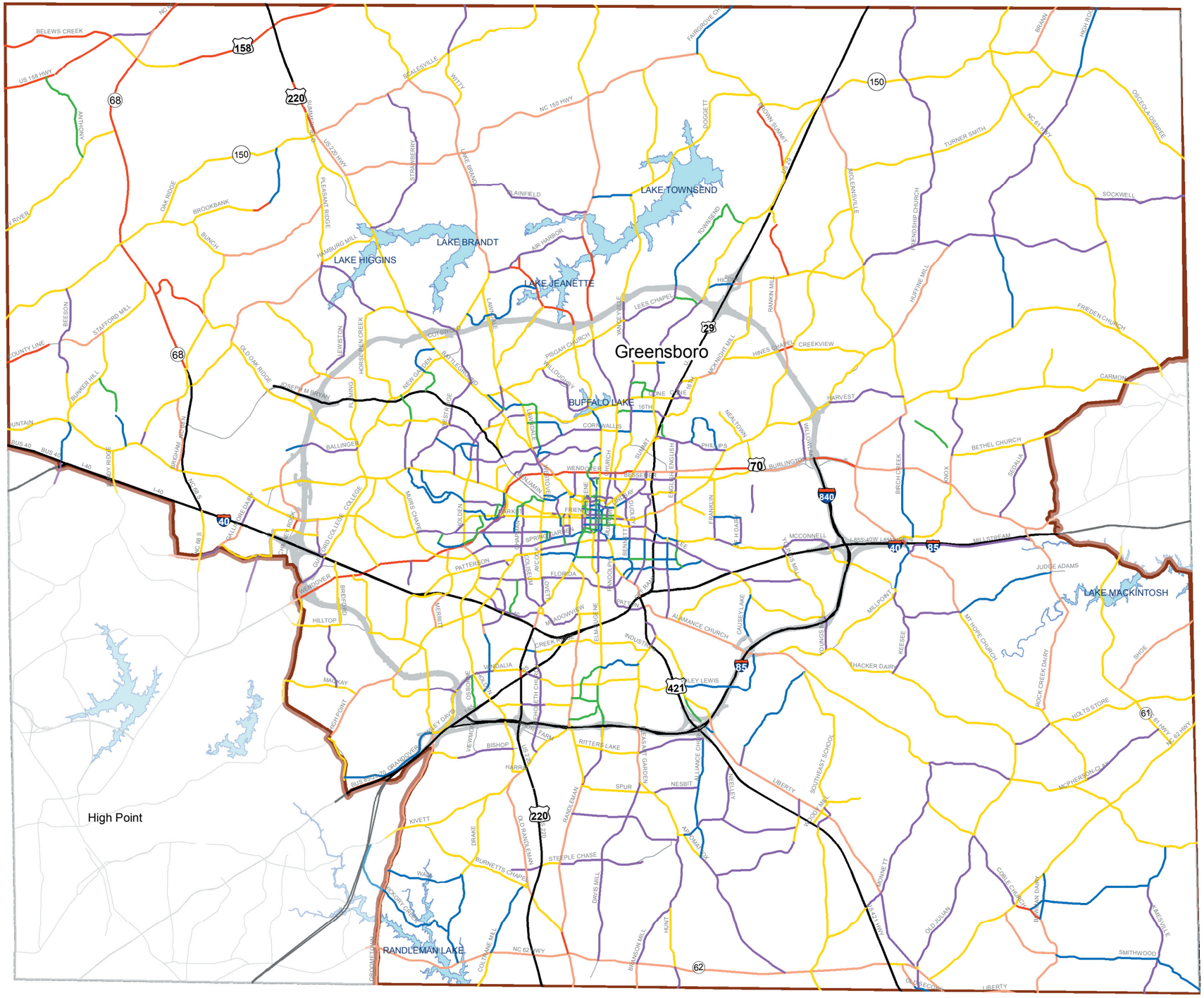


Figure 3(g). Mileage of roadways in Greensboro for each BLOS grade.



Greensboro Urban Area

Comprehensive Bicycle, Pedestrian, and Greenway Plan

Map 3.3

Bicycle Level of Service

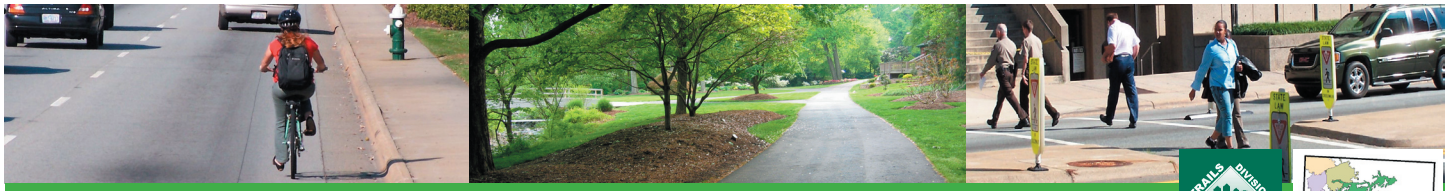
Legend

Bicycle Level of Service

- A
- B
- C
- D
- E
- F
- Highway
- Urban Loop
- Major Roads
- Greensboro MAB
- Lakes

1 Miles

Data Source: City of Greensboro



3.5 Bicycle Level of Service (Bicycle LOS)

3.5.1 Bicycle Level of Service Model Background

The Bicycle Level of Service (Bicycle LOS) Model was used to evaluate bicycle suitability on roadways in the Greensboro Urban Area. The Bicycle LOS Model is a scientifically-calibrated method of evaluating the comfort level of bicyclists on a roadway segment, given existing bicycling conditions in relation to motor vehicle traffic. It uses objective, quantitative data to produce a measure of the level of service perceived by a *typical*[2] bicyclist. Model inputs include measurable traffic and standard roadway factors such as:

- Lateral separation between bicyclists and adjacent motor vehicle traffic (measured by the width of the right-most lane and paved shoulder)
- Presence and width of a paved shoulder or bike lane
- Volume and speed of motor vehicle traffic
- Percentage of heavy trucks
- Number of travel lanes
- Presence of on-street parking
- Pavement condition

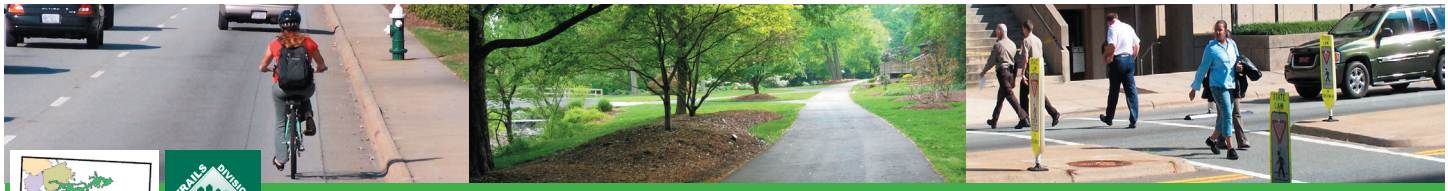
The Bicycle LOS Model uses letter grades to describe existing conditions. Level "A" reflects the best conditions for bicyclists; level "F" represents the worst conditions. Appendix E provides a detailed description of the Bicycle LOS Model used in the Greensboro Urban Area. The field measurements taken by Greensboro staff for use in the model are described in Appendix E.

3.5.2 Bicycle Level of Service in the Greensboro Urban Area

The Greensboro Department of Transportation conducted a field inventory to evaluate Bicycle LOS on 870 miles of roadways within the Greensboro Urban Area boundary between November 2005 and February 2006. The results can be seen in the Bicycle LOS map (Map 3.3). The field analysis network represented about 25 percent of all roadway miles in the urban area. While all roads were not included, most of the major arterial and collector roadways in the Urban Area were analyzed in the field. These main roadways serve the most traffic and provide the best connectivity between neighborhoods and destinations, and require analysis to develop recommendations for improvement. Many of the minor roadways that were not included in the analysis are more conducive to bicycling (and would likely have high Bicycle LOS grades) because of lighter traffic volumes and slower traffic speeds.

The Bicycle LOS results show that approximately one-third (35.1%) of the study network roadways have Bicycle LOS grades of "C" or better. However, most roads have grades of "D" or worse, indicating poor comfort for bicyclists (see Figure 3(g), Table 3(a), and Map 3.3 Bicycle Level of Service Map). This is comparable to other urban areas such as Winston-Salem, Baltimore, and Richmond.

In general, the roadways in the Greensboro central business district have Bicycle LOS grades of "A" and "B". The downtown speed limit of 20 miles per hour helps make bicycling on these streets more comfortable for bicyclists. The section of Spring Garden Street with striped lanes for bicycling also has a higher Bicycle LOS than sections of the street to the west that have higher traffic volumes and no bicycle lanes. Several streets in the neighborhoods surrounding the central business district also have high Bicycle LOS grades, including Haywood Street, Whittington Street, Tuscaloosa Street, Garland Drive, Parkway Avenue, and Dellwood Drive. Note that many other neighborhood streets are also likely to have Bicycle LOS grades of "A" or "B", but they were not evaluated.



As expected, many of the major arterial roadways in the City received below average to poor Bicycle LOS grades of “D”, “E”, or “F”. These roadways include:

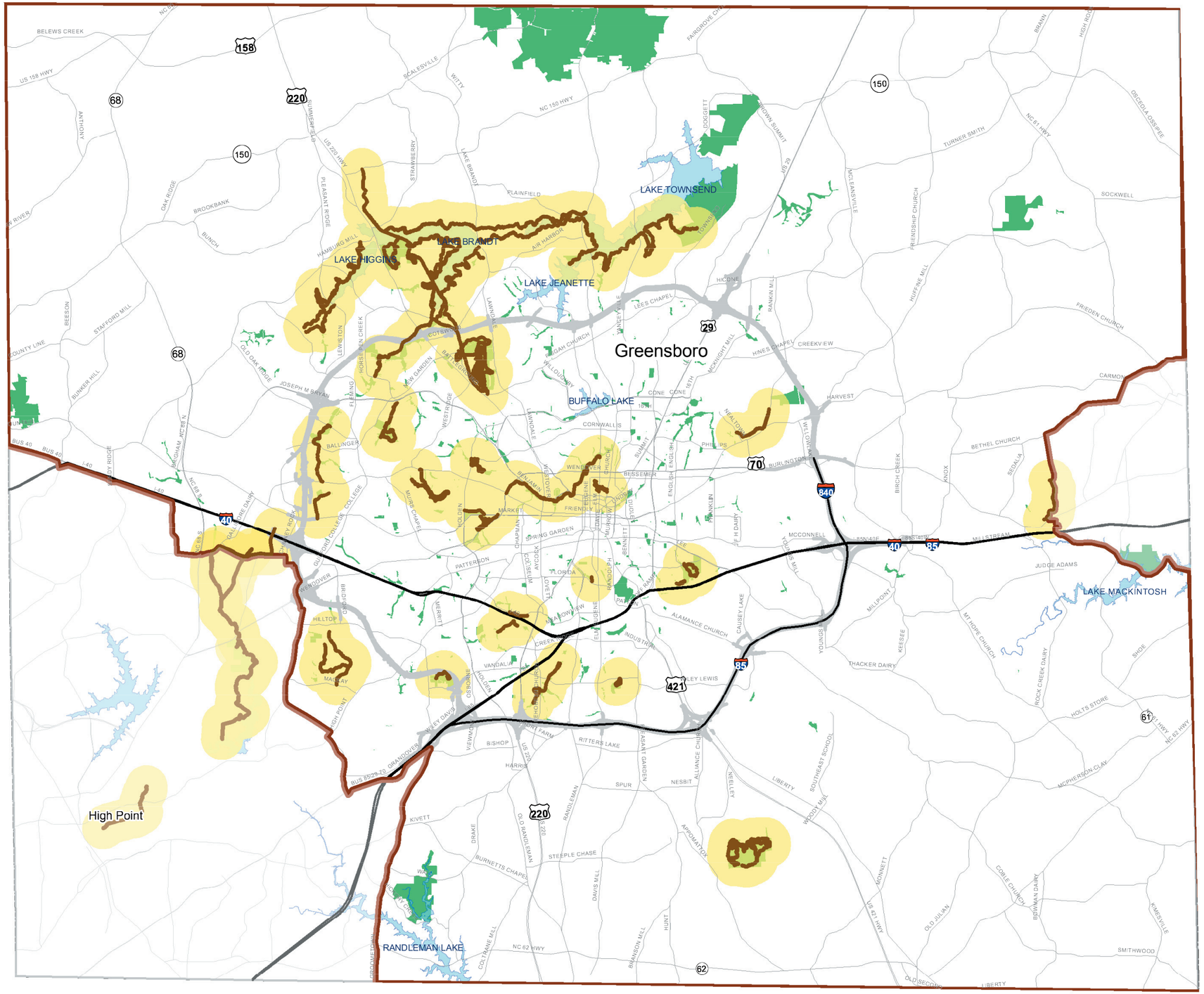
- Wendover Avenue
- Summit Avenue
- East Market Street
- Martin Luther King, Jr. Drive
- South Eugene Street
- Randleman Road
- Freeman Mill Road
- High Point Road
- Aycock Street
- Holden Road
- West Market Street
- West Friendly Avenue
- Muirs Chapel Road
- New Garden Road
- Battleground Avenue
- Lawndale Drive
- Cone Boulevard
- Pisgah Church Road

These roadways typically serve high volumes of traffic, have four or more travel lanes, have higher speed limits than surrounding residential areas, and lack striped areas to accommodate bicycling. Wendover Avenue has the worst bicycling conditions in Greensboro, receiving Bicycle LOS grades of “F” for most of its length.

In the areas outside of Greensboro, the roadways on the east side of the Urban Area generally have higher Bicycle LOS grades than roadways on the west side. This may be a reflection of the higher traffic volumes on roadways due to greater amounts of development near Piedmont Triad International Airport and the communities of Oak Ridge and Summerfield. Rural highways such as US 220, US 158, US 70, NC 150, NC 68, NC 62, and NC 61 also tended to receive Bicycle LOS grades of “D”, “E”, and “F” because they serve higher volumes of traffic, have more heavy trucks, and many sections of these roadways do not have shoulders.

Greensboro Urban Area Bicycle Suitability Summary			
Study Network Roadways			
	Miles	% of Miles	Segments
Total Study Network*	869.6	100.0	990
Bicycle Level of Service	Miles	% of Measured Miles	Segments
A	27.0	3.1%	71
B	82.4	9.5%	127
C	194.4	22.4%	240
D	391.6	45.2%	388
E	125.3	14.5%	96
F	45.9	5.3%	46
No grade**	3.0	N/A	22
Total	**869.6**	100.0%	**990**
	Miles	% of Measured Miles	Segments
Segments with 3’ or wider shoulder	29.4	3.4%	34
*Study network includes collector roadways, arterial roadways, and current neighborhood bike routes; it excludes local streets and freeways.			
**Segments with no grade include gravel roadways, roadways under construction, and road segments that were too short to take measurements.			

Table 3(a). Summary of Greensboro roadway suitability.



Greensboro Urban Area

Comprehensive Bicycle, Pedestrian, and Greenway Plan

Map 3.4

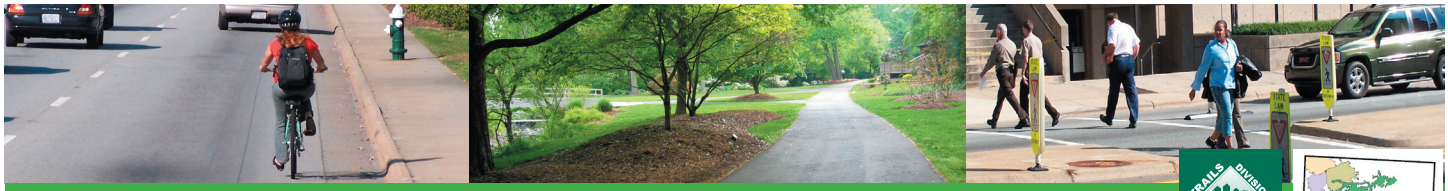
Off-road Trails (0.5 Mile Service Radius)

Legend

- 0.5 Mile Trail Buffer
- Existing Off-Road Trails
- Urban Loop
- Interstate
- Major Roads
- Parks
- Greensboro MAB
- Lakes

1 Miles

Data Source: City of Greensboro



3.5.3 Bicycle Level of Service Considerations

The Bicycle LOS Model should be used with the following considerations in mind:

- Bicycle LOS grades represent the *perceived* level of comfort experienced by a *typical* bicyclist.
- Bicycle LOS grades are not associated with safety or reported crashes.
- The Bicycle LOS model is a roadway segment analysis; it does not apply to intersections.

The Bicycle Level of Service Model was developed using the perceptions of a diverse group of bicyclists. These cyclists represented a wide range of ages and experience levels. Each of the cyclists rated their own level of comfort as they rode on roadway segments with a wide variety of traffic conditions and street layouts. Their responses were combined using statistical modeling techniques to determine which measurable traffic and roadway characteristics had significant relationships to the comfort levels reported by all of the bicyclists. A quantitative model was developed from these data to predict, with the greatest possible accuracy, how a diverse set of bicyclists would feel on a roadway with any given combination of traffic and roadway characteristics. Therefore, a "typical" bicyclist is a bicyclist that is most closely represented by the wide range of ages and experience levels present in the original Bicycle Level of Service experiment. In general, it is expected that more experienced cyclists would independently rate roadways higher than a "typical" cyclist because they are more likely to be comfortable riding in more difficult conditions. Please see Appendix D for additional background on the Bicycle Level of Service Model.

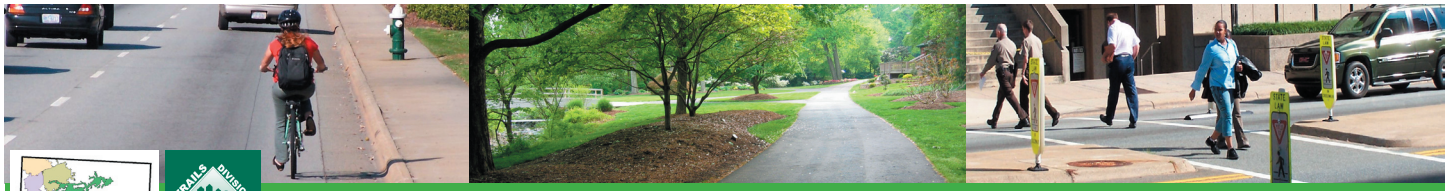
3.5.4 Bicycle Level of Service Applications

The Bicycle LOS Model is used by planners, engineers, and designers throughout the US and Canada in a variety of planning and design applications. Applications include:

1) Conducting a benefits comparison among proposed bikeway/roadway cross-sections
2) Identifying roadway restriping or reconfiguration opportunities to improve bicycling conditions
3) Prioritizing and programming roadway corridors for bicycle improvements
4) Creating bicycle suitability maps
5) Documenting improvements in corridor or system-wide bicycling conditions over time

Bicycle LOS suitability ratings have already been used in Greensboro to identify opportunities for improving bicycling conditions, prioritizing facility recommendations, and for bicycle suitability mapping during this planning process. GDOT should also document improvements in bicycle suitability over time by repeating the Bicycle LOS inventory on a regular basis (such as every five years). Finally, GDOT should use the Bicycle LOS model on a regular basis to compare the bicycle suitability of alternative roadway cross-sections.

Tables 3(b) and 3(c) below show examples of how the Bicycle LOS Model can be used to test alternative roadway cross-sections. Currently, the section of Church Street between Lee's Chapel Road and Air Harbor Road is a two-lane undivided road with moderate levels of traffic, a high speed limit, little or no paved shoulder, and average pavement (see top half of figure). Under current conditions, this road segment receives a Bicycle LOS grade of "F" (poor). Repaving the roadway and adding a 2-foot paved shoulder can raise the Bicycle LOS grade to a "E" (below average). Repaving and adding a 5-foot shoulder would raise the Bicycle LOS grade to "C". The alternatives for Holden Road show how repaving and restriping a multi-lane roadway with a shoulder can also improve bicycle suitability.



GREENSBORO MPO BICYCLE LEVEL OF SERVICE ALTERNATIVES COMPARISON

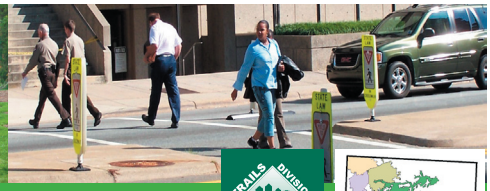
Route Name	From	To	Len. (Ls) (Mi)	Lanes (L) Th #	Con.	Traffic Data Vol. (ADT) (vpd)	Pct. (HV) (%)	Post. Spd. (SPp) mph	Width of Pavement (Wt) (ft)	(Wl) (ft)	(Wps) (ft)	Occu. Park. N/E (%)	Occu. Park. S/W (%)	Rumb. Stps. (Y/N)	Pvmt Cond Lane (5..1)	Pvmt Cond Shdr (5..1)	Bicycle LOS Score	Bicycle LOS Grade (A..F)
Existing Conditions																		
Church Street	Lee's Chapel Road	Air Harbor Road	2.07	2	U	8,000	6	50	11.0	0.5	0.0	0	0	N	3.0	2.0	**5.64**	**F**
Alternatives Evaluation																		
Alternative A: Repaving with 2-foot shoulder																		
Church Street	Lee's Chapel Road	Air Harbor Road	2.07	2	U	8,000	6	50	13.0	2.0	0.0	0	0	N	5.0	5.0	**4.55**	**E**
Alternative B: Repaving with 5-foot shoulder																		
Church Street	Lee's Chapel Road	Air Harbor Road	2.07	2	U	8,000	6	50	16.0	5.0	0.0	0	0	N	5.0	5.0	**3.19**	**C**
Example Road	A	B	0.00	0		0	0	0	0.0	0.0	0.0	0	0	N	0.0	0.0	**#**	**#**

GREENSBORO MPO BICYCLE LEVEL OF SERVICE ALTERNATIVES COMPARISON

Route Name	From	To	Len. (Ls) (Mi)	Lanes (L) Th #	Con.	Traffic Data Vol. (ADT) (vpd)	Pct. (HV) (%)	Post. Spd. (SPp) mph	Width of Pavement (Wt) (ft)	(Wl) (ft)	(Wps) (ft)	Occu. Park. N/E (%)	Occu. Park. S/W (%)	Rumb. Stps. (Y/N)	Pvmt Cond Lane (5..1)	Pvmt Cond Shdr (5..1)	Bicycle LOS Score	Bicycle LOS Grade (A..F)
Existing Conditions																		
Holden Road	Cornwallis	Friendly	0.49	4	D	22,500	4	35	14.0	0.0	0.0	0	0	N	4.0	4.0	**3.86**	**D**
Alternatives Evaluation																		
Alternative A: Repaving																		
Holden Road	Cornwallis	Friendly	0.49	4	D	22,500	4	35	14.0	0.0	0.0	0	0	N	5.0	5.0	**3.70**	**D**
Alternative B: Repaving and Striping a 5-foot bike lane																		
Holden Road	Cornwallis	Friendly	0.49	4	D	22,500	4	35	17.0	6.0	0.0	0	0	N	5.0	5.0	**2.04**	**B**
Example Road	A	B	0.00	0		0	0	0	0.0	0.0	0.0	0	0	N	0.0	0.0	**#**	**#**

L = Total number of through lanes
Con = Configuration of the road segment
ADT = Average Daily Traffic on the segment or link
HV = estimated percentage of trucks
Spd. Lmt. (SPp) = Posted Speed Limit
Wt = total width of outside lane (and shoulder) pavement
Wl = width of paving between the outside lane stripe and the edge of pavement, if any
Wps = width of parking
OSPA = percentage of segment with occupied on-street parking
PCt = FHWA's five point pavement surface condition rating ("5" is new, "1" is poor)

Tables 3(b) and (c). Bicycle level of service alternatives comparison for Church Street and Holden Road.



3.6 Service Radius for Greenways

The current level of service of the Greensboro greenway and trail network is very limited due to the fact that the network of trails is mostly confined to the north and northwest areas of the community (See Map 3.4). Generally, a good level of service would be to have trails within 1/2 mile of the majority of the population. A one half mile distance is a good level of service for pedestrian travel. A map of existing trails with 1/2 mile buffers shows the gaps in the current system.

3.7 Community Meeting and Survey Results

Public input was gathered through several different means and is described in more detail in Appendices A and B. Public meetings and surveys were the key instruments used. A total of nine public meetings were held during the planning process (four in October and five in April) in separate locations. Public input was taken in the form of map markups and comments and through discussion between the citizens, consultant, and City staff.

The consultant also completed four different surveys in preparation of the Greensboro Urban Area Bicycle, Pedestrian and Greenways Plan. The first was a statistically valid survey conducted by the University of North Carolina at Greensboro Department of Public Health Education. The purpose of this survey was to study the habits and patterns of both trail users and those persons that describe themselves as non-trail users. The results of this survey helps us to better understand who uses trails in Greensboro and why. Perhaps most importantly, the survey addresses why trails are not being used by certain segments of the population.

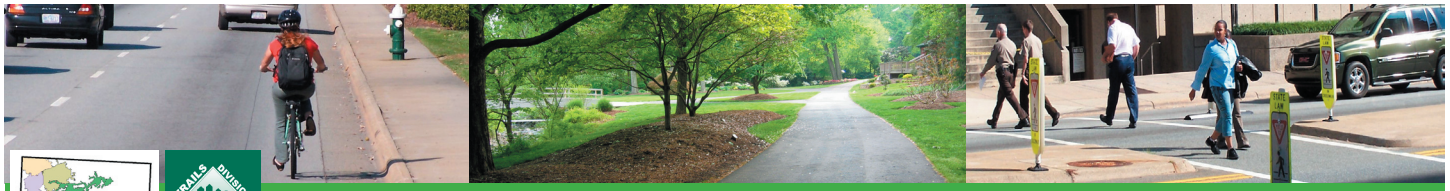
The second survey was an opinion survey conducted via the Internet. The consultant worked with the City of Greensboro to prepare questions and tabulate the results of this survey that received over 700 resident responses. The third survey was conducted in conjunction with the October 2005 public open house meetings with 53 hardcopy handouts filled out by participants. The final opinion survey was distributed at the second set of public meetings held in April 2006. 34 responded to these open-ended questions.

Taken in combination, these surveys help to portray supply and demand issues for bicycle, pedestrian and greenway facilities. The surveys show who uses trails and why, provides a demographic profile and helps to define what the community can do to better meet the needs of its residents. The complete result summaries can be found in Appendices A and B.

3.7.1 Public Meetings

Nine public meetings were held where citizens provided feedback on their visions and specific recommendations for the bicycle, pedestrian, and greenway system. The consultant presented a project update and asked for the public's input into the process. Members of the Greensboro Urban Area Metropolitan Planning Organization and Greensboro Parks and Recreation were in attendance at the meetings as were members of Moses Cone-Wesley Long Community Health Foundation and BIG (Bicycling in Greensboro, Inc.), a newly formed bicycle advocacy group. The meetings were staffed and led by the consultant team.

Four public meetings, held in geographically-distributed, separate locations in October 2005, occurred early in the planning process to hear initial citizen concerns and recommendations. A total of 157 citizens participated in these workshops. Five additional public meetings, again held in geographically-distributed, separate locations in April 2006, allowed the public to provide feedback to preliminary network recommendations. A total of 134 participated in these workshops.



During the first set of public meetings, the consultant team gained a good perspective on community priorities and the widespread support of enhanced area-wide bicycle, pedestrian, and greenways networks. The second round of workshops gave people a chance to review Draft Plan elements and provide feedback to the consultant team. The community gave a positive response to the progress and provided some additional, specific recommendations.

Common overall recommendations included providing more bicycle and pedestrian facilities, connecting college campuses, providing trails in under served areas, closing gaps in the existing trail and sidewalk network, improving crosswalks, providing better pedestrian access to bus stops, improving access to major destinations, and suggesting other local, specific recommendations for facilities.

Figure 3(h). Citizens gather around to make recommendations for the bicycle, pedestrian, and greenway network.

3.7.2 Public Open House Survey Results

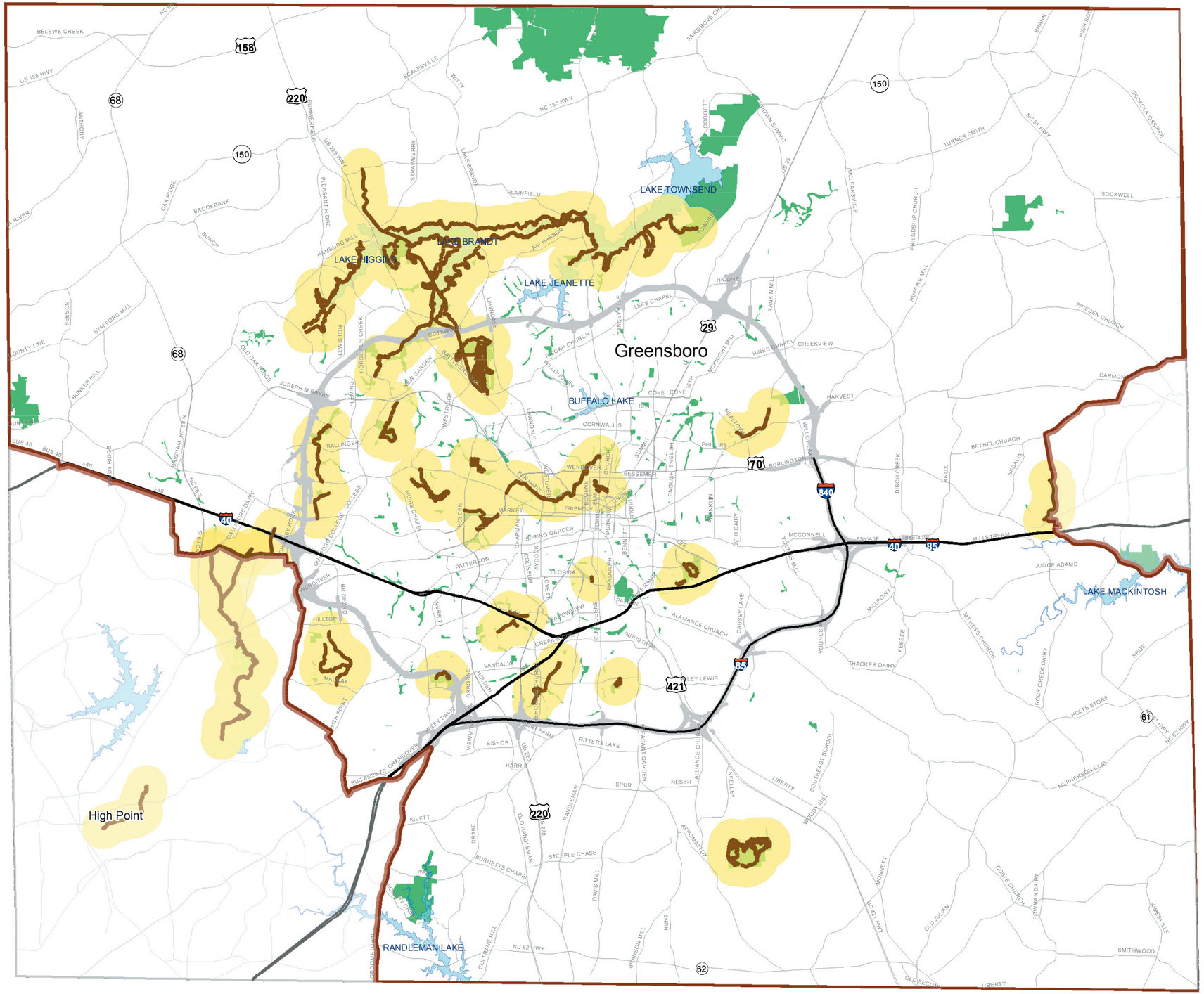
One of the workshop objectives was to have participants fill out a public comment form, prepared by the consultant team. The comment form was designed to solicit input on a series of 24 questions. A total of 53 responses were recorded. The discrepancy between responses to the comment form and attendance at the meeting is due to a couple factors. First, not all attendees filled out comment forms. Second, some residents that attended the first day of workshops picked up blank comment forms for friends and neighbors who were unable to attend the meetings. Another online survey was also made available to citizens and these results are provided below.

A variety of people were surveyed who use walking and biking for various purposes such as for exercise, transportation, recreation, and convenience. Top discouraging factors for walking and biking were a lack of facilities (sidewalk, trail, or on-road bicycle facility), travel time, and heavy traffic. Overwhelmingly, when asked what would encourage users to walk and bike more often, the response was for more sidewalks and bicycle facilities.

3.7.3 Online Survey Results

An online survey was created for the Greensboro Metropolitan Area Bicycle, Pedestrian, and Greenway Plan. The online survey link was made available on the City of Greensboro website and distributed at the four October public workshops. The survey contained 24 questions related to pedestrian, bicycle, and demographic questions. Over 700 citizens completed the survey. A variety of respondents completed the survey ranging from on-road bicycle commuters, to recreational hikers who preferred off-road greenways, to those who bike or walk for exercise.

In general, most respondents supported the concept of a more walkable and bikeable community. People wanted to walk and bike to a number of locations with trails, greenways, and parks being the top destinations. Leading factors that discouraged respondents from biking and walking were a lack of facilities and unsafe intersections.



Greensboro Urban Area

Comprehensive Bicycle, Pedestrian, and Greenway Plan

Map 3.4

Off-road Trails (0.5 Mile Service Radius)

Legend

- 0.5 Mile Trail Buffer
- Existing Off-Road Trails
- Urban Loop
- Interstate
- Major Roads
- Parks
- Greensboro MAB
- Lakes

1 Miles

Data Source: City of Greensboro

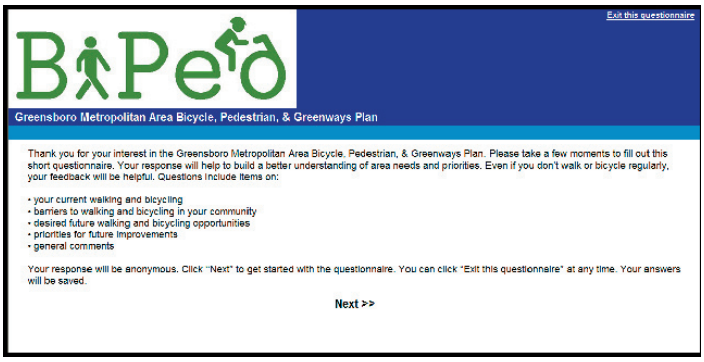


Figure 3(i). Front page of the online survey.

3.7.4 Consideration of 2030 Long Range Transportation Plan Public Input

As noted earlier in this document, the 2030 Long Range Transportation Plan set the stage for the Bicycle, Pedestrian, and Greenways Plan, including confirming the widespread community support for an increasingly balanced transportation system in the future. Complete documentation of the input received from that effort is available at www.guampo.org. One highlight from that effort was a statistically valid phone survey (conducted in 2003) of more than 1,200 residents from throughout the planning area. This was useful in that it represents a snapshot of overall public opinion at that time. It reinforces the input received in this plan, in that it confirms that the creation of a more balanced transportation system is a widely held priority.

3.7.5 University of North Carolina at Greensboro Survey Results

The UNC-G study utilized two different methods for collecting data: an intercept survey that was conducted on area trails and a phone survey that polled residents to determine, among other things, if they used trails. The results of this survey are provided in the following text.

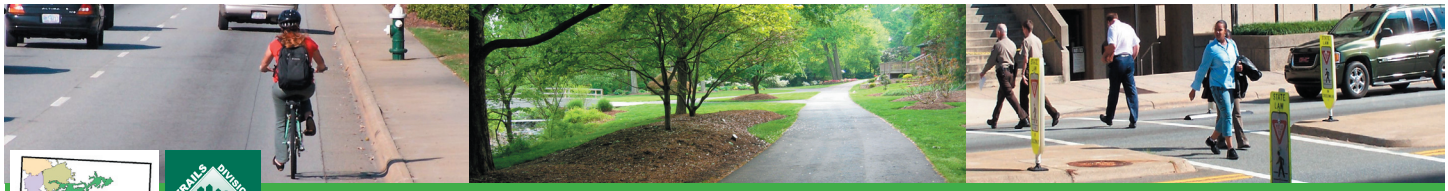
A. Intercept Survey

The data for the intercept study was gathered from greenway and trail users in Guilford County, North Carolina. A 21-item questionnaire was designed in collaboration with the Greensboro Parks and Recreation Department. The questionnaire items specifically address trail connections, demographic characteristics, and trail usage. Demographic characteristics of trail users included age, gender, marital status, education level, employment status, annual household income, and self-identified racial category.

Interviewers were monitored regularly during data collection to ensure adherence to the protocol. Interviewers approached greenway and trail users at the access points of the trails just prior to or immediately following their activities. Interviewers identified themselves, and requested the users to participate in the study. Individuals 18 years of age or older were surveyed. Participation was voluntary and the questionnaire responses were anonymous and confidential. Efforts were made to obtain at least ten percent of the total surveys from each of the seven greenways and trails. Surveys were administered at both a.m. and p.m. sunlight hours on each day of the week to capture a variety of trail users. The greenways and trails for this study were selected with the guidance of the Greensboro Parks and Recreation Department, based on the popularity of the trail, their geographic location throughout the county and to provide representation of the diverse greenways, community parks and regional parks within Guilford County. The surveys were collected during April 2004 through April 2005. Completed survey questionnaires were obtained from 452 participants.

B. Telephone Survey

The data for the phone study was gathered from greenway and trail users and non-users inside of the city limits of Greensboro. A 19-item questionnaire was designed with input from staff at Greensboro Parks and Recreation Department and the Moses Cone-Wesley



Long Foundation. The questionnaire items specifically address trail usage, demographic characteristics, and motivational factors. The demographic characteristics collected included, age, gender, marital status, education level, employment status, annual household income, and self-identified predominate race/ethnicity. The survey staff administered the surveys according to standardized protocols. A typical phone interview lasted five minutes.

The phone survey was stratified by zip code in order to compare the responses of residents of Northwest Greensboro (zip codes 27408, 27409, 27410, and 27455) where most of the trails are located to those of Southeast Greensboro (zip codes 27401, 27403, 27405, 27406, 27407) where fewer trails and greenways are located. Tri Star Marketing Group supplied the survey staff with phone numbers and addresses for 2,500 Northwest Greensboro residents and 2,500 Southeast Greensboro residents. The lists were generating by randomly selecting 2,500 phone numbers from Tri Star Marketing Group's master list of residential phone numbers for Northwest zip codes and Southeast zip codes of Greensboro. The master lists contained respectively, 39,843 and 53,141 phone numbers. Five hundred surveys (250 each from the Northwest and Southeast) were collected during June through August 2005.

Most surveys were completed between five and nine p.m. in order to take advantage of the better response rate during those hours. Interviewers identified themselves, and requested the users to participate in the survey. Individuals 18 years of age or older were surveyed. Participation was voluntary and the questionnaire responses were kept confidential. Questionnaire responses were recorded by the interviewer, using check boxes and were translated into numeric code for statistical analysis.

C. Data Analysis

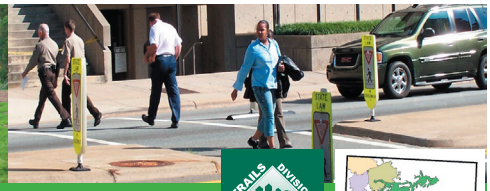
For the intercept survey, the overall proportion of respondents was calculated by demographic and by trail usage categories. The same proportions were calculated for each of the seven trails included in the study. The proportion of surveys collected under different conditions was also calculated. The association between sex and the following variables was also calculated:

- Companionship on the trails,
- Activity at time of intercept, and
- Motivation for trail use was estimated by articulating prevalence odds ratios (ORs) and the respective 95% confidence intervals (CIs).

From the phone survey, the period prevalence of trail and greenway use for Greensboro residents was estimated for the past year (summer 2004-summer 2005) and for the past week (summer 2005). Separately the period prevalence for the past year was estimated for Northwest and Southeast Greensboro.

The proportion of phone survey respondents in different demographic categories was calculated for all respondents, those who identified themselves as users and those who identified themselves as non-users. Lastly, the demographic characteristics of the respondents of the phone survey were compared to the trail users who completed the intercept survey.

For non-users the proportion aware vs. unaware of the Greensboro trail and greenway system was calculated. The reasons for non-use were tabulated and the proportion of non-users who stated one of six different factors- exercise, physician recommendation, weight loss, meditation, nature, transportation- might motivate them to begin using the trails was calculated.



For users, the consultant calculated the proportion who used the trails primarily for exercise, primarily for health, and primarily for transportation. The consultant also tabulated the users activities during the last week- walking, bicycling, and running/jogging- by frequency and length of time.

Intercept Survey Trail Users

Four hundred fifty surveys were completed for the intercept survey of the Greensboro Greenways and Trails. For the intercept survey, we found the majority of our trail users to be Caucasian (67%), males (51%), between the ages of 20-39 (52%), well educated (having some post secondary education, (65%) employed full-time (60%) with incomes $45,000 and below (45%).

Of the users surveyed, 70% lived less than 5 miles from the trail. The majority used the trail alone, with exercise being the number one motivational factor. Three quarters of those interviewed reported that they were on the trail to walk.

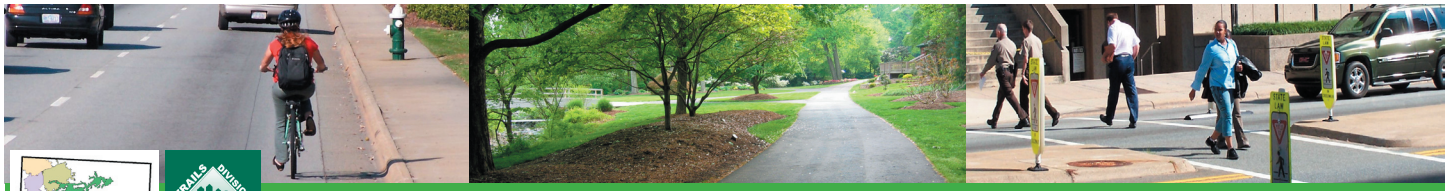
Phone Survey Non-Users

Out of the 500 phone survey participants, 298 were self-reported non-users, the majority located in Southeastern Guilford County. Individuals over the age of 60 accounted for 48% of the non-users with the 50-59 age group following with 20%. With regard to gender, females represented 56% of the non-user group. Most were married (59%) with at least a high school education, working full time or retired, and had annual incomes starting at $15,000. Caucasians (59%) followed by African Americans (33%) accounted for the vast majority of the non-users. Among those who used trails at least once in the past year, a more in depth analysis of their use was conducted. These individuals were asked about their usage, if any, of the trails in the last 7 days. The prevalence of use by region was also examined. There was a higher prevalence of 46.5 % of use for those in Northwestern Guilford County. More than half of the users in the Southeast, 63%, reported that although they used the trails in the past year, they had not in the last 7 days.

Over 70% were aware of the greenway and trail system in the city of Greensboro. A closer look was taken at those who reported being aware of the greenways and trails, comparing awareness between regions. Although the Southeast had more reported non-users, 55% of them were aware of the systems. Awareness was reported by 45% of those in the northwest. The survey asked for reasons they may not have used the trails. Fourteen preset reasons were provided to guide the participants in answering the question. The number one reason for non-use among those who were aware of the system was no time. Forty-six aware participants (22%) stated the trails were not close enough to them. Preferring indoor exercise and having no companion were close behind. Over half of the participants reported reasons not listed on the surveys that were recorded in the other category. Some of these included: poor health (13%), not participating in recreational activities (7%), old age (7%), and no desire and/or interest in using the greenways and trails.

The results of this study are extensive and there are many lessons to be learned. Further analysis may highlight even more lessons. However, at this point the most important results appear to be:

- The annual prevalence of trail and greenway use by Greensboro residents for the period summer 2004-summer 2005 is estimated to be 40.4%.
- The weekly prevalence of use, 17.2%, is much lower, however.
- The difference in the prevalence of use between Northwest Greensboro (where there are more trails) and Southeast Greensboro (where there are less) is substantial. If Greensboro could increase annual prevalence of use in



the Southeast to equal that in the Northwest (by building more trails in the Southeast, for instance), annual trail and greenway usage in the Southeast would increase by 25 people per 100 in the Southeast.

- More than half of residents of Greensboro residents would like to receive more information about their trails and greenways. However, there is little consensus among residents about how they would like to receive the information.

Trail use was found to be more prevalent in the Northwest section of Greensboro, with 53% of those surveyed in the Northwest using the trails within the past year and 46.5% of users utilizing the trails in the past 7 days. In comparison, only 28% of those surveyed in the Southeast section of Greensboro reported using the trails within the past year, furthermore, only 26% of the users had used in the past 7 days. Interestingly enough, if one were to look at a map of the current trail system in Greensboro, you would find the vast majority of the trails are located in the Northwest section of Greensboro. In fact, only one of the seven major parks is located in the Southeast area of Greensboro. To further recognize the need for an expansion of the current trail system into portions of Southeast Greensboro, the intercept survey conducted with current trail users found that 70% of those that actively used the trails traveled less than 5 miles to access the trail. Also, when asked why they were not using the trails, the top two responses given were no time and that the trails were not close enough to them.

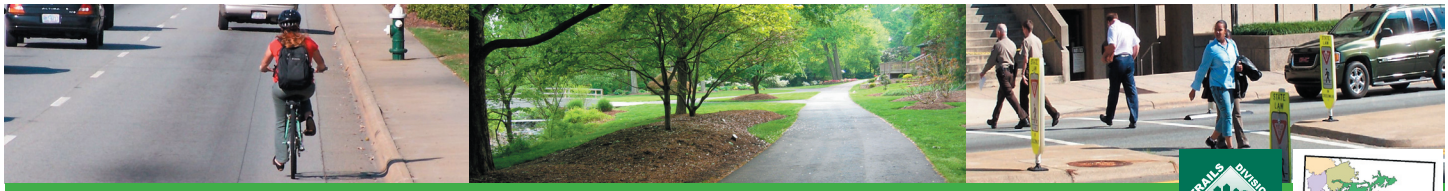
The results of the two studies strongly support the need for expansion of the current trail system. Together the two studies illustrate that residents of Greensboro are much more likely to be active and utilize trails, residents are likely to use the trails more often, and residents are more likely to consider starting to use the trails when the trails are located less than five miles from their dwellings.

Our investigation had several noteworthy strengths, including the examination of use and non-use of the greenways and trails of Guilford County by region and demographic characteristics. A substantial amount of data was collected from both surveys with 452 intercepts surveys and 500 phone surveys completed. The phone surveys evenly represented both the Northwest and Southeastern regions of Guilford County. Many reasons for non-use of the greenways were identified in the phone surveys. Interest in receiving information on the trails systems was measured, as well as, the means by which residents would most appreciate receiving trail information.

Challenges in this investigation included setting the definition for self-reported users. This definition was the basis of our estimate of the annual prevalence of trail and greenway use by Greensboro residents for the period summer 2004-summer 2005. Use of the trails at least once in the last year was used as the definition, and based on this definition the prevalence of use was 40.4%. However, this prevalence is quite sensitive to the one year time period we used in our definition. When we used a second more stringent definition of a user (someone who used a trail or greenway in the past week) the prevalence of use declined to 17.2%.

3.8 Summary and Conclusions

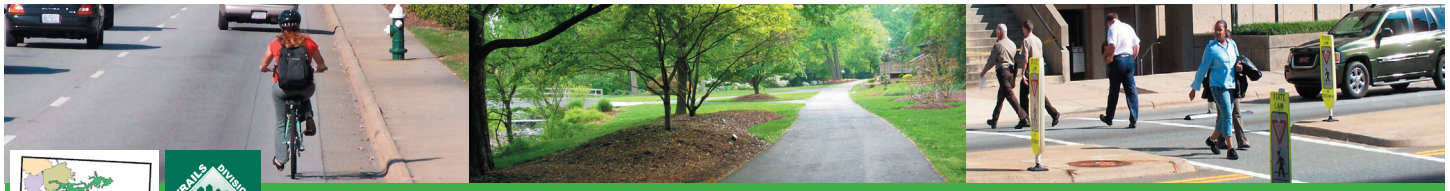
The analysis in this chapter supports the need for a more comprehensive bicycle, pedestrian, and greenway network to serve the Greensboro Metropolitan area. Health and wellness issues, bicycle and pedestrian crashes, levels of service, and community input all point towards the need for safe, functional accessibility to the outdoors. These needs can be met with a comprehensive system of on-road and off-road bicycle,



pedestrian, and greenway facilities recommended in Chapter 4 and the programs and policies to support this process in Chapter 5.

(Endnotes)

[1] A study by Stutts and Hunter of a sample of cases collected at eight hospital emergency rooms in three states, showed that only 56 percent of the pedestrians and 48 percent of the bicyclists were successfully linked to cases reported on their respective state motor vehicle crash files. This study looked at only the most serious crashes (involving emergency room treatment). We can assume that less-severe crashes were accurately reported at an even lower rate. References about the accuracy of police-reported pedestrian and bicycle crashes include:

a) Stutts, J.C. and W.W. Hunter. "Police-reporting of Pedestrians and Bicyclists Treated in Hospital Emergency Rooms," Transportation Research Record No 1635, Transportation Research Board, 1998. P. 88-92.

b) Aultman-Hall, L and J. LaMondia. Developing a Methodology to Evaluate the Safety of Shared-Use Paths: Results from Three Corridors in Connecticut, Connecticut Transportation Institute, Connecticut Department of Transportation, Joint Highway Research Advisory Council, JHR 04-297, Project 02-2, May 2004. Available Online: http://www.engr.uconn.edu/ti/Research/jhr04-297_02-2.pdf.