WalkBikeNC

NORTH CAROLINA STATEWIDE PEDESTRIAN AND BICYCLE PLAN

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PROJECT FUNDING

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Special Thanks

Thank you to the hundreds of North Carolina residents, business owners, and government employees who participated in-person at committee meetings, focus group meetings, regional workshops, community events, and other activities.

Special thanks are also due to the more than 10,000 people who were involved via e-mail and the WalkBikeNC website.

Thank you to the NCDOT Board of Transportation members who participated in steering committee meetings during the development of this plan.

Consultant Team

- **Alta Planning + Design (Lead Consultant)**
- Active Living by Design
- Community Design Group
- Econsult Corporation
- Planning Communities, LLC
- Stantec Inc.
- Toole Design Group, LLC

"All efforts to create a healthier North Carolina deserve our total support. We live in a wonderful country and a fantastic state. Each of us is needed to be at our best all the time. When we walk, run, and bicycle, we are saying to ourselves and to each other, we care enough to be the best for our self and for each other."

~ Maya Angelou, 11/13/12

Chapel Hill, NC

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1 Introduction & Overview

Greensboro, NC

North Carolina: A Growing Population

The 21st Century has brought and will continue to bring meaningful changes to North Carolina's communities. Over the next few decades, significant trends will unfold that will create both opportunities and challenges for the state. One of the foremost influences on North Carolina's future will be continued population growth, fueled by migration from other states and abroad.

> In 2010, North Carolina ranked as the tenth most populous state in the country with 9.5 million people.[1] By 2030, it will be home to an estimated 12.2 million people, surpassing Michigan, Ohio, and Georgia to become the seventh most populous state.[2]

This growth will be coupled with a continued population shift from rural to urban areas. **In 1990, 50.3% of North Carolina's population resided in urban areas. By 2010, that percentage had increased to 66.1% and is expected to reach over 75% by 2040.**[2] In addition, population density has reversed its downward trend in North Carolina's major cities since 1940. Population density and migration to urban centers began increasing in 1990 as sprawl decreased, a trend being observed nationwide. A larger, increasingly urban population will be joined by a number of trends that will influence the mobility, health, living preferences, and economic vitality of North Carolinians and their communities. These trends are all pointing the way towards the need for better places for North Carolina residents to walk and bike.

In this Chapter

North Carolina: A Growing Population

Age Composition

Housing Choice

Health Status

Economic Snapshot

Walking and Bicycling: What North Carolinians are Saying

Plan Purpose: Why a Statewide Pedestrian and Bicycle Plan?

Vision & Goals

Who is Involved in the Plan, and What is the Planning Process?

What Does the Plan Include?

What's Next?

In Raleigh and Charlotte, two of North Carolina's fastest growing cities, population density is increasing even when taking into account the massive growth in square miles for each of these cities over the past two decades (see table below). Similarly, increases in housing density can be seen statewide over the past half century (see maps at right). These increases in density may offer opportunities for shorter trips to work, school, shopping, and other destinations. With a mix of land-uses and the appropriate infrastructure, such trips could be made in these higher density areas by walking and bicycling, rather than driving.

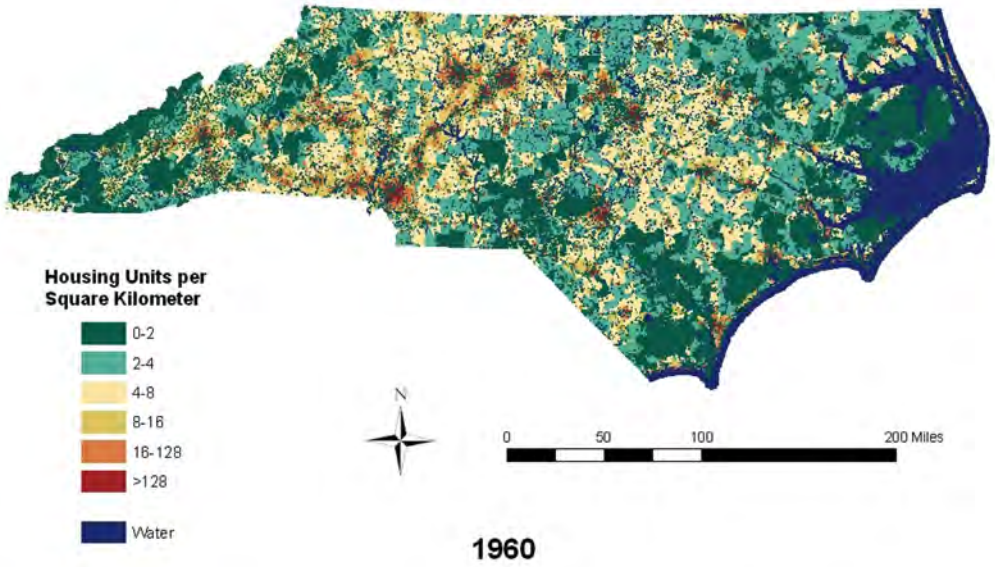
Raleigh Population Density:

Year	Population	Area (Square Mile)	Density (Population/ Square Mile)
1990	207,951	88.14	2,359.5
2000	276,093	114.6	2,409.2
2010	403,892	142.9	2,826.3

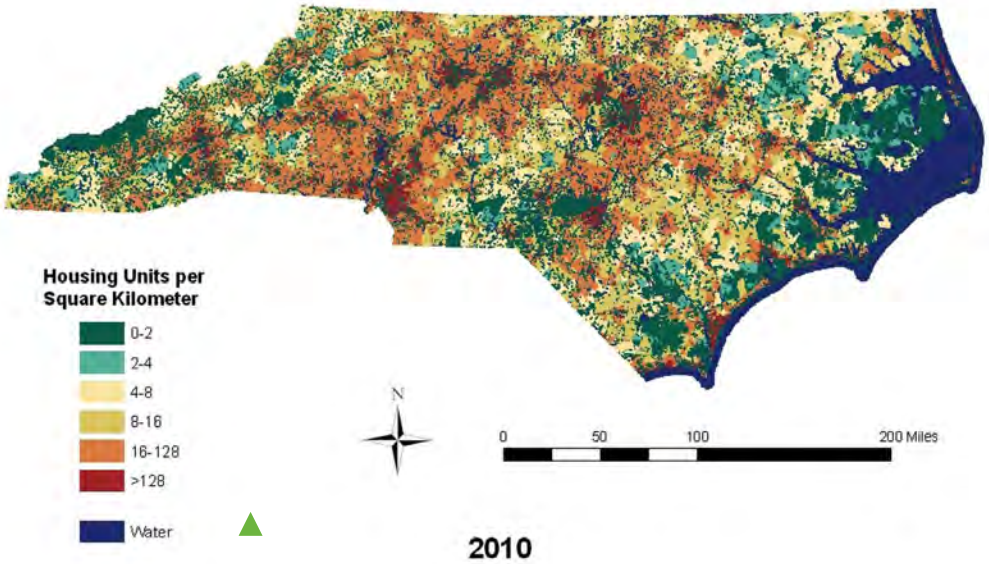
Charlotte Population Density:

Year	Population	Area (Square Mile)	Density (Population/ Square Mile)
1990	395,934	174.26	2,272.1
2000	540,828	242.27	2,232.4
2010	731,424	297.68	2,457.1

Increase in Population Density, 1990-2010. Both population and population density have been increasing.
Sources: 2010 US Census; Mitchell Silver, AICP. Planning Raleigh 2030: Designing a 21st Century: www.tricc.org/docs/TCCJan182008.pdf.



Housing Units per Square Kilometer in 1960.

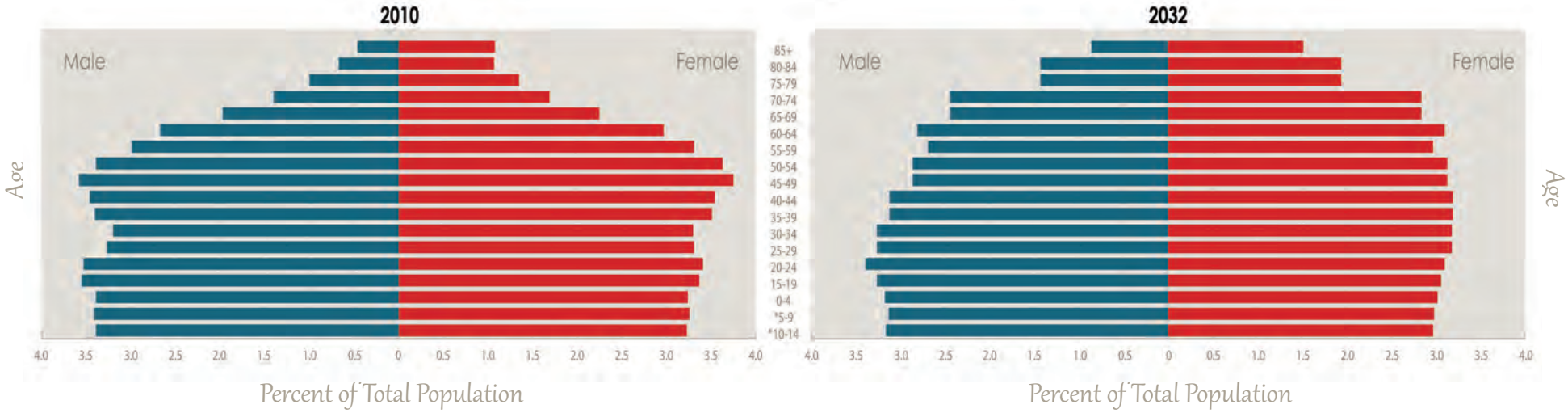


Housing Units per Square Kilometer in 2010
This shows a dramatic increase in urbanization and population density.

AGE COMPOSITION

Another trend indicating a need for better walking and bicycling options is our changing age composition. As seen in the US Census information below, in 2010, the 65+ age group in North Carolina accounted for 13% of the population. In 2032, this number is projected to be nearly 20%. As these older adults begin to drive less, their access to independent mobility will be greatly influenced by how well our streets and transportation networks accommodate pedestrians, and impaired pedestrians in particular.

North Carolina Population Pyramids, 2010 and 2032



Age Group	2010	Percentage
Under 18	2,281,635	23.9%
18-24	938,618	9.9%
25-44	2,573,744	27.0%
45-64	2,507,407	26.3%
65+*	1,234,079	12.9%

Age Group	2032	Percentage	Pop. Change from 2010
Under 18	2,614,632	22.1%	14.6%
18-24	1,083,644	9.1%	15.5%
25-44	3,017,305	25.5%	17.2%
45-64	2,786,665	23.6%	11.1%
65+	2,328,177	19.7%	88.7%

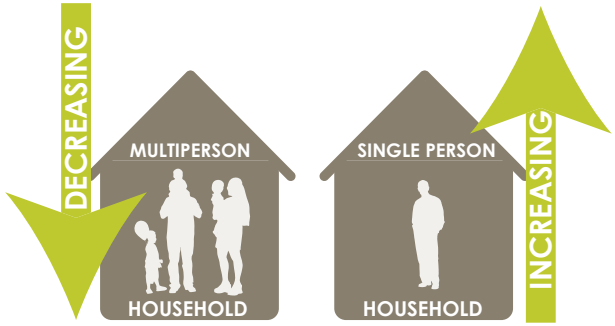
▲

Age Population Pyramid for North Carolina, 2010; and projected for 2032. Sources: US Census Bureau, 2010; http://www.osbm.state.nc.us/demog/countytotals_agegroup_females_2032.html

> *One of the most important emerging trends in our state is an increasing number of North Carolinians age 65 or older: this segment of the population is anticipated to increase from 13% in 2010 to nearly 20% by 2032, representing more than 2.3 million people.*

As they age, many of these older North Carolinians will choose not to drive or find themselves unable to drive. Yet they will still require safe, alternative forms of transportation. More than one in five (21%) Americans age 65 or older do not drive due to declining health, declining mental capacity, safety concerns, lack of access to a car, or personal preference.[3] Communities that offer walk-friendly and transit access to health care, healthy foods, community centers, and social activities will be crucial for the physical health, mental health, and wellbeing of our senior population.

In addition to many senior citizens, alternative transportation options are also essential for many other Americans who do not drive. One-third of Americans currently do not drive because of age, economics, disability, or choice. This includes more than 60 million Americans who are too young to drive and 8 million adults over the age of 60 that do not have a driver's license.[4] Walking and bicycling improvements will help to provide a more equitable transportation system that addresses the mobility and access needs of drivers and non-drivers alike.



By 2025, single person households are expected to overtake multiple person households as the majority.

Housing Choice

An increase in the percentage of households with a single occupant is another change that will affect the transportation needs and preferences of North Carolina's population. **The rise in single person households will influence where people choose to live, the types of housing they prefer, and how they get around.** Smaller housing units in more walkable neighborhoods will be in greater demand, and households with a single income will likely desire more affordable transportation options than the private car. Two-thirds of Americans already consider the walkability of an area in their housing decision, with grocery stores, pharmacies, hospitals, and restaurants being the most-desired places within a short walk from home.[5] North Carolina can accommodate this growing demographic by creating communities where North Carolinians can safely and regularly walk and bike for fun or utility.

More than one in five (21%) Americans age 65 or older do not drive. Below, older adults take part in a walking program in Spring Lake, NC.

Communities that offer walk-friendly and transit access to health care, healthy foods, community centers, and social activities will be crucial for the physical health, mental health, and wellbeing of our active adult population. Photo in Asheboro, NC.

1

Health status

From 1995 to 2010, the instance of obesity in North Carolinians increased from 16.9% to 28.6% of the population.[6]

More than 65% of North Carolinians are overweight or obese.[6]

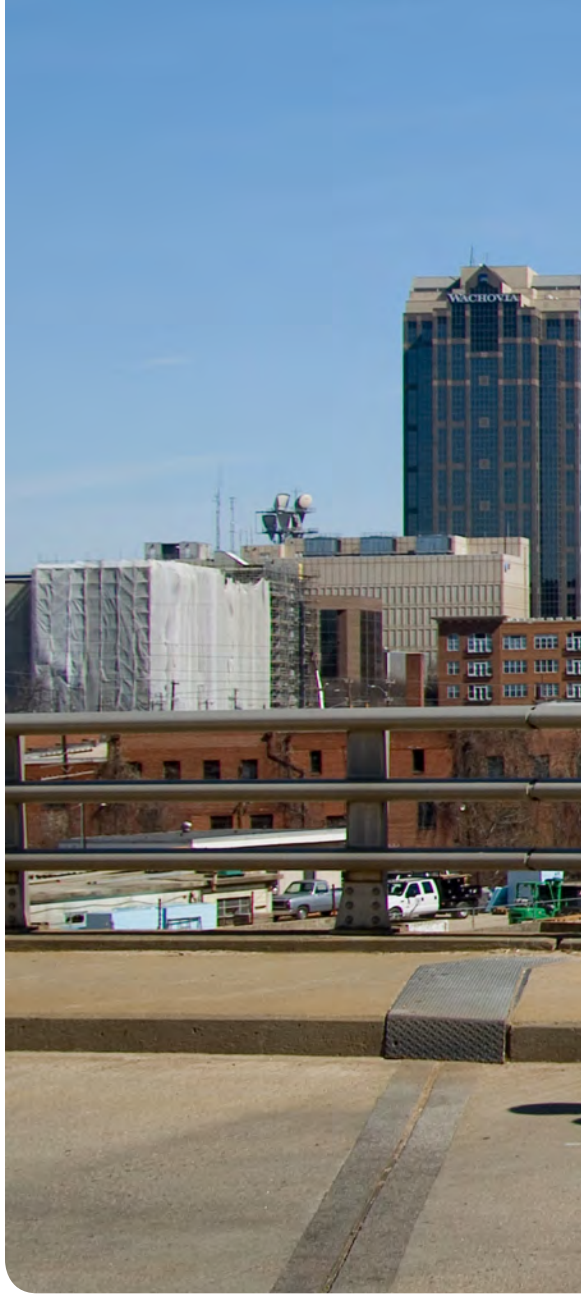
Physical inactivity, overweight, and obesity rates have major implications for the health of North Carolinians, leading to an increased risk of heart disease, diabetes, and other serious health conditions. Without safe environments where physical activity such as walking and biking can be incorporated into daily life, these rates will likely remain at epidemic levels. The Surgeon General recommends the following levels of activities by age group (for more detail on these guidelines, see the 2008 Physical Activity Guidelines for Americans at www.health.gov/paguidelines):

- **Children and adolescents should do 60 minutes or more of physical activity daily.**
- **Adults should do at least 150 minutes a week of moderate-intensity, or 75 minutes a week of vigorous-intensity aerobic physical activity, or an equivalent combination**
- **When older adults cannot do 150 minutes of moderate-intensity aerobic activity a week because of chronic conditions, they should be as physically active as their abilities and conditions allow.**

In many areas, more and better pedestrian and bicycle facilities are needed so that people can reach these levels in their daily routines.

Economic snapshot

Economic development will also continue to be a priority for North Carolina. Over the past few decades, North Carolina has diversified from a traditionally agricultural and manufacturing economy to a knowledge-based economy of global importance. North Carolina's success hinges upon its ability to retain workers educated and trained in the state as well as to attract talented workers from around the country and the world. Increasingly, companies and workers are seeking out places that offer a sense of community, a supportive environment for active living, and amenities close to home, including schools, shops, restaurants, parks, and entertainment. In fact, a majority of homebuyers (58%) now prefer mixed-use communities that include stores and other businesses within walking distance.[7] As part of an affordable



Incorporating walking and biking into daily life can combat the obesity epidemic in North Carolina. Photo in Raleigh, NC.

housing study funded by the NC Association of Community Development Corporations, 62% of low and moderate income earners in the Asheville metropolitan area reported that they were willing to move to well-located affordable housing in safe areas, and in areas conducive to walking and bicycling.[9]

Pedestrian and bicycle trails consistently rank as one of the most important community amenities by prospective homebuyers, above golf courses, parks, security, and others.[8]

HOMEBUYER SURVEY

- [x] Trails
- [ ] Golf Course
- [ ] Swimming Pool
- [ ] Parks
- [ ] Security

By making targeted improvements to the accessibility of key destinations, increasing opportunities for active mobility options, and enhancing community safety and health, North Carolina can build upon its reputation as a premiere high-quality-of-life location for residents, workers, and tourists alike.

Walking and Bicycling: What North Carolinians Are Saying

These demographic, health, and economic trends affecting North Carolina's population underscore the need for targeted, forward-thinking investments that will make North Carolina's communities safer, healthier, more economically robust, and more accessible for everyone. Demand for better walking and bicycling conditions has already been expressed across the state.

> *According to a survey of 16,000 North Carolina residents, the most commonly reported safety issue for walking and bicycling was inadequate infrastructure (75%).*[10]

However, a 2011 public survey conducted by NCDOT found that the majority of respondents rated North Carolina's pedestrian and bicycle facilities as below-average quality or lower.[10]

The 2011 Bicycle and Pedestrian Safety Survey found a similar mismatch between current walking and bicycling conditions and the safety needs of North Carolinians. This survey of 16,000 residents, developed by the Institute for Transportation Research and Education (ITRE) at North Carolina State University, found significant concerns about safety. More than 60% of respondents felt that bicycling for any purpose was somewhat or very dangerous. A similar question on pedestrian conditions found more than 30% of the state felt the same way about walking. The two most commonly reported safety issues were inadequate infrastructure for walking and bicycling (75%) and lack of pedestrian and bicycle connectivity between activity centers/commercial centers and residential neighborhoods (70%).

Furthermore, a recent national study has found that younger people are avoiding or postponing buying cars and acquiring driver's licenses. The percentage of 17 year-olds with driver's licenses dropped from 69% in 1983 to 46% in 2010.[11] Additionally, the study, "Transportation and the New Generation", found that from 2001 to 2009, the average annual number of vehicle miles traveled by young people (16 to 34-year-olds) decreased from 10,300 miles to 7,900 miles per capita—a drop of 23 percent.[12] Such a shift, combined with the growing preference for mixed-use housing (noted in the 'Economic Snapshot' above), indicates a need for a similar shift in transportation policy.

This underscores the significant gap that exists between North Carolinians' desire to walk and bike and the infrastructure available to safely do so. Safety data show that these concerns are not unfounded; the Alliance for Biking and Walking listed North Carolina 41st lowest in its ranking of pedestrian safety by state and 44th lowest for bicycling safety.[13]

In a 2007 survey by the State Center for Health Statistics, 60% of North Carolinians reported that they would increase their level of physical activity if they had better access to walking and bicycling facilities such as sidewalks and trails.[14]

Walking, biking, greenways, and trails consistently appear as top priorities for communities in North Carolina. Below: Greenway trail in Davidson, NC.

1

Plan purpose: why a statewide pedestrian and bicycle plan?

The 2013 *North Carolina Statewide Pedestrian and Bicycle Plan* identifies current conditions for walking and bicycling in North Carolina and serves as a guide for NCDOT in developing a transportation system that safely accommodates walking and bicycling statewide. Pedestrian and bicycle planning at the state level can help to bridge the disconnect between current conditions and what North Carolinians envision for walking and bicycling in terms of safety, mobility, and connectivity. By providing a "big picture" perspective of walking and bicycling in North Carolina, NCDOT can better determine the walking and bicycling needs of North Carolinians and the policies, projects, and programs that best meet these needs. A statewide plan is also important for establishing standards and providing accountability. Because NCDOT maintains the majority of roadways in the state (more road miles than any other state except Texas) and funds many of the multi-use pathways, a consistent statewide approach is imperative.

The 2013 *Statewide Pedestrian and Bicycle Plan* provides an update to the 1996 *Bicycling and Walking in North Carolina: A Long-Range Transportation Plan*. Since the 1996 plan, many improvements have been made to address walking and bicycling at the local, regional, and state levels in North Carolina. The 2013 Plan aims to build upon these successes and identifies targeted goals and actions for improving walking and biking conditions in North Carolina, thereby supporting NCDOT's mission of "Connecting people and places safely and efficiently, with accountability and environmental sensitivity to enhance the economy, health, and well-being of North Carolina."

Vision and goals

The vision and goals for the *Statewide Pedestrian and Bicycle Plan* were developed based on input from the Joint Steering Committee and Advisory Committee, the 2011 Bicycle and Pedestrian Safety Summit report, and public outreach. The vision statement outlines how walking and bicycling will be integrated into North Carolina's transportation system and how these improvements will affect North Carolina's future. The vision statement includes five vision themes that appear throughout the plan: ***Mobility, Safety, Health, Economy, and Environment***. These five goals make up the framework of the plan. Together these five components describe the conditions that need to be satisfied in order for North Carolina to achieve its vision for walking and bicycling. Finally, the objectives listed for each goal provide specific strategies and measurable actions to track the plan's progress, support its goals, and achieve its overarching vision.

Themes/Pillars

Mobility

Safety

Health

Economy

Environment

Vision

North Carolina is a place that incorporates **walking and bicycling** into daily life, promoting **safe access** to destinations, physical activity opportunities for improved **health**, increased **mobility** for better transportation efficiency, retention and attraction of **economic development**, and resource conservation for better **environmental stewardship** of our state.

Improving mobility and safety includes meeting the needs of all citizens. Photo: Downtown Raleigh.

Goals

Improve mobility strategically with greater investment in walking and biking infrastructure (through a Complete Streets approach), improved transportation equity and choice, connectivity between transportation modes, reduced traffic congestion, and through better coordination between land use and transportation planning.

Improve safety for all roadway users through strategic, consistent, and connected pedestrian and bicycle facility improvements, education, and enforcement strategies.

Contribute to public health by providing active living environments with safe, connected, accessible facilities along with programs that encourage walking and bicycling.

Maximize economic competitiveness and return on investment by creating more attractive walkable and bikable communities and jobs through additional NCDOT, public, and private funding.

Advance environmental stewardship by reducing automobile dependence and connecting and protecting North Carolina's natural resources through a network of greenways.

Action steps for each of these goals can be found in Chapter 8 and Appendix 9-10.

1

Who is involved in the plan, and what is the planning process?

The development of the 2013 *Statewide Pedestrian and Bicycle Plan* was a jointly funded effort by the North Carolina Department of Transportation (NCDOT), Department of Environment and Natural Resources (DENR), Department of Commerce, Department of Health and Human Services (DHHS), Blue Cross and Blue Shield of North Carolina Foundation, and the Davis Wealth Management (DWM) Foundation. To ensure the planning process was comprehensive and representative, NCDOT assembled a Steering Committee and Advisory Committee of Division of Bicycle and Pedestrian Transportation staff, NCDOT divisions, MPO/RPO staff, ped/bike advocacy groups, funding partners, and county and municipal representatives. Intradepartmental and interdepartmental efforts were instrumental in guiding the development of this plan and laid the foundation for future coordination.

The development of the final plan was an 18-month process informed by a robust public engagement process. The Steering Committee and Advisory Committee provided oversight and guided the development of the plan to completion. Plan development began with the Steering Committee Kick-Off meeting in July 2012. Regular meetings, workshops, and an ongoing communications and outreach effort all informed the plan's development.

This plan required participation from multiple agencies, NCDOT staff, and the entire North Carolina community - every citizen counts.

Focus group meetings and regional public engagement workshops were held across the state in Fall 2012 to invite and incorporate input from diverse interest groups (see Appendix 9.2). These were followed by additional Steering Committee and Advisory Committee meetings leading to the development of the draft plan in early 2013. A second round of focus group meetings and stakeholder engagement took place in Spring 2013. The final draft plan was developed in late Spring/early Summer 2013, with the final plan adopted in Winter 2013.

A complete list of Steering and Advisory Committee members is included in Acknowledgments. A detailed schematic of the planning project timeline can be seen below.

2012

July-Aug

Begin project

Meet with committees to discuss the project vision and current conditions

Launch web site, social media & online input map

Begin evaluation and interviews for updating the State Bicycle Route

Project web site

2012

Sept-Oct

Conduct outreach at 3 Regional Workshops, *14* Focus Group Meetings, and *16* public events across North Carolina

Public outreach

2012

Nov-Dec

Develop the first draft of the WalkBikeNC Plan

Collect comments from staff and committee members

Launch the WalkBikeNC Blog

Draft plan & blog

2013

Jan-Feb

Revise the Draft Plan and develop additional plan products

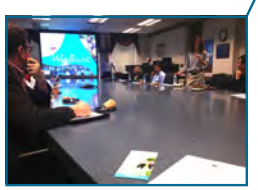
Plan summary & topic area summaries

2013

Mar-May

Second round of focus group meetings and stakeholder meetings

Continued Public Comment



Focus group/ Stakeholder Meetings

2013

June-Dec

Final plan meetings & presentations

Final revisions to plan products

Plan approval & adoption

Plan approval and adoption

Public Engagement

A variety of communications and engagement strategies were used to inform the public of the statewide plan and invite questions, comments, and review. Communications outreach and public engagement strategies used throughout the development of the plan included:

- Steering Committee
- Focus group meetings
- Regional public engagement workshops
- Inter-/Intra-agency coordination
- Plan website
- Social media campaign
- Festivals and public/professional events outreach

This multifaceted approach allowed project planners to reach individuals and stakeholder groups of all areas of North Carolina, and learn of their diverse walking and bicycling needs and desires. Their input was used throughout the development of this plan. A detailed listing of public meetings and workshops, outreach events, and communications materials can be found in Appendix 9-2.

Visions, goals, and objectives were recorded at the Joint Steering and Advisory Committee Meeting held in July 2012. Input from the Committees, focus groups, and general public shaped the direction of this plan.

What does the plan include?

The *Statewide Pedestrian and Bicycle Plan* provides a review of walking and bicycling in North Carolina today, including the history of pedestrian and bicycle planning in North Carolina, relevant reports and surveys, current trends, people and processes involved in pedestrian and bicycle planning, and a review of current pedestrian and bicycle facilities around the state.

The plan also includes a guide for addressing statewide pedestrian and bicycle policy in North Carolina. This information, along with public input and the guidance of the Steering Committee, was used to inform the recommendations for North Carolina pedestrian infrastructure and bicycle infrastructure.

Chapters on NCDOT design standards and programming for health, safety, and active living provide a comprehensive guide on how pedestrian and bicycle planning can more specifically support the goals of safety, health, economics, mobility, and environmental stewardship. The implementation and tools for benchmarking and accountability sections then provide a blueprint of the steps and planning tools needed to monitor the plan's progress and turn its vision and goals into reality.

What's next?

The 2013 *Statewide Pedestrian and Bicycle Plan* will serve as the guidance document for addressing pedestrian and bicycle transportation in North Carolina. The Plan will be implemented by NCDOT, with coordination and cooperation with DENR, DHHS, Department of Commerce, and other public and private agencies. Specifically, the NCDOT Division of Bicycle and Pedestrian Transportation (DBPT) will be a champion and leader in implementation. This Plan and its resulting progress and projects will be evaluated to ensure efficiency, sustainability, and effectiveness. The Plan will make North Carolina a national leader for walking and bicycling.

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2 Walking & Biking In North Carolina Today

Fayetteville Street
Raleigh, NC

This chapter presents a short history of pedestrian and bicycle planning in North Carolina and an overview of existing walking and bicycling conditions. In many ways, North Carolina is ideally positioned to increase its walking and bicycling activity – seasonable weather for most of the year, dense street grid networks at the core of older towns and cities, and a long-standing state pedestrian and bicycle program provide the framework needed to foster safe walking and bicycling. In order to take advantage of these assets and improve the conditions for pedestrians and bicyclists, it is important to first review the progress that has been made and the opportunities and challenges that we face.

In this Chapter

History of Pedestrian and Bicycle Planning in North Carolina (1974-2012)

Planning for Walking and Bicycling in North Carolina

Walking and Bicycling in North Carolina: Impacts, Trends, and Issues Today

Mobility

Safety

Health

Economics

Environment

Timeline of Major Local Accomplishments

History of Pedestrian and Bicycle Planning in North Carolina (1974-2012)

NCDOT Division of Bicycle and Pedestrian Transportation

Bicycle planning formally began in North Carolina in 1974 with the passage of the Bicycle and Bikeway Act by the State General Assembly. With this legislation, the nation's oldest comprehensive state bicycle program was created, and in 1977, additional legislation was enacted that established the North Carolina Bicycle Committee. The Committee represented the interest of bicyclists in advising the NCDOT on decisions pertaining to the bicycling public and was later dissolved under the 2011 repeal. During the 1970s and 1980s the North Carolina Bicycle Program was responsible for achieving many milestones in bicycle planning in North Carolina, including the development of some of the state's first bicycle policies and infrastructure. The program also established the state Bicycle Highways system, mapping and signing bike routes across the state. In response to the 1991 Intermodal Surface Transportation Efficiency Act (ISTEA), the bicycle program was expanded to include pedestrian activities (1992). Today the bicycle and pedestrian program is known as the NCDOT Division of Bicycle and Pedestrian Transportation (DBPT) and is one of the largest such divisions in the country.

North Carolina's first statewide pedestrian and bicycle plan, *Bicycling and Walking in North Carolina: A Long-Range Transportation Plan*, was drafted and adopted in 1996. This plan established for the first time a set

of long-range goals and objectives to improve walking and bicycling conditions in North Carolina. The vision and expectations put forward in the plan led to the development of new pedestrian and bicycle initiatives, including the 1997 Walkable Communities Conference series, the annual Cycle North Carolina cross-state ride, the state's two Bicycle and Pedestrian Safety Summits (2000 and 2011), and the Bicycle and Pedestrian Planning Grant Initiative. The grant program (starting in 2004) addresses the need for local pedestrian and bicycle planning in North Carolina. Each year municipalities apply to receive matching funds for the development of comprehensive pedestrian and bicycle plans. Since its inception, 135 communities have been awarded a total of $3.6 million in grant funds through the program.

DBPT has led planning, engineering, and programmatic efforts since its inception. The Division sponsors workshops, trainings and conferences for the Complete Streets Planning and Design Guidelines, fosters multi-modal planning, and integrates walking and bicycling into the ongoing activities of the Department of Transportation. The Division fosters a broad range of both pedestrian and bicycle safety initiatives including Safe Routes to School, educational programs, and media awareness campaigns.

Division of Bicycle and Pedestrian Transportation (DBPT) Milestones

1970s

1929 Bicycle legally defined as vehicle by the NC General Assembly

1974 NC Bicycle Program founded; Supports the legal definition that a bicycle is a vehicle

1975 Bicycling Highways system created

1977 Legislation enacted establishing the North Carolina Bicycle Committee

1978 NC Board of Transportation adopted the NCDOT Bicycle Policy, the nation's most comprehensive set of bicycle policies.

1979 NCDOT signs the first bicycle route

1980s

1981 The first state-funded bikeway is built

1984 NCDOT launches its first statewide safety and education campaign, "Bicycles are Vehicles"

1985 NC Board of Transportation adopts first Bicycle TIP schedule.

1986 Effort launched to require bicycle safety education in schools

1990s

1987 DBPT developed the first state "Share the Road" sign and plaque. The design was adopted as a national standard for the MUTCD in the 1990s

1990 "Basics of Bicycling" curriculum created, implemented in schools

1991 NCDOT Bicycle Policy was updated to clarify responsibilities for the provision of bicycle facilities

1992 The Governor's Highway Safety Program begins providing funding for safety programs through local law enforcement agencies

1993 NC Bicycle Facility Planning and Design Guidelines adopted; Pedestrian Policy Guidelines established how sidewalks are funded and maintained

1994 Administrative Action to Include Greenway Plans adopted, requiring NCDOT to consider greenways during the highway planning process

1996 Adoption of first statewide pedestrian and bicycle plan

1997 DBPT sponsors Walkable Communities Conference series

1999 Inaugural "Cycle North Carolina" cross-state ride

2000s

2000 DBPT calls NC's first Bicycle and Pedestrian Safety Summit; Bridge Policy adopted

2001 Passage of the Child Bicycle Safety Act, requiring persons under the age of 16 years to wear helmets

2004 DBPT launches Bicycle and Pedestrian Planning Grant Initiative

2005 General Assembly approved the "Share the Road" license plate, which promotes bicycle safety awareness and raises funds for purchase of bicycle helmets for underprivileged children

2008 Guide for Temporary Pedestrian Accommodations in work zones

2012 DBPT pilots the state's first comprehensive pedestrian safety awareness campaign "Watch for Me NC"; DBPT partnering sponsor for the inaugural Statewide Bike Summit

DBPT Mission Statement:

To decrease bicyclist and pedestrian injuries and fatalities on North Carolina's streets, highways, and other public rights-of-way by improving these corridors and the travel environment for safe bicycle and pedestrian use, thus promoting increased bicycling and walking.

2

DBPT: Planning

The DBPT is a national leader in the breadth and depth of pedestrian and bicycle planning achieved across North Carolina. In 2004, to encourage the development of comprehensive municipal-level bicycle plans and pedestrian plans, DBPT in partnership with NCDOT's Transportation Planning Branch (TPB) created a matching grant program to fund plan development. To-date, a total of $3.6 million has been allocated to more than 130 municipalities through this grant program (See pages 2-17 through 2-18 for more detailed information). The Planning Grant Initiative won an FHWA Transportation Planning Excellence Award in 2010.

The Division of Bicycle and Pedestrian Transportation expanded its municipal planning grant program in 2009, to include grants to councils of government for comprehensive regional bicycle plans. Funding had been set aside by the legislature in 2007 to begin this program. "The Regional Bicycle Planning Initiative" provides money and technical assistance to develop on-road and off-road bicycle connections between municipal jurisdictions and through scenic natural areas within a defined region. These connections identify improvements to existing roadways and may also locate preferred alignments through public lands or new developments for greenways and rail trails. These comprehensive planning documents aim to create a safe bicycle system between origins and destinations of interest within a county or multi-county region. The goals of this planning initiative are to:

- identify an integrated system of on-road and off-road trail connectivity that is safe and pleasant to use
- encourage regional coordination of bicycle improvements that enhance bicyclist access, mobility and safety
- put forward creative solutions that overcome physical and political barriers to implementation of projects and programs
- promote policies and guidelines that assure the integration of bicycle accommodations in state, regional and local highway and bridge projects; infrastructure improvements on public lands, such as state and national park and forest lands; and private development projects
- identify project and program recommendations that are realistic, well-informed and implementable
- contribute to local economic development in regions throughout the state

DBPT determines pedestrian and bicycle project prioritization. This data-driven approach places projects in priority order, based on various criteria including how the project meets NCDOT's goals. The strategic prioritization process occurring every two years serves as the primary input source for the developmental STIP and the 10-year Program & Resource Plan.

The Little Sugar Creek Greenway in Charlotte, NC is one of many projects funded and managed by the DBPT.

DBPT: Programs

DBPT understands that creating safe and inviting pedestrian and bicycle transportation systems requires attention to more than physical infrastructure; it also requires implementation of pedestrian and bicycle-related programs. Special attention is made by the DBPT for the development of targeted education, encouragement, enforcement, and evaluation strategies that improve North Carolina residents' health, safety, and their ability to incorporate walking and bicycling into everyday. Successful DBPT programs reach pedestrians, bicyclists and motorists in all different sectors of the population in North Carolina.

Specific funding is set aside for bicycle and pedestrian training workshops, safety research, projects and initiatives designed to meet needs statewide. Examples of successful programs and projects initiated by the DBPT include:

- Safe Routes to School (SRTS)
- Bicycle Helmet Initiative
- The 'Watch For Me NC' Pedestrian Campaign
- "Let's Go NC" Bicycle and Pedestrian Curriculum
- Crash Data Tool

EXAMPLE PROGRAM: SAFE ROUTES TO SCHOOL (SRTS)

The federal SRTS program provides funds that can be used for planning, design, and construction of infrastructure-related projects that will substantially improve the ability of students to walk and bicycle to school.

North Carolina has received these funds to be used for projects that improve the transportation infrastructure around schools; reinforce appropriate behaviors of motorists, pedestrians, and bicyclists; and educate and encourage children to take advantage of walking and bicycling opportunities where it is safe to do so and where it is not safe; facilitate a project in order to make it safe.

The purposes of the SRTS program are to:

- Enable and encourage children, to walk and bicycle to school
- Make bicycling and walking to school a safer and more appealing form of transportation, thus encouraging a healthy and active lifestyle from an early age
- Facilitate the planning, development, and implementation of projects and activities that will improve safety and reduce traffic, fuel consumption, and air pollution in the vicinity of schools

Watch for Me NC & Safe Routes to School (SRTS) are two example programs managed by the DBPT.

Safe Routes To School initiatives across the state are helping students and parents understand how walking and biking to school can be safe, fun, and good for the environment. This picture in Raleigh took place during Walk to School Day (2012) and featured public engagement activities and entertainment.

DBPT: Engineering (Project Development and Design)

Engineering has been a hallmark of the DBPT from its inception. DBPT manages millions of dollars for pedestrian and bicycle projects across the state. Throughout its history, the DBPT has designed dozens of greenway projects and managed hundreds more.

Currently, DBPT engineering staff manages, administers, and reviews bicycle/pedestrian/greenway construction projects around the state. The Division participates in revising policies, guidelines, and manuals that impact pedestrian and bicycle accommodations; works to resolve complex pedestrian and bicycle design issues on major highway projects; and offers training and technical support to other DOT planning and design units as well as municipalities. In addition, engineering staff review all design plans from Divisions and provide expertise on Complete Streets projects and ADA issues.

DBPT oversees the initiation and programming of some bicycle and pedestrian projects in the TIP. This includes:

- Defining prioritization criteria and utilizing a project prioritization methodology to rank projects.
- Working with municipalities to define projects and determine if design and preliminary engineering is needed; assisting with feasibility study
- Working with municipalities to develop project design RFQs that follow FHWA/NCDOT guidelines
- Reviewing ROW, environmental, permitting documents

PLANNING FOR WALKING AND BICYCLING IN NORTH CAROLINA

Pedestrian and bicycle planning in North Carolina goes beyond the efforts of the DBPT, and is carried out on several different scales in North Carolina by a range of agencies, departments, and organizations. This section provides an overview of the key processes, plans, and stakeholders relevant to walking and bicycling in North Carolina.

Process for Funding and Constructing Pedestrian and Bicycle Facilities

Pedestrian and bicycle facilities are planned, designed, and built by municipalities, counties, private developers, NCDOT, and others in North Carolina.

Local Process

Municipalities and counties can implement projects through their own capital improvement programs (CIPs), tax increment financing, bonds, and other means including raising property valuation tax rates. Two examples of local streetscape improvement efforts are outlined below:

- The City of Raleigh's Transportation CIP Budget allocates funding for sidewalk construction, maintenance, and repair, streetlight installations, and bicycle facility improvements. In 2012, $500,000 was dedicated for bicycle marking/striping projects that were recommended in the *Raleigh Bicycle Transportation Plan*. In 2012, the City of Raleigh also received a Congestion Mitigation and Air Quality Grant through the Capital Area Metropolitan Planning Organization for $1.1 million that required a $225,000 local match. The Raleigh City Council approved the combination of these two efforts into a single project to stripe dozens of miles of on-road bicycle facilities in 2013-2014.

- The City of Charlotte's Sidewalk Retrofit Policy establishes the intent of how available funding should be used and how sidewalk projects are prioritized. The Transportation Action Plan policies establish funding priorities for the City. Charlotte also constructs pedestrian facilities as part of major roadway projects through its Thoroughfare and Street Projects program.

▲ Mid-block crossing construction in Charlotte, NC

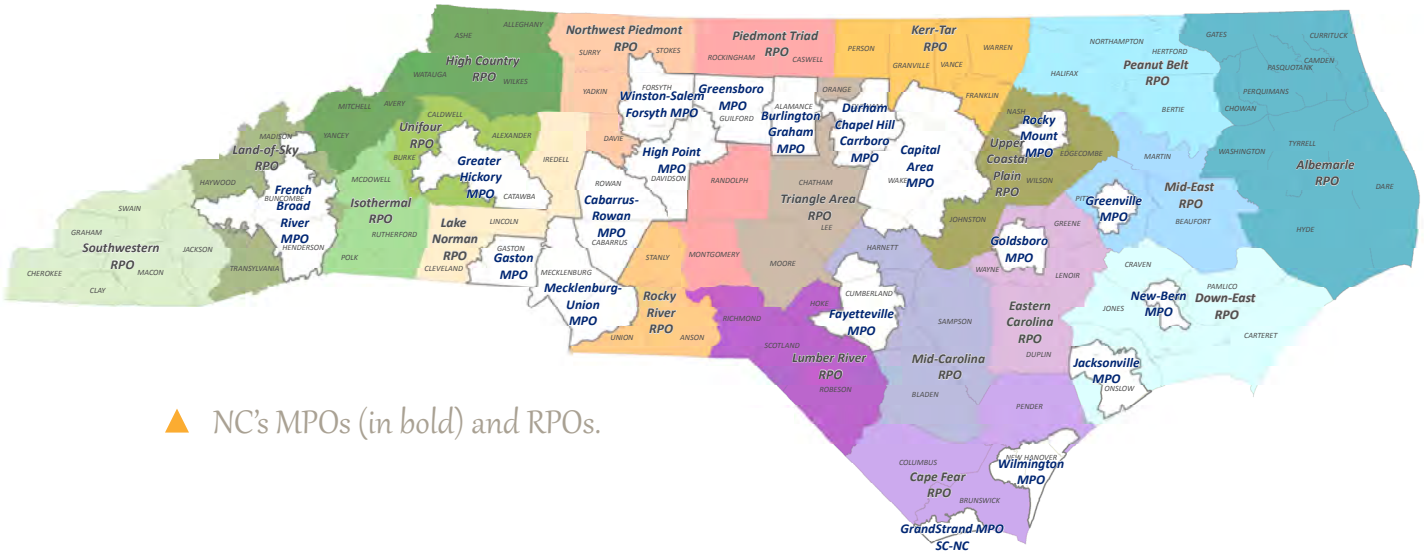
Private developers also contribute to pedestrian and bicycle facilities on the local level, most notably sidewalks, bicycle lanes and greenway trails. These improvements are determined by local zoning ordinances and subdivision requirements that regulate the infrastructure that both public and private entities construct. The nature of such requirements varies considerably. For example, counties in North Carolina typically do not place the same level of requirements for the dedication of rights-of-way or construction of pedestrian and bicycle facilities as their municipal counterparts. Even among municipalities, there are significant differences in the amount of responsibility that private development incurs in the construction of pedestrian and bicycle facilities. In order for pedestrian and bicycle infrastructure to become integrated into local transportation systems, it is critical that these local requirements promote a built environment that equally meets the needs of pedestrians, bicyclists, motorists, and transit users (consistent with Complete Streets principles).

State Process

Within NCDOT, most construction of pedestrian and bicycle facilities occurs at the local or NCDOT Division level.

Broadly speaking, there are two types of pedestrian and bicycle infrastructure projects, *independent* and *incidental:*

- *Independent* projects are those where pedestrian or bicycle facilities comprise the entire project. These projects are planned by municipalities based on a perceived local need and submitted to the local metropolitan planning organization (MPO) or rural planning organization (RPO), which then prioritizes all projects received. Based on this prioritization, NCDOT implements as many projects as funding allows. Independent projects are prioritized, funded and



▲ NC's MPOs (in bold) and RPOs.

constructed separately from the standard project development process.

- *Incidental* projects are those included as a part of a larger street or highway project. These projects are identified either during project development/scoping or through the "Policies to Projects" process that begins with long-range goals and investment decisions and ends with a detailed work program that spells out specific projects needed to achieve the goals.

Statewide Planning

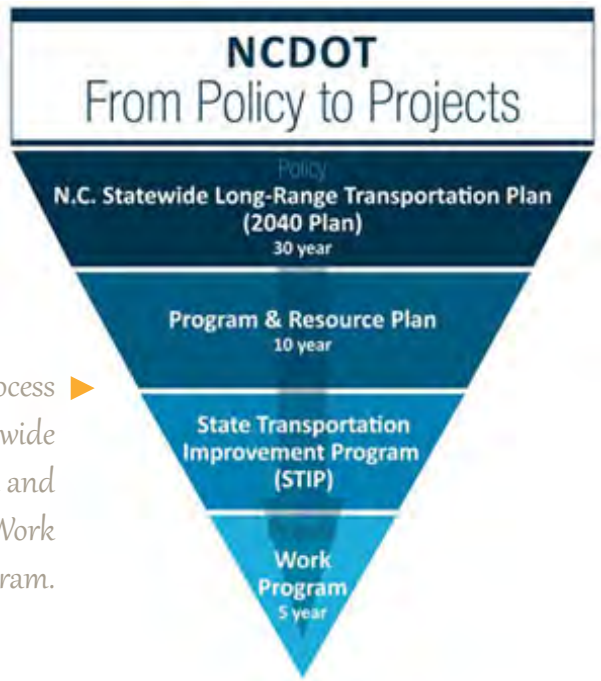
The process for larger street or highway projects (of which incidental pedestrian and bicycle projects are a part) begins with the Statewide Transportation Plan (also called the '2040 Plan') and ends with the 5-year Work Program. These plans and programs are briefly summarized, followed by other related statewide plans and initiatives.

North Carolina Statewide Transportation Plan (2040 Plan)

The 2040 Plan provides a blueprint for how North Carolina's transportation system should develop over the next 30 years to meet the needs of its users. The plan reaffirms NCDOT's Mission and Goals and identifies strategic policy, process, and program improvements including:

1. Working with regional partners to increase flexibility and responsiveness
2. Reward entities that better integrate land use and transportation
3. Increase funding flexibility to recognize regional, urban and rural differences
4. Strengthen planning processes to recognize diversity

The plan also reviews the current conditions for each mode of transportation, according to Level of Service (LOS) standards (as defined by NCDOT, level of service is the "quality of service from the perspective of the user" and can vary from a "desired state" of LOS A to a failing state of LOS F). Bicycle and pedestrian performance is reported



The Policy to Projects process begins with the Statewide Transportation Plan and ends with the 5-year Work Program.

to be at LOS D. The plan states that the greatest priority for pedestrian and bicycle improvements is addressing walking and bicycling safety needs. Based on NCDOT estimates, the 30-year investment needs for pedestrian and bicycle improvements total $1.29 billion to achieve LOS A. Current deficiencies in the pedestrian and bicycle network account for $1.05 billion, or 81%, of 30-year needs.

Program and Resource Plan

The Program and Resource Plan is a 10-year project list that addresses transportation needs identified through long-range planning. Potential projects are prioritized by staff from NCDOT, MPOs and RPOs with the goals of improving safety, mobility and infrastructure health based on crash data, congestion levels, pavement conditions, and other criteria.

State Transportation Improvement Program

NCDOT publishes a federally required State Transportation Improvement Program (STIP) that describes the projects to be programmed in the next seven years. It is reviewed annually and updated every two years. The STIP includes independent and incidental pedestrian and bicycle projects. For more on the STIP, see: www.ncdot.gov/bikeped/funding/process/.

Metropolitan Transportation Improvement Program (MTIP)

The MTIP is the MPO corollary of the STIP, providing a seven-year forecast of all transportation projects in the Metropolitan Area Boundary. There are currently 19 MPOs in North Carolina. Notably, eleven of these MPOs are Transportation Management Areas, or TMAs. These TMAs receive not only planning monies directly through the federal government that can be used for planning and conceptual design of pedestrian/bicycle projects and programs, but also an additional sum of money equivalent to 10% of the Surface Transportation Program funds that can be used for planning, design, right-of-way acquisition and construction of pedestrian and bicycle projects.

Five Year Work Program

The Work Program derives from the Program and Resource Plan. It contains both program and project-level information. The Work Program is an accounting of the state's annual transportation program grouped into Construction & Engineering, Maintenance, Operations, Administration and Transfers. The Work Program is NCDOT's commitment to the projects and services planned for the next five years. Work Program projects are found in the first five years of the (10 year) Project List. The Five Year Work Program is produced and reviewed by the Board of Transportation every year. The first two years of the Work Program are aligned with the biennial budget cycle. The Work Program includes specific

pedestrian and bicycle projects throughout the state.

Project Development Process

Once a project is defined and prioritized through the planning processes described previously, it moves into the project development process. It is during this stage that the final design of projects is determined. The first step in the project development process is the formation of a design input team. The design input team includes internal NCDOT team members and external team members who work to ensure that all users are considered. The current project development process includes the following steps:

1. ***Establishment of goals and objectives*** of the project, including the identification of pedestrian-related issues and opportunities.
2. ***Evaluation of existing and future conditions*** to ensure that the project is appropriate for the area. This includes an assessment of current pedestrian demand, travel patterns, and pedestrian crashes, as well as an evaluation of latent pedestrian demand, and future demand as a result of anticipated land-use changes.
3. ***Development of alternatives*** for the project and evaluation of trade-offs to determine a recommended alternative.

The final recommended alternative reflects the ultimate design for the project, including project-specific features and dimensions. Given the Complete Streets policy (see following page), the project development process outlined previously should generally lead to the inclusion of pedestrian and bicycle facilities; however, this is not always the case. If a pedestrian or bicycle facility is not included in a planned project but a municipality believes that it should be, currently the municipality is required to notify NCDOT and request inclusion of the facility.

For example, for pedestrian facilities, NCDOT's Pedestrian Policy Guidelines outline the current process for a municipality to request inclusion of incidental pedestrian facilities in a proposed project. If this process is followed and the pedestrian facilities are approved by NCDOT, local cost sharing is required for most projects based on a sliding scale, ranging from a 50/50 split for larger cities to an 80/20 split for smaller communities. If a municipality misses the window to request inclusion of pedestrian facilities, the facility may still be requested if the municipality agrees to cover the full cost.

▲ NCDOT Ped/Bike Project Construction.

2

NCDOT, Bicycling & Walking in North Carolina: A Long-Range Transportation Plan, 1996

The 1996 statewide pedestrian and bicycle plan was the first of its kind in North Carolina. The plan developed five goals to guide NCDOT's efforts to improve conditions for walking and bicycling:

1. Provide the bicycle and pedestrian facilities necessary to support the mobility needs and economic vitality of communities throughout North Carolina.
2. Provide a comprehensive program of education and enforcement strategies that will improve the safety of all bicyclists and pedestrians.
3. Institutionalize walking and bicycle considerations to enhance current transportation practices at the state, regional, county, and local level.
4. Identify and promote new and innovative ways to advance bicycle and pedestrian safety and enjoyment through research and needs assessment.
5. Encourage walking and bicycling as viable transportation options.

NCDOT, North Carolina's Strategic Highway Safety Plan, 2007

The *Strategic Highway Safety Plan* outlines several strategies for improving pedestrian and bicycle safety on North Carolina highways. These include:

- Revising the DMV Drivers Handbook to include more information and test questions on how to share the road with bicyclists and crossing pedestrians
- The rights and responsibilities of different road users
- Training law enforcement on bicycle and pedestrian laws and local law enforcement efforts to improve walking and bicycling safety
- Stronger penalties for violating directions/directives of school crossing guards
- Establishing a central governing body for driver education in North Carolina

NCDOT, Complete Streets Planning and Design Guidelines, 2012

NCDOT released its complete streets guidelines in 2012 following the adoption of a Complete Streets Policy in 2009. This document includes recommendations to accommodate all users of the transportation network, including pedestrians and bicyclists. The process of planning and designing complete streets, as well as guidelines for implementing the policy, are addressed. NCDOT is currently conducting complete streets training throughout the state to help regional, county, and local planners, engineers, and designers incorporate these guidelines into their projects and programs.

Division of Parks and Recreation, NC Department of Environment and Natural Resources, 2009-2013 North Carolina Statewide Comprehensive Outdoor Recreation Plan, 2008

The *Statewide Comprehensive Outdoor Recreation Plan* (SCORP) is North Carolina's five-year policy plan for outdoor recreation and provides guidance for the Land and Water Conservation Fund (LWCF) program and for other state-administered grant programs. The primary state agencies involved in the SCORP implementation include the Division of Coastal Management, Division of Water Quality, Division of Parks and Recreation, Division of Forest Resources, and the Wildlife Resources Commission.

The SCORP includes a listing of the top 20 outdoor activities by percent of state residents who participate:

1. Walk for pleasure (82%)
2. Family gathering (74.6%)
3. Gardening or landscaping (65.4%)
4. Driving for pleasure (58.2%)
5. View/photo natural scenery (57%)
6. Visit nature centers, etc. (52.9%)
7. Sightseeing (52.9%)
8. Picnicking (50%)
9. Attend sports events (48.6%)
10. Visit a beach (44.2%)
11. Bicycling (31%)

Other statewide and county trends from the SCORP that reflect conditions in North Carolina or impact local priorities include:

- The number of North Carolinians participating in recreational activities has increased by nearly 50 percent in the past decade, from 27.4 million to 40.5 million participants
- Between 1995 and 2006, participation in every outdoor recreation activity increased in North Carolina except for team sports (-1.5 percent change, 21.6 percent participating). The highest percentage increase of participants occurred in outdoor adventure activities (87.5 percent change, 51.2 percent participating).

Statewide Bicycle Routes and Major Trail Systems

North Carolina Bicycle Route System

One of the first of its kind in the country, North Carolina's bicycle route system was developed in response to the 1974 Bicycle and Bikeway Act. The bicycle route system identifies roads across North Carolina that are safer for bicycling, and links them to a network of bicycling highways that provide access to major population centers of the state, state parks, historic sites, and other points of interest. The current network consists of nine different routes covering 2,400 road miles. Bicycle tourists use regional and route-specific maps to navigate the state.

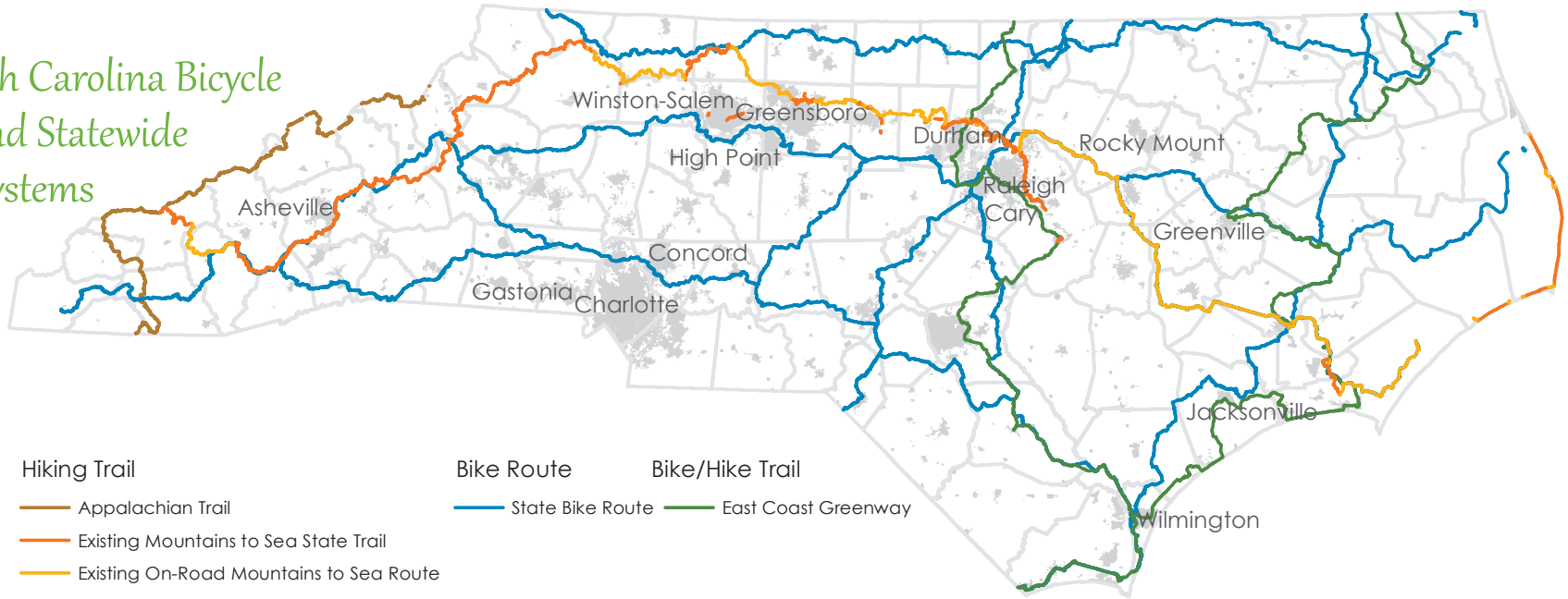
Statewide Trails

MOUNTAINS-TO-SEA STATE TRAIL

The Mountains-to-Sea State Trail is a unit of the North Carolina State Parks System. In implementation, it is a partnership among state and federal land managing agencies, counties and municipalities, and volunteer groups such as the Friends of the Mountains-to-Sea Trail. The Mountains-to-Sea State Trail will be a continuous, off-road trail from the Great Smoky Mountains National Park in western North Carolina to Jockeys Ridge State Park on the Outer Banks. The distance is approximately 1,000 miles, but only 530 miles have been completed. The NC Division of Parks and Recreation is working with multiple partners to complete the trail. NCDOT has assisted with planning and implementation of some segments of the Mountains-to-Sea State Trail because the trail is an important component of a walk/bike strategy for many communities along the route of the trail.

http://www.ncparks.gov/About/trails_mst.php
http://www.ncmst.org/

Existing North Carolina Bicycle Routes and Statewide Trail Systems



EAST COAST GREENWAY

The East Coast Greenway (ECG) is a developing multi-state trail system that extends almost 3,000 miles from Florida to Maine. At completion, the greenway will connect all major cities of the eastern seaboard by off-road paths. As of 2012 over 25% of the greenway is complete. The 360-mile North Carolina portion of the ECG travels through the eastern part of the state, with the current route connecting Durham, Raleigh, Fayetteville, and Wilmington. Approximately 18% of North Carolina's off-road route has been constructed.

http://www.greenway.org/nc.aspx

Regional Trails

AMERICAN TOBACCO TRAIL

The American Tobacco Trail (ATT) is a rail-trail that extends from western Wake County north to downtown Durham. With the 2013 addition of a pedestrian and bicycle bridge over Interstate 40, the trail stretches a total of 22 miles. The ATT has been incorporated as part of the North Carolina segment of the East Coast Greenway.

CAROLINA THREAD TRAIL

The Carolina Thread Trail is a planned regional trail network that spans 15 counties in western North Carolina and South Carolina. As of 2012, 100 miles of the trail are open for use and 14 corridors are being developed. County-level greenway plans have been completed for all 15 participating counties. These plans include recommendations for on-road walkways and bikeways in addition to off-street greenways and blueways. The CTT is a model project for regional trail planning coordination between local communities and partner organizations.

http://www.carolinathreadtrail.org

NEUSE RIVER GREENWAY

Part of the Mountains-to-Sea Trail, the Neuse River Greenway runs 33 miles from the base of Falls Lake Dam, through Raleigh and connecting to Clayton in Johnston County. The greenway is 33 miles in length making it the longest, continuous paved greenway in the state as of 2013. The greenway requires no street crossings.

Regional Bicycle and Pedestrian Planning

Metropolitan areas and smaller urban areas encompass multiple cities and towns and often extend across county lines. As North Carolina's population continues to grow and urbanize, regional planning for walking and bicycling will become increasingly important, particularly for integration with transit and key destinations. Identifying helpful connections, setting design standards, and collaborating on planning initiatives across departments and levels of government will all be important for providing cohesive regional pedestrian and bicycle planning networks across North Carolina.

MPO and RPO Plans

Metropolitan Planning Organizations (MPOs) and Rural Planning Organizations (RPOs) are responsible for regional transportation planning in North Carolina. These regional planning bodies have jurisdictions that span across multiple counties and parts of counties, making cross-county and municipal coordination crucial for successful planning.

Some North Carolina MPOs and RPOs have stand-alone pedestrian and bicycle plans, including those listed below.

Locality	Date	Type	Plan
CAMPO (Capital Area MPO)	2003	MPO	Bike/Ped
Durham-Chapel Hill-Carrboro MPO	1993	MPO	Bike
Fayetteville MPO	2009	MPO	Bike/Ped
Greensboro	2006	MPO	Bike/Ped
Greenville Urban Area	2011	MPO	Bike/Ped
Jacksonville	2008	MPO	Bike/Ped
Wilmington Area	1981	MPO	Bike
Winston-Salem Urban Area	2005	MPO	Bike
Winston-Salem Urban Area	2007	MPO	Ped
Mid-Carolina RPO	2005	RPO	Bike/Ped

Other MPOs and RPOs have incorporated bicycle and pedestrian plans into their Long-Range Transportation Planning (LRTP) documents or do not have a plan, but have interspersed pedestrian and bicycle elements within the LRTP. Similarly, some counties and metropolitan areas have incorporated bicycle and pedestrian planning into their Comprehensive Transportation Plans (CTP) and Metropoloitan Transportation Plans (MTP).

County Plans

The following NC counties have completed stand-alone pedestrian and/or bicycle plans:

Locality	Date	Plan
Alamance County	1994	Bike/Ped
Caldwell County	2004	Bike/Ped
Chatham County	2011	Bike
Durham County	2006	Bike
Forsyth County	1988	Bike
Haywood County	2011	Bike
Mecklenburg County	1977	Bike
Orange County	1999	Bike

Other Regional Plans

Many regional planning efforts have occurred or are occurring around the state to promote regional connectivity.

Regional plans include:

- *Croatan Regional Bike Plan*
- *High Country Regional Bike Plan*
- *Kerr-Tar Lakes District Regional Bike Plan*
- *Lake Norman Regional Bike Plan*
- *CORE Pedestrian-Bicycle-Greenspace Plan*
- *Blue Ridge Bike Plan*
- *Albemarle Regional Bike Plan*
- *Central Park Regional Bike Plan*

Local Pedestrian and Bicycle Planning

More than 130 municipalities in North Carolina have completed pedestrian and bicycle plans, more than 80 percent of which were funded in part by DBPT's Planning Grant Initiative. Following is a list of municipalities with completed pedestrian and/or bicycle plans. The adoption year of the most recent plan for each municipality is listed.

Locality	Date	Bike/Ped	NCDOT Grant
Aberdeen	2011	Ped	X
Ahoskie	2010	Bike	X
Albemarle	2010	Bike	X
Albemarle	2007	Ped	X
Asheboro	2008	Ped	X
Asheville	2008	Bike	X
Asheville	2004	Ped	
Badin	2008	Ped	X
Banner Elk	2009	Ped	X
Beaufort	2009	Bike	X
Belmont	2009	Ped	X
Belmont	2013	Bike	X
Bessemer City	2010	Ped	X
Biscoe	2010	Ped	X
Black Mountain	2008	Ped	X
Boiling Springs	2006	Ped	X
Boone	2012	Ped	X
Boone	1995	Bike/Ped	
Brevard	2006	Ped	X
Bryson City	2007	Ped	X
Burnsville	2006	Ped	X
Burlington	2013	Ped	
Butner	2010	Ped	X
Carolina Beach	2011	Bike	X
Carrboro	2009	Bike	X
Cary	2007	Ped	X
Chapel Hill	2005	Bike/Ped	

Locality	Date	Bike/Ped	NCDOT Grant
Charlotte	2008	Bike	X
Cherryville	2009	Ped	X
Clayton	2006	Bike	X
Clinton	2012	Ped	X
Columbia	2010	Ped	X
Conover	2008	Ped	X
Cornelius	2012	Ped	X
Cramerton	2008	Ped	X
Creedmoor	2012	Ped	X
Creedmoor	2012	Bike	X
Davidson	2008	Bike	X
Dunn	2008	Ped	X
Durham	2006	Bike	
Durham	2006	Ped	X
Eastern Band of Cherokee Indians	2009	Ped	X
Eden	2010	Ped	X
Edenton	2009	Ped	X
Elizabeth City	1985	Bike	
Elon	2008	Bike/Ped	
Fayetteville	1980	Bike	
Goldsboro	1999	Bike/Ped	
Graham	2006	Ped	X
Granite Falls	2011	Ped	X
Grifton	2008	Ped	X
Hendersonville	2007	Ped	X
Hertford	2007	Ped	X
Hickory	2005	Bike/Ped	
Hildebran	2010	Ped	X
Hillsborough	2009	Bike/Ped	
Holly Springs	2012	Bike	X
Holly Springs	2007	Ped	X
Indian Trail	2011	Bike	X
Indian Trail	2009	Ped	X

Locality	Date	Bike/Ped	NCDOT Grant
Jamestown	2010	Ped	X
Jefferson	2008	Ped	X
Kannapolis	2007	Ped	X
Kenansville	2007	Ped	X
Kernersville	2007	Bike/Ped	
Kings Mountain	2011	Bike	X
Kings Mountain	2002	Bike/Ped	
Kinston	2008	Ped	X
Leland	2008	Bike	X
Locust	2009	Ped	X
Mars Hill	2007	Ped	X
Marshville	2010	Ped	X
Matthews	2006	Bike	X
Mint Hill	2011	Ped	X
Mooresville	2008	Bike	X
Mooresville	2006	Ped	X
Morehead City	2011	Ped	X
Morehead City	2007	Bike	X
Nashville	2008	Ped	X
New Bern	2006	Bike	X
New Bern	2009	Ped	X
North Topsail Beach	2006	Bike	X
North Wilkesboro	2009	Ped	X
Norwood	2007	Ped	X
Oak Island	2006	Bike	X
Old Fort	2010	Ped	X
Oxford	2012	Ped	X
Oxford	2013	Bike	X
Pembroke	2010	Ped	X
Pine Knoll Shores	2008	Ped	X
Pittsboro	2009	Ped	X
Raleigh	2009	Bike	X
Roanoke Rapids	2011	Ped	
Rocky Mount	2007	Bike	X

Locality	Date	Bike/Ped	NCDOT Grant
Rocky Mount	2012	Ped	
Roxboro	2008	Ped	X
Salisbury	2009	Bike	X
Sanford	2010	Ped	X
Sanford	2012	Bike	X
Shelby	2007	Ped	X
Southern Pines	2010	Bike	X
Sparta	2006	Ped	X
Stallings	2008	Ped	X
Swansboro	2011	Bike	X
Sylva	2011	Ped	X
Tarboro	2006	Bike	X
Thomasville	2009	Bike	X
Troutman	2008	Ped	X
Wake Forest	2008	Bike	X
Wake Forest	2006	Ped	X
Washington	2013	Bike	X
Washington	2006	Ped	X
Waynesville	2010	Ped	X
Waxhaw	2012	Ped	X
West Jefferson	2011	Ped	X
White Lake	2010	Ped	X
Williamston	2012	Ped	X
Wilkesboro	2007	Ped	X
Wilmington	2009	Ped	X
Wilson	2008	Bike	X
Wilson	2006	Ped	
Winston-Salem	2005	Bike	
Winston-Salem	2007	Ped	
Winterville	2009	Ped	X
Wrightsville Beach	2005	Bike	
Yadkinville	2010	Ped	X
Yanceyville	2012	Ped	X

2

Walk and Bicycle-Friendly Communities, Universities, and Businesses

The Walk Friendly Communities program provides national recognition to places that support safe walking environments, support access to destinations by foot, and integrate pedestrian facilities into the transportation network. The program is operated by the Pedestrian and Bicycle Information Center of the University of North Carolina Highway Safety Research Center and is sponsored by the U.S. Department of Transportation Federal Highway Administration and FedEx.

The Bicycle Friendly America program recognizes communities, universities, and businesses that provide safe bicycling environments and encourage bicycling through projects, programs, and other efforts. The program is run by the League of American Bicyclists.

Below is a listing of North Carolina communities, universities, and businesses that were rated as walk or bike-friendly.

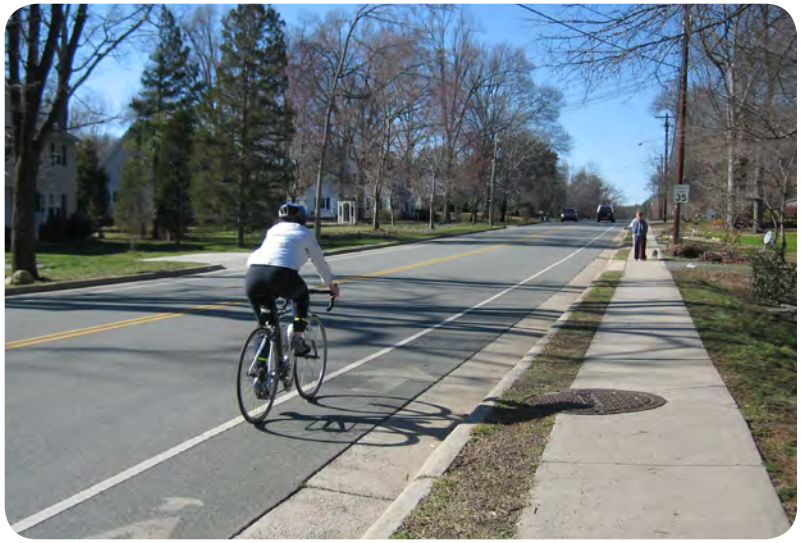
Bicycle Friendly Communities	
Name	Ranking
Asheville	Bronze
Carrboro	Silver
Cary	Bronze
Chapel Hill	Bronze
Charlotte	Bronze
Davidson	Bronze
Durham	Bronze
Greensboro	Bronze
Raleigh	Bronze
Wilmington	Bronze

Walk Friendly Communities	
Name	Ranking
Cary	Bronze
Charlotte	Bronze
Davidson	Bronze

Bicycle Friendly Universities	
Name	Ranking
Duke University	Bronze
North Carolina State University	Bronze
University of North Carolina, Greensboro	Bronze
University of North Carolina, Wilmington	Bronze

Bicycle Friendly Businesses	
Name	Ranking
City of Durham	Silver
Liberty Bicycles	Silver
Schuler Funeral Home	Bronze
National Institute of Environmental Health Sciences	Bronze
Town of Chapel Hill	Bronze
URS Corporation Morrisville	Bronze

Many Carrboro roads feature bicycle lanes. Carrboro has earned the highest designation in North Carolina of Silver Bicycle Friendly Community as of 2013.



In 2012, Rocky Mount invested in streetscape improvements, making Main Street more attractive and pedestrian-friendly.

Wilmington, one of North Carolina's Bicycle Friendly Communities, features North Carolina's first bike boulevard, (a low-volume roadway providing preferential treatment for bicyclists) on Ann Street (part of the River to the Sea Bikeway).

2

Pedestrian and Bicycle Organizations

Committees and Commissions

Some regional planning organizations and municipalities in North Carolina have established pedestrian and bicycle advisory groups to provide recommendations to decision-makers regarding walking and bicycling issues. These committees and commissions are typically made up of citizens, bicycle and pedestrian advocates, planners, and/or local staff who are interested in pedestrian and bicycle issues in their locality. The following are a list of examples and may not be inclusive of all organizations:

- Asheville Bicycle & Pedestrian Task Force
- CAMPO Bicycle & Pedestrian Stakeholders Group
- Chapel Hill Bicycle & Pedestrian Advisory Board
- City of Charlotte Bicycle Advisory Committee
- Durham Bicycle and Pedestrian Advisory Commission
- Emerald Isle Bicycle and Pedestrian Advisory Committee
- French Broad River MPO Complete Streets Subcommittee
- Greenville Bicycle and Pedestrian Commission
- Kernersville Pedestrian and Bicycle Advisory Committee
- Mecklenburg County Greenway Advisory Committee
- Raleigh Bicycle and Pedestrian Advisory Commission
- Southern Pines Bicycle and Pedestrian Advisory Committee
- Wilmington MPO Bicycle & Pedestrian Advisory Committee
- Wilson Bicycle and Pedestrian Advisory Board
- Winston-Salem Bicycle Advisory Committee

Pedestrian and Bicycle Advocacy Organizations

Bicycle and pedestrian advocacy organizations exist in cities across North Carolina. Some of these operate primarily on a local level, while others take a more regional or statewide approach in their advocacy efforts. Active advocacy groups in North Carolina include:

- North Carolina Active Transportation Alliance (NCATA)
- Bicycling in Greensboro (BIG)
- Charlotte Area Bicycle Alliance
- Carrboro Bicycle Coalition (CBC)
- Durham Bicycle Coalition
- Asheville on Bikes
- Bicycle HaywoodNC
- Connect Gaston

North Carolina is also home to a number of clubs for on-road and off-road walkers, cyclists, mountain bikers, runners, and hikers. While these groups typically have a recreational focus, many are also involved in advocacy efforts, volunteer activities such as trail maintenance, and planning and sponsoring rides, skills courses, and other events. Formally and informally they help to raise awareness about walking, running, and cycling in North Carolina.

Walking and Bicycling in North Carolina: Impacts, Trends, and Issues Today

The state of North Carolina, its agencies, MPOs/RPOs, counties, municipalities, stakeholders, and citizens have improved walkability and bikability through effective planning, facility development, and advocacy as described in the first half of this chapter. The second half of this chapter addresses the current impacts, trends, issues, and challenges related to walking and bicycling in North Carolina. These are expressed through the "lens" of the five pillars described in Chapter 1 (mobility, safety, health, economics, and environment).

The five pillars directly address the NCDOT mission statement:

> *Connecting people and places safely and efficiently, with accountability and environmental sensitivity to enhance the economy, health and well-being of North Carolina.*

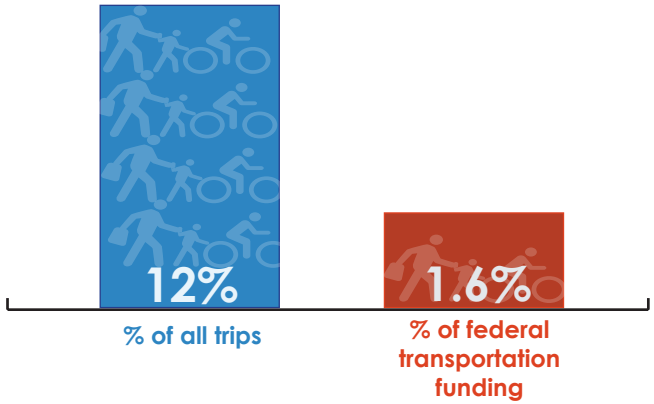
Ultimately, the existing conditions described will inform the Plan's recommendations for policies, infrastructure, programs, inter- and intra-agency coordination, and implementation with the goal of accomplishing the transportation mission of NCDOT.

Mobility

Reasons for Action

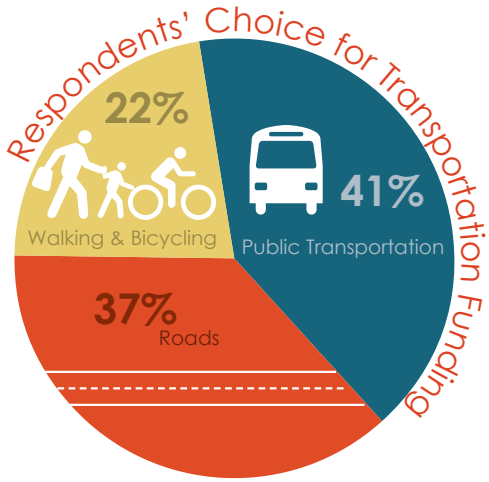
Walking and bicycling are the most efficient types of transportation available. These trips require less infrastructure, reduce congestion, and improve personal health. However, too often, these forms of transportation are viewed as only recreation-based. Nationally, according to an FHWA National Household Travel Survey completed in 2009, walking trips make up 10.9% of trips (42 billion out of 388 billion annually). Further, every transportation trip begins and ends as a pedestrian. In addition, US citizens believe that more funding should be provided for pedestrian and bicycle infrastructure.

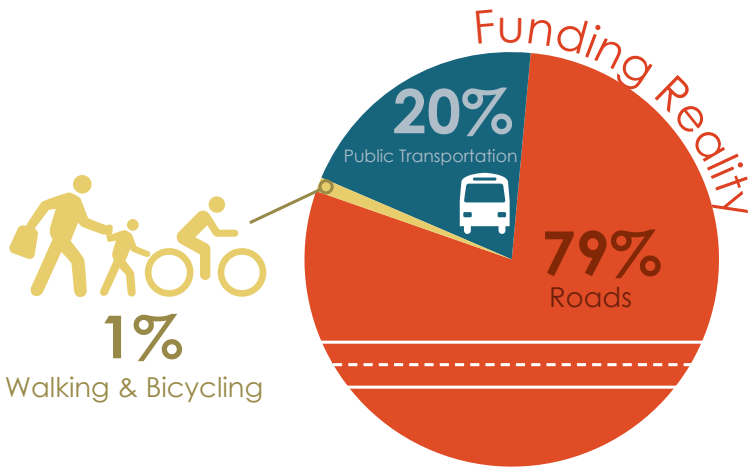
Levels of Bicycling and Walking and Bike/Ped Funding in the U.S. [3]



National Opinions on Transportation

According to a national transportation poll, Americans think differently about transportation funding than the reality of current budget allocation. (Transportation for America, designed by Collective Strength, and fielded by Harris Interactive, 2007)





In North Carolina, recent planning initiatives confirm national trends. Historically, less than 1% of state and federal transportation dollars in North Carolina went toward independent pedestrian and bicycle infrastructure projects (incidental projects are not currently tracked). As described in Chapter 1, this does not meet the demands of the current population nor does it meet the demands of a growing urban population and elderly population. The *2040 North Carolina Statewide Transportation Plan* (2012) reports bicycle and pedestrian conditions to be at the low end of level of service, at grade "D" (as defined by NCDOT, level of service is the "quality of service from the perspective of the user"and can vary from a "desired state" of LOS A to a failing state of LOS F). If funding levels remained the same ($4 million per year), the level of service would be "F" by 2022.

MPOs, RPOs, and municipalities who have completed bicycle and pedestrian plans submitted bicycle and pedestrian investment needs of $78 million per year, a figure that does not reflect the entire state need and is constrained by a project limit in their submittals. Seven MPO/RPO input summits that took place as part of the state prioritization process revealed that $47.4 million should be allocated to bicycle and pedestrian projects per year (ten times the current amount) to raise the level of service to the low end of "C."

Trends

North Carolinians commuted an average of 23.4 minutes in 2010.[1]

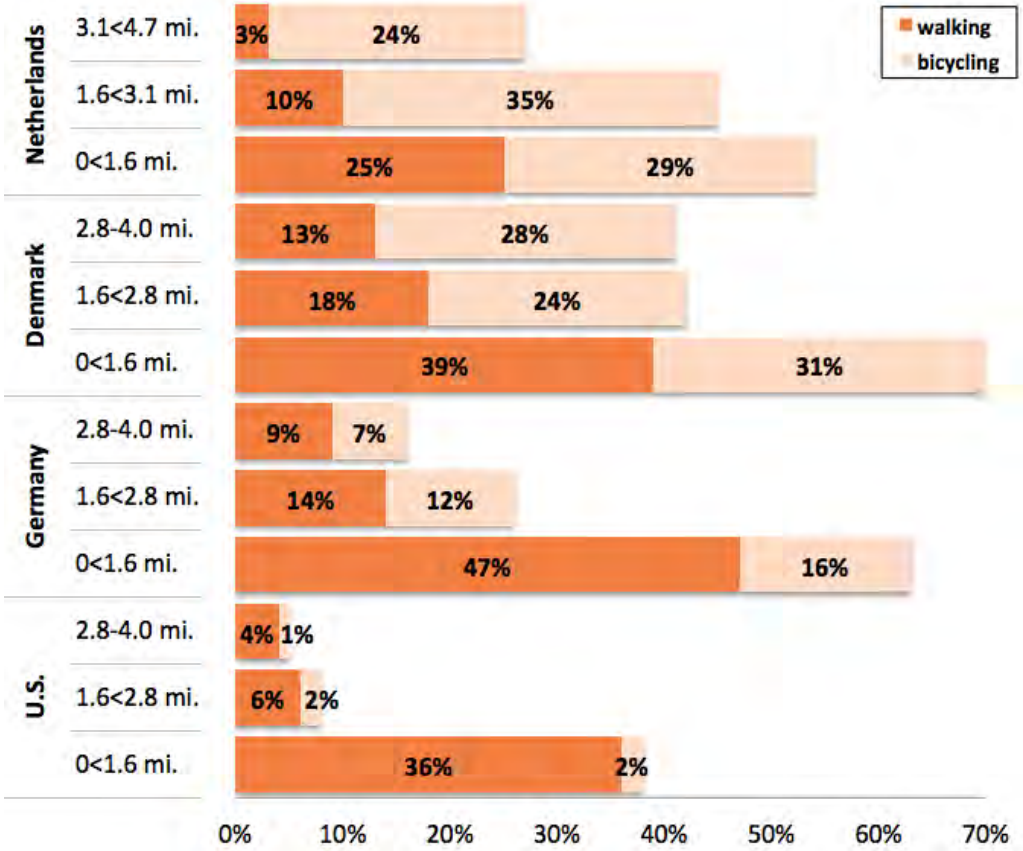
42% of commutes are under 10 miles while 58% are above 10 miles.[2]

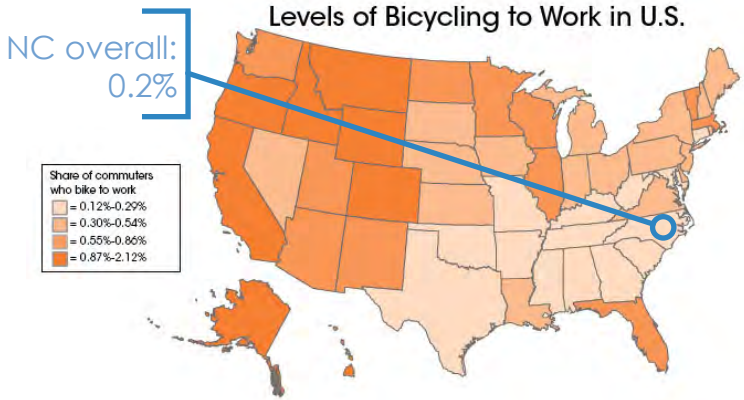
While future commuting time and distances are difficult to predict, it is clear that many North Carolinians have chosen to live further from their workplaces than most people would be able to walk or bicycle. However, 42% still live within 10 miles, making walking and biking a more feasible option.

Although North Carolina's walking and bicycling levels are low compared to many other states, there is vast potential to increase the percentage of trips that are taken by walking and bicycling. North Carolina places 42nd for walking commute rates and 41st for bicycling commute rates in state rankings.

As discussed previously, trends including an aging population and increasing movement to urban areas suggest an opportunity to increase mode share. In addition, recent studies have noted trends revealing that Millennials—those born between 1981 and 2001—are a part of a generation of declining car ownership.

▼ *International Walking and Bicycling Trips Comparison.*



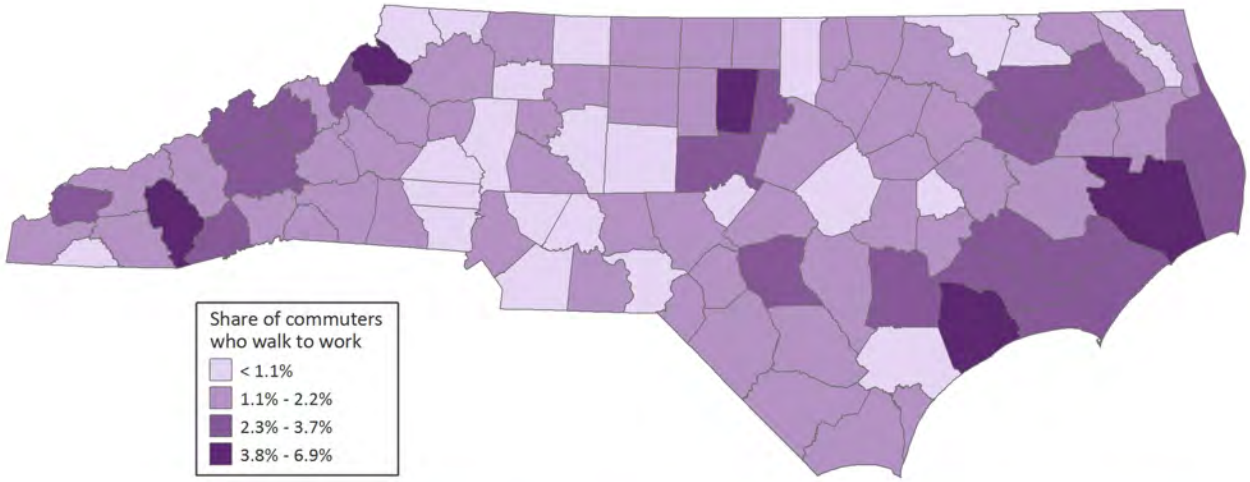


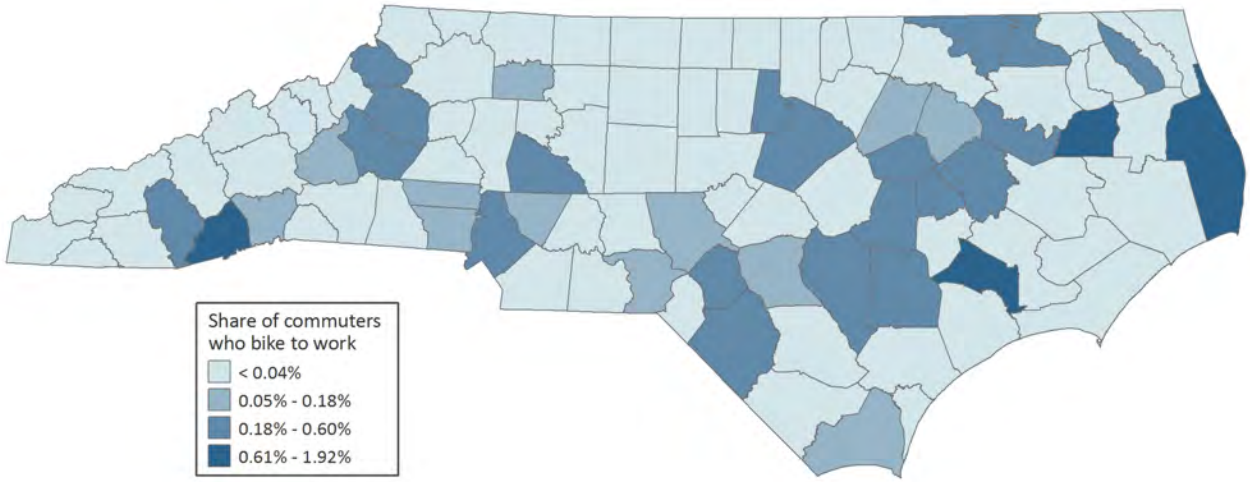
▲

Nationally, North Carolina compares unfavorably with much of the country in terms of the percentage of commuters walking and bicycling to work. Source: Alliance for Biking and Walking 2012 Benchmarking Report, American Community Survey 3-year data, 2007-2009.

An estimated 40% of all trips (commute and non-commute) taken by Americans are less than two miles, equivalent to a bike ride of 10 minutes or less, yet just 13% of all trips are made by walking or bicycling nationwide.[3]

To put these numbers into perspective, 34% of all trips are made by walking or bicycling in Denmark and Germany, and 51% of all trips in the Netherlands are by foot or by bike. The figure on 2-24 shows a comparison of the percentage of walking and bicycling trips by distance in the United States, Germany, Denmark, and the Netherlands. While walking rates are relatively comparable, particularly for trips of less than 1.6 miles, the bicycle has been greatly underutilized for short trips in the United States.





North Carolina Mode Share by County

Source: Alliance for Biking and Walking 2012 Benchmarking Report, American Community Survey 3-year data, 2007-2009.

Germany, Denmark, and the Netherlands are wealthy countries with high rates of vehicle ownership, like the United States, yet an emphasis on providing quality walking and bicycling facilities has alleviated the reliance on motor vehicles for short trips. **In the United States, bike commuting increased 71% from 2000 to 2009 in the 31 largest Bicycle-Friendly Communities, 62% in the 70 largest cities, and 44% across the United States.** This suggests that bike commuting will increase more significantly in urban areas that have made their communities more walkable and bikeable.

According to the 2012 Report to the U.S. Congress on the Outcomes of the Nonmotorized Transportation Pillot Program (NTPP), there were dramatic increases in bicycling and walking in four cities where $25 million was distributed for improvements. The number of bicyclists increased 49% while the number of pedestrians increased by 22% between 2007 and 2010. In 2010 alone, 16 million miles were bicycled or walked that would have otherwise been driven.[4] This also supports the 1997 and 2003 Transportation Research Board studies that found a positive association between miles of bike pathway per resident and percentage of population commuting by bicycle in 35 cities.[5]

SAFETY

Reasons for Action

Each year between 150-165 pedestrians and 16-20 bicyclists are killed in collisions with motor vehicles on North Carolina roads, with many more seriously injured or experiencing evident or possible injuries. The high rates of pedestrian and bicycle crashes contribute to North Carolina's ranking as one of the least safe states for walking and bicycling. See Appendix 9.9 for detailed North Carolina pedestrian and bicycle crash data.

In its 2012 Benchmarking Report, the Alliance for Biking and Walking ranked North Carolina 41st and 44th lowest for pedestrian and bicyclist safety, respectively.

State	Mode Share*	Total Fatalities**	% of Total**	Fatalities (per 1000 bicyclists/pedestrians)
North Carolina	2.0%	162	12.3%	1.898
Oregon	6.0%	43	11.4%	0.416
Minnesota	3.7%	52	12.4%	0.519
Colorado	4.2%	57	12.3%	0.554
Montana	6.4%	16	7.3%	0.533
Alaska	9.2%	11	17.2%	0.359
California	3.7%	662	21.5%	1.098
Virginia	2.7%	89.3	10.2%	0.866
South Carolina	2.2%	114.3	13.3%	2.694
Georgia	1.8%	168.7	10.7%	2.239
Florida	2.2%	612.3	21.0%	3.386

Average yearly fatalities due to motor vehicle collisions. This table compares North Carolina to surrounding states and states with higher mode shares. In general, states with higher mode shares and better facilities have lower fatality rates.

**2006-2010 ACS 5 year estimates*
***NHTSA 2009*

2

Trends[6]

In North Carolina, 10 bicyclists are killed per year per 10,000 daily bicyclists* (which ranks sixth worst in the country). Similarly, nine pedestrians are killed per year per 10,000 daily pedestrians* (which ranks 10th worst in the country). When compared to states that feature higher bicycle and pedestrian modeshare (in other words, more bicyclists and pedestrians), North Carolina has a significantly higher per-capita fatality rate (as seen in the table on the previous page).

During the five-year period from 2007 to 2011, a total of 4,700 bicycle-motor vehicle crashes and 12,286 pedestrian-motor vehicle crashes were reported to North Carolina authorities.[6] Crashes involving bicyclists and pedestrians are under-reported, so the number of individuals involved in and possibly injured in bicycle or pedestrian collisions is likely even higher than what is shown on record. These numbers show the prevalence and severity of pedestrian and bicycle crashes in North Carolina and highlight a major public safety issue in our state.

** "Daily bicyclists and pedestrians" - Numbers generated through weighting, or multiplying, by share of the population biking and walking to work—to adjust for exposure.*

From 2006-2010, 13% of all traffic fatalities in North Carolina were bicyclists and pedestrians.

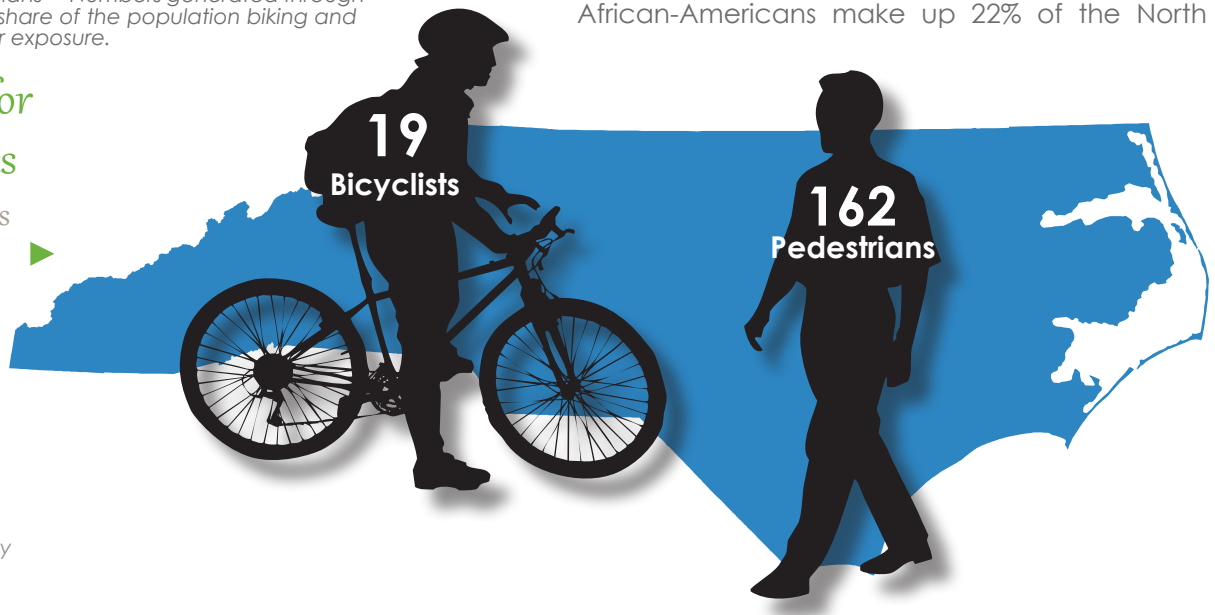
Source: Traffic Safety Facts North Carolina 2006-2010. USDOT, National Highway Traffic Safety Administration

The majority of pedestrian and bicycle collisions occur in areas within municipal limits in North Carolina, classified as urban areas. From 2007 to 2011, 72% of North Carolina pedestrian collisions and 70% of bicycle collisions occurred in urban areas, with the remaining crashes occurring in unincorporated areas of the state. When 2007-2011 crash sites were classified by development density, 86% of pedestrian crashes and 84% of bicycle crashes occurred in areas that were at least 30% developed, showing an even greater prevalence of urban area collisions. This is likely due to higher rates of walking and biking in these areas.

The 2007 to 2011 data also revealed important trends related to minorities and safety. For example, Black/African-Americans were found to be over-represented as pedestrians and bicyclists involved in crashes. Black/African-Americans make up 22% of the North Carolina

Average Yearly Fatalities for Bicyclists and Pedestrians

Average yearly fatalities due to motor vehicle collisions.[6]



population, yet 38% of pedestrians and bicyclists involved in crashes from 2007-2011 were reported to be Black/African-American. These results suggest that African-Americans may be disproportionately exposed to crash risks due to greater walking and bicycling rates, characteristics of the built environment that affect safety, or other factors.

Pedestrian-motor vehicle collisions can be classified into several different types. Some of the most prevalent types of pedestrian-motor vehicle crashes are shown in the following table.

Rank	Grouped Pedestrian Crash Type	Total	Percent of NC Total
#1	Unusual Circumstances	2511	20.2%
#2	Crossing Roadway - Vehicle Not Turning	2058	16.6%
#3	Off Roadway	1540	12.4%
#4	Backing Vehicle	1307	10.5%
#5	Walking Along Roadway	1203	9.7%
#6	Dash/Dart-Out	1094	8.8%
#7	Crossing Roadway - Vehicle Turning	862	6.9%
#8	Pedestrian in Roadway - Circumstances Unknown	676	5.4%

North Carolina pedestrian crash type groups, 2005-2009.
Source: University of North Carolina Highway Safety Research Center.

'Unusual circumstances' accounted for several different collision scenarios, including: vehicles colliding with other vehicles or objects before striking a pedestrian; pedestrians striking vehicles; and vehicular assault. The other most common types of collisions involve: pedestrians being hit while crossing a roadway; while walking in an off-road environment such as in a parking lot or across a driveway; while a vehicle is reversing; or while walking along the side of the road. Providing greater opportunities for pedestrians to safely and visibly cross and walk along the roadway could help to reduce the risk of these types of crashes. Crosswalks, pedestrian signals, and sidewalks along roadways and in parking lots would all contribute to improved pedestrian safety in these instances.

Some types of bicycle-motor vehicle crashes were also found to be more prevalent than others. Motorist Overtaking Bicyclist was the most commonly reported bicycle crash type from 2005-2009 (16.8%), but is assumed to be a much greater risk by novice or unknowing cyclists. These crashes occur when a motorist attempts to pass a bicyclist and does not see the bicyclist, passes too closely, or otherwise fails to clear the bicyclist while passing. These and other types of prevalent crashes are shown in the following table.

Rank	Grouped Bicyclist Crash Type	Total	Percent of NC Total
#1	Motorist Overtaking Bicyclist	810	16.8%
#2	Motorist Failed to Yield - Sign-Controlled Intersection	468	9.7%
#3	Bicyclist Failed to Yield - Midblock	426	8.8%
#4	Bicyclist Failed to Yield - Sign-Controlled Intersection	382	7.9%
#5	Motorist Left Turn/Merge	326	6.8%
#6	Motorist Failed to Yield - Midblock	302	6.3%
#7	Bicyclist Left Turn/Merge	295	6.1%
#8	Crossing Paths - Other Circumstances	247	5.1%
#9	Bicyclist Failed to Yield - Signalized Intersection	229	4.7%
#10	Motorist Right Turn/Merge	220	4.6%

North Carolina bicycle crash type groups, 2005-2009. Source: University of North Carolina Highway Safety Research Center.

The issue of a motorist or bicyclist failing to yield often occurs when a motorist or bicyclist misjudges the speed of the approaching vehicle and the time available to cross the road or intersection, or when a motorist or bicyclist does not see the approaching vehicle in time. Poor lighting, the lack of many signalized intersections to detect bicyclists waiting at red lights, and lack of appropriate bicycle facilities may all contribute to these types of crashes. Of all bicycle-motor vehicle crashes in North Carolina from 2005-2009, 62.2% occurred when the bicyclist was in a roadway travel lane. Only 4.7% of collisions involved a bicyclist positioned in a bike lane or on a paved shoulder. A lack of designated bicycle facilities on the roadway may therefore be a primary risk factor for bicycle-motor vehicle crashes in North Carolina.

Safety benefits can be made with walking and bicycling improvements. Studies show that installing pedestrian and bicycle facilities directly improves safety by reducing the risk of pedestrian-automobile and bicycle-automobile crashes. The following table provides examples of common pedestrian design treatments and their resulting collision rate reductions. Bicycle and pedestrian crash analysis informs the facility, program, and policy recommendations found in the following chapters.

North Carolina 2011 Bicycle and Pedestrian Safety Survey

The 2011 Bicycle and Pedestrian Safety Survey was administered by the Institute for Transportation Research and Education (ITRE) to gather information on North Carolinians' concerns, attitudes, and ideas for improvement regarding walking and bicycling safety. More than 16,000 responses were collected. The survey found that 80% of respondents feel that bicycling for daily needs is currently somewhat or very dangerous, while 43% said that walking for daily needs is currently somewhat or very dangerous.

Top five bicycle and pedestrian safety issues cited:

1. Lack of on-roadway bicycle facilities (82%)
2. Lack of pedestrian paths and sidewalks (63%)
3. Lack of alternatives to cycling on main arterials (55%)
4. Lack of bicycle paths and greenways (53%)
5. Motorists or bicyclists not sharing the road (50%)

According to survey respondents, the facility improvements that are most needed to improve safety for pedestrians and bicyclists are bike lanes on collectors and arterials (84%), sidewalks on collector streets and in commercial corridors (64%), paths and greenways (63%), and sidewalks on local and neighborhood streets (63%).

Top three selected solutions to improve pedestrian safety:

1. Improve roadway design to accommodate pedestrians as regular users and include sidewalks as a standard feature (79%)

Installing sidewalk has been shown to reduce crashes involving pedestrians by 88% (Right: NC 105 in Boone).

2. Retrofit existing roads to add sidewalks (67%)
3. Build more paths and greenways (61%)

Top three selected solutions to improve bicycle safety:

1. Improve roadway design to accommodate cyclists as regular users and include bike lanes as a standard feature (84%)
2. Retrofit existing roads to add bike lanes (70%)
3. Build more paths and greenways (54%)

The results of the survey help NCDOT to identify the safety issues that are of greatest concern to North Carolinians and the improvements that can be made to most effectively encourage safe walking and bicycling in the state.

Health

Health is not merely the absence of illness. It is determined by how we live, work, learn and play, not just how often we visit the doctor. A healthy community is one with physical and social environments that make healthy choices the easy choices. In recent decades, we have built physical activity out of our lives and environments. Our transportation system is a major part of the physical environment, and it currently poses barriers to better health in North Carolina.

Reasons for Action

North Carolinians' health outcomes are largely impacted by chronic diseases like cancer, heart disease, stroke and diabetes. Three important health behaviors - physical activity, nutrition and tobacco - help determine our health outcomes throughout life. Obesity and overweight, which are mainly caused by consuming too many calories and expending too little energy, are increasing problems in our state. We are in the midst of an epidemic of obesity. The rate of obesity in North Carolina has more than doubled from 13% in 1990 to 28.6% in 2010.[7] If current trends persist, an estimated 58% of North Carolina adults will be obese by 2030. By continuing on this trajectory, the number of chronic physical conditions would increase dramatically, including heart disease, arthritis and diabetes. But you cannot solely blame individuals for this epidemic if the environment they live in does not make physical activity options accessible. It is hard to imagine the added human toll and economic burdens to North Carolina residents, families, insurers and governments.

65% of North Carolina adults are either overweight or obese; North Carolina also is ranked 5th worst in the nation for childhood obesity[7]

Trends

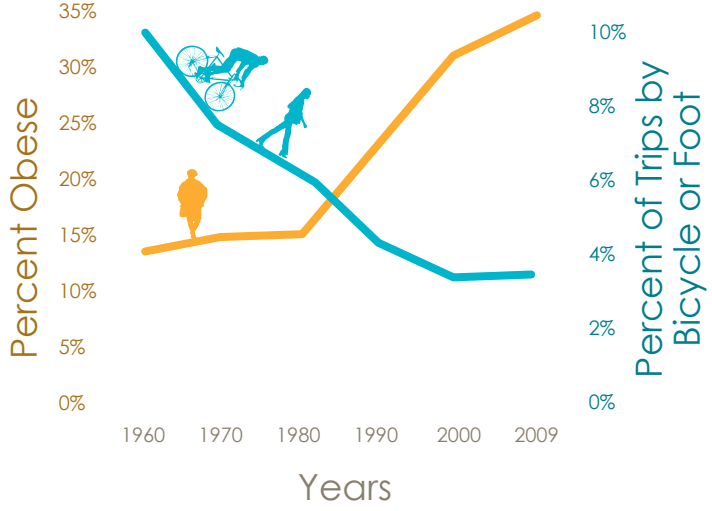
Critical Disparities in Health

Among low-income people and people of color in North Carolina, physical inactivity, obesity, and diabetes rates are higher than the state average, posing much greater health risks among these populations. While the rate of physical inactivity among North Carolinians is 26.7% on average, 32.5% of the non-Hispanic black population and 37.0% of households with incomes less than $24,999 are physically inactive. Non-Hispanic blacks also experience almost double the rate of obesity to their non-Hispanic white counterparts at 42.4% and 26.7%, respectively. Racial and ethnic differences also exist in diabetes rates; 15.3% of non-Hispanic blacks in North Carolina have diabetes compared to 8.7% of non-Hispanic whites.[7]

2

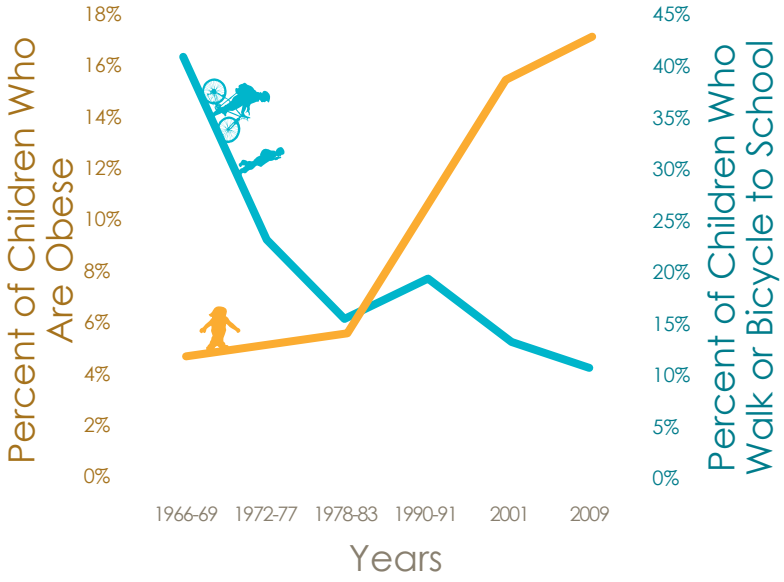
Change in Walking and Bicycling Rates vs. Adult Obesity Rates

Sources: Ogden and Carroll 2010, Census 1960, 1970, 1980, 1990, 2000, ACS 2009. Note: bicycling was not separated from 'other' modes in early Census surveys, so 1960 and 1970 levels show are for walking only; r=-0.93 (bicycle + walk/overweight); r=-0.87 (bicycle + walk/obesity). Note that it should not be implied that obesity is caused solely by less bicycling and walking.



Trend in Obese Children vs. Rate of Walking and Bicycling to School

Sources: CDC, NHANES, McDonald 2007, Ogden and Carroll 2010, NHTS 2009. Note: r=-0.70. Note that it should not be implied that obesity is caused solely by less bicycling and walking.



The prevalence of these largely preventable conditions reflect limited or nonexistent access to healthy choices. In addition, older adults and people with disabilities are more likely to live with chronic diseases. Finally, children are perhaps the most vulnerable and yet hold the greatest potential to learn and adopt healthy behaviors that can last a lifetime.

The Financial Cost of Physical Inactivity in North Carolina

Most of us have lost loved ones to chronic disease, and/or we live with these conditions within our families. The human burden of pain and suffering is clear. What is increasingly obvious is the financial burden from chronic diseases. Recent reports have 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.[8] While these financial figures are bleak, researchers have found that every dollar invested in accessible pedestrian and bicycle trails can result in a savings of nearly $3 in direct medical expenses.[9] Also, the more people spend on health care, the less they have for other expenditures, impacting the economy negatively.

Better Health through Active Transportation

The good news is that we can stop or reverse the trend towards higher disease rates in North Carolina. Regular physical activity is one of the simplest solutions to give ourselves a longer, healthier life. Increasing one's level of physical activity reduces the risk and impact of cardiovascular disease, diabetes, and some cancers. It also helps to control weight, improves mood, and reduces the risk of premature death.[10] Furthermore, regardless of one's weight, regular physical activity delays the onset and reduces the likelihood of developing chronic diseases. Children and adults can lead measurably healthier lives by incorporating 30 or more minutes of activity each day. Using active transportation to and from school, work, parks, restaurants, stores and other routine destinations is one of the best things we can do to prevent chronic diseases.

Providing safe paths for pedestrians will encourage more people to walk, and therefore promote a healthier community. (Left: Mt. Airy Ararat River Greenway).

2

> *Of North Carolinians surveyed, 60% would increase their level of physical activity if they had better access to sidewalks and trails.*[11]

The public health impacts of the transportation system extend beyond physical inactivity and obesity. By shifting more North Carolinians to walking and bicycling for transportation, even for small trips, the state will reduce automobile emissions and improve air quality. Cleaner air leads to fewer symptoms and illnesses for those suffering from asthma and other chronic respiratory conditions.

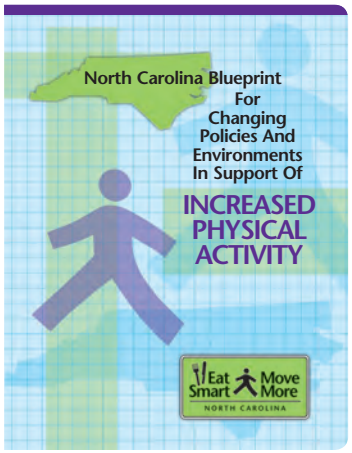
Health professionals and advocates have become new partners in promoting and planning for active transportation. After carefully considering the best science and converging evidence, public health authorities, including the Centers for Disease Control and Prevention and the Institute of Medicine, have recommended road improvements, connectivity, land use policies, active transportation to schools, and programs to advance walking and bicycling.[12,13]

> *In 2012, NCDOT's Board of Transportation adapted its mission statement to include "health and well-being" and passed a "Public Health Policy," which declares the importance of a transportation system that supports positive health outcomes.*

North Carolina Action towards a Healthier Transportation System

In many aspects, North Carolina is helping lead the way with innovative approaches to collaboration and action to improve health through active transportation. Planning processes led by NCDOT have brought many health professionals and advocates into important transportation planning efforts.

The North Carolina Department of Health and Human Services (NC DHHS) is recognized as a leader among state health departments for its approaches to improving health and healthier community design. It has done this by identifying the top health issues and evidence-based prevention strategies for active transportation. NC DHHS supports local communities with training, technical assistance and grant opportunities. In 2005, NC DHHS initiated and convened the Healthy Environments Collaborative (HEC), which includes the departments of Transportation, Commerce, and Environment and Natural Resources. The HEC was formed to consider the health impacts of each department's work and collaborate in improving health in North Carolina. Health funders, like Blue Cross and Blue Shield Foundation of North Carolina, major health systems, and private businesses across the state also recognize the importance of creating projects and programs that link active transportation to health outcomes.



The Eat Smart, Move More coalition has also been addressing health and physical activity in North Carolina and is composed of a broad leadership team. The organization provides funding for projects that promote physical activity. The organization

has also developed a number of reports including: *Eat Smart, Move More: North Carolina's Plan to Prevent Overweight, Obesity, and Related Chronic Diseases* (2007-2012), *North Carolina's Obesity Prevention Plan* (2013-2020), and the *North Carolina Blueprint for Changing Policies and Environments in Support of Increased Physical Activity*.

Health Impact Assessments

Health Impact Assessments (HIAs) analyze policies, plans or projects - prior to approval - to determine their public health effects. Within North Carolina, HIAs are gaining momentum as a process to determine the impacts of active transportation projects. As part of *WalkBikeNC*, three North Carolina communities were chosen for demonstration HIAs (see Appendix 9.4 for the analysis summary and report). HIAs have also been recently completed or are currently underway in Aberdeen (*Pedestrian Transportation Plan*), Charlotte (*The Effect of Light Rail Transit on Body Mass Index and Physical Activity*), Davidson (*Public Health and Neighborhood Design Standards*), Haywood County (*Haywood County Comprehensive Bicycle Plan*), Raleigh (Blue Ridge Road Corridor), and Wilmington/New Hanover County (*Wilmington/New Hanover County Greenway Plan*). The Charlotte study compared light rail users to groups living in the same neighborhoods with similar commuting patterns and perceptions of neighborhood environments. The study found that walking to and commuting by light rail transit was associated with an 81% reduced odds of becoming obese.[14]

> The Charlotte 'Light Rail' study found that residents who switched to walking to and commuting by light rail weighed an average of six and a half pounds less than those who continued to drive to work.[14]

Economics

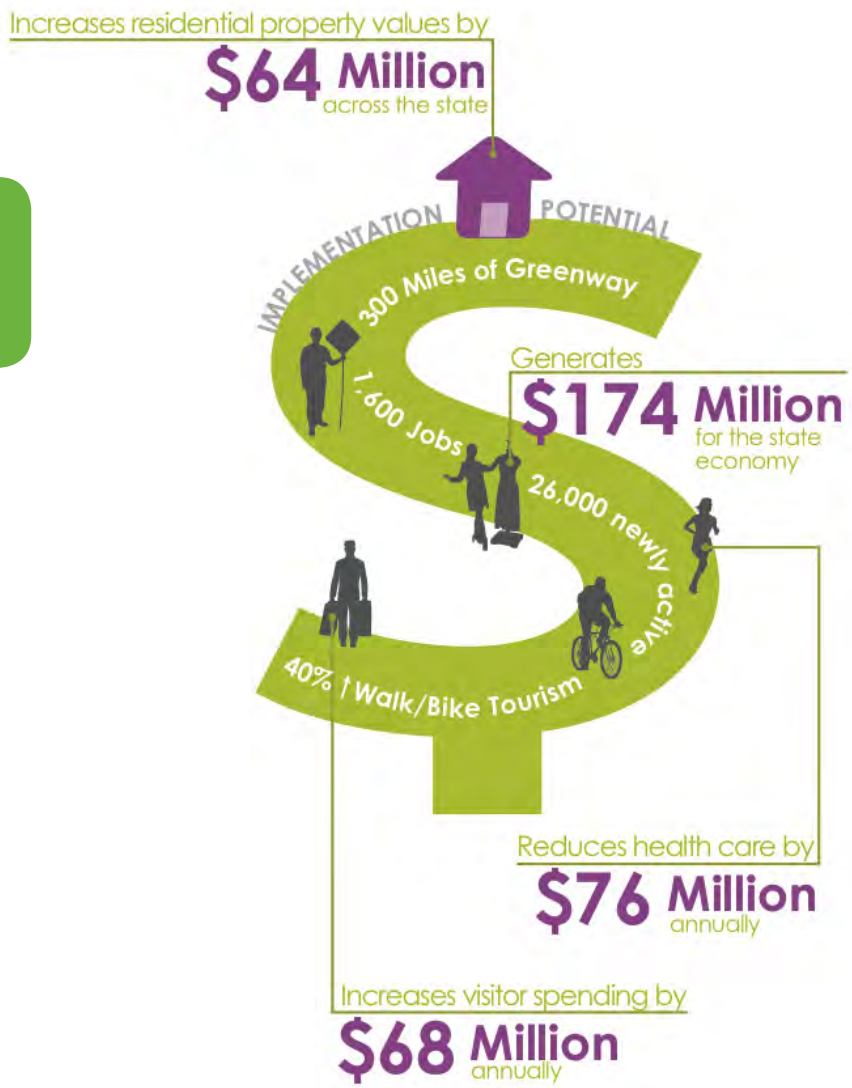
Reasons for Action

While they are currently a small part of the North Carolina economy, walking and bicycling activities generate significant economic benefits. Facilities for bicyclists and pedestrians generate economic returns through improved health, safety, environmental, and quality of life conditions, as well as by increasing property values, attracting visitors, creating jobs, and attracting employers (refer to Appendix 9.5 for the full economic impact analysis).

With its mild climate, North Carolina is well-suited to attracting tourists from out of state through bicycle and pedestrian activities. North Carolina is the 6th most visited state in the United States and 2011 was a record year as visitors spent $18 billion. North Carolina hosted approximately 23 million overnight visitors in 2011, many of whom partook in activities related to walking or biking.[15] Two percent of out-of-state tourists reported bicycling while on vacation, and 4% participated in hiking activities.[16] Tourists unfamiliar with the state will likely be drawn in particular to facilities that make walking and biking safer and easier.

Walking and biking are also economically efficient transportation modes. Many North Carolinians cannot afford to own a vehicle and are dependent on walking and biking for transportation.

> 6.7% of occupied housing unit residents in North Carolina do not own a vehicle.[17]



These economic estimates were derived under the assumption of adding 300 miles of greenway statewide. The full economic impact analysis can be found in Appendix 9.5.

The rising gas prices of recent years have made an impact on Americans of varying income levels. Although this increase can't be attributed to gas prices alone, 2008 was the year with the highest recorded rate of increase in bike commuting in the last decade.

During the 2008 gas spike, many bike shops felt this rise in bike commuting. That August, Bikes Belong surveyed more than 150 bike retailers from nearly 40 states. **Seventy-three percent of retailers said they were selling more transportation-related bicycles. Nearly every shop (95%) had customers citing high gas prices as a reason for their purchase, and four in five retailers said gas prices were helping them sell more bikes.**[18] According to a 1997 survey of bike commuters, 46% said they ride to save money on gasoline.[19]

Trends

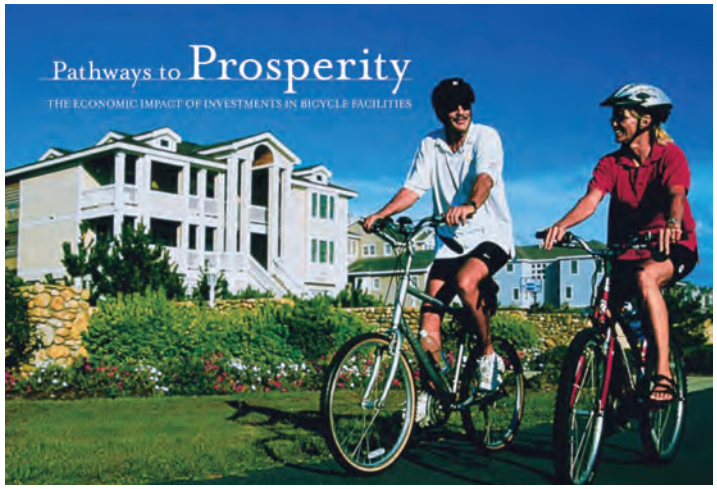
Current Bicycle and Pedestrian-Related Programs Generating Economic Activity

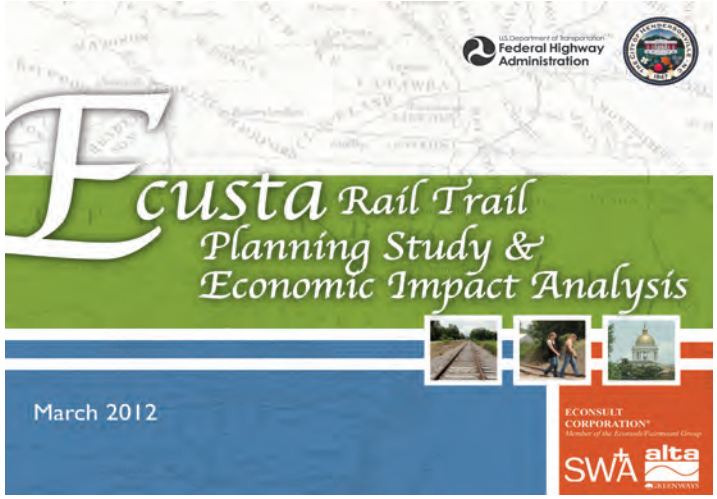
North Carolina is also home to many cultural events that rely on walking or bicycling. These events, including car-free street days, street festivals, and art walks, have the potential to generate economic benefits by attracting out-of-town visitors, improving property values by increasing the appeal of communities, and encouraging healthy activity. Currently, Durham hosts the "Bull City Summer Streets" event, in which downtown streets are closed to cars on scheduled weekend days to make room for bicyclists, pedestrians, rollerbladers, and dance activities. Cities throughout North Carolina hold regular art walks, in which local artists with shops located on a scheduled route show and sell wares, often accompanied by live music and other attractions. Such events could be further increased, improved, or expanded through changes that make traveling on foot easier and safer.

The North Carolina Department of Commerce's Main Street Program assists small towns in making improvements to reestablish their downtowns as thriving economic centers. Since the Program's start in 1980, towns have experienced a total gain of $1.66 billion in new investment and 14,600 new jobs.[20] While the Main Street Program takes a wide approach to improving downtowns that includes promotions, community partnerships, and design improvements, among other strategies, many plans completed through the Program include initiatives to make streets more bicycle and pedestrian friendly. Towns have focused on improving sidewalk connectivity, creating marked walking routes, installing bike lanes, and implementing street-level design improvements for a more enjoyable walking experience. Transforming downtown shopping into an enjoyable, active experience has helped towns attract consumer spending that might previously have occurred at larger shopping centers outside their tax base and improve downtown property values.

The Economic Impact of Investments in Bicycle Facilities: A Case Study of the Northern Outer Banks

A 2004 study of investments in bicycle facilities on the Outer Banks found substantial benefits from bicycle-related tourism. An estimated 680,000 visitors were found to bicycle in the area annually, resulting in an annual economic impact of $60 million.[21] The study found that the economic benefits of bicycle facilities from tourism expenditures alone far outweigh the costs of constructing the facilities. Approximately $6.7 million of municipal, state and federal funds were used to construct the special bicycle facilities in the northern Outer Banks. Other economic benefits, including increased property values and reduced healthcare costs, further improve the ratio of benefits to costs.





Ecusta Rail-to-Trail Economic Impact Analysis

Additionally, a 2012 study of the proposed 20-mile Ecusta Rail Trail in Hendersonville and Transylvania Counties found that the project would create 180 construction jobs and 27 permanent jobs and would attract 20,000 visitors annually. As a result of increased property values near the trail, the project is expected to generate an additional $160,000 per year in property tax revenues, among other benefits.[22]

Environment

Reasons for Action

Environmental stewardship, for the purposes of this plan, addresses the impact that transportation and land use decisions (both at the government/policy level and personal level) can have on the air and landscapes that North Carolinians and tourists both enjoy. Environmental sensitivity and resource protection are strong goals of NCDOT and walking and bicycling are integral to achieving those goals. Incorporating green infrastructure - including parks, open space, and greenways - into pedestrian and bicycle planning generates many benefits, such as improving air and water quality, maintaining biodiversity by providing wildlife habitat corridors, sequestering carbon, providing recreation spaces, and improving quality of life by creating a connected network of greenways and pedestrian and bicycle facilities. Even a modest increase in walking and bicycling trips (in place of motor vehicle trips) can have significant positive impacts on air and water quality. For example, a family that replaces two miles of driving each day with walking or bicycling will, in one year, prevent 730 pounds of carbon dioxide from entering the atmosphere.[23]

> According to the National Association of Realtors and Transportation for America, 89% of Americans believe that transportation investments should support the goal of reducing energy use.[24]

Environmental stewardship is represented in many ways across North Carolina today from transportation planning, statewide trails, open space and recreation areas, and environmental education. Walking and bicycling trails

Motor Vehicle Emissions

Sources: The Green Commuter, a publication of the Clean Air Council & WorldWatch Institute.

through North Carolina landscapes enable tourism, recreation, and environmental education opportunities.

The Conservation Planning Tool (CPT), developed by the North Carolina Department of the Environment and Natural Resources (DENR), has already been used in comprehensive, long-range transportation planning in North Carolina. This tool identifies important natural heritage features, unique landscapes, farmlands, high-quality forests, etc. and is helping planners make more informed land use and transportation decisions.

Similarly, the Green Growth Toolbox (GGT) is a technical assistance tool designed by the NC Wildlife Resource Commission to help communities conserve high quality habitats alongside new homes, workplaces, and shopping centers. It consists of a handbook, GIS dataset, and website. An individualized training workshop and technical assistance is available to communities across the state.

Encouraging pedestrian and bicycle connections in key wildlife and habitat areas between developments helps to minimize the need for connecting roads through sensitive

Walking and biking is a great way to enjoy our state's natural resources - and protect them too!

environmental areas. The CPT can be used to identify priority wildlife and habitat areas and the GGT can help communities understand specific land use planning practices that will encourage conservation of these areas.

Trends

While the statewide plan focuses primarily on transportation, it should also be recognized that walking and bicycling are significant recreational activities in North Carolina. In the 2009 *Systemwide Plan for State Parks*, trails (including shared-use trails) were found to be the most popular facilities in the park system.[25] The 2009-2013 *Statewide Comprehensive Outdoor Recreation Plan* (SCORP), found "walking for pleasure" to be the most common outdoor recreational activity, enjoyed by 82% of respondents, and bicycling by 31% of respondents.[26] DPR is in the process of developing a state and regional trails plan for North Carolina.

In addition to preparing the SCORP (page 2-13), the North Carolina Division of Parks and Recreation (DPR) operates the State Parks System, consisting of more than 218,000 acres, with 41 state parks and recreation areas as well as 33 undeveloped conservation areas, including state natural areas, state rivers, state trails, and state lakes. Park resources can help mitigate climate, air, and water pollution, which contribute to impacts on public health. The state parks are also important destinations for local and regional trail and greenway routes. The State Parks System includes four State Trails, which are also part of the North Carolina Trails System (GS 113A-83). By statute, the NC Trails System is focused on scenic and recreational trails to serve the outdoor recreation needs of an expanded population and to promote public access and enjoyment of outdoor, natural and remote areas. Because of the commonalities between walking and biking for recreation and for transportation, DPR is an important partner to DOT's Bicycle and Pedestrian Division.

Environmental education is another important component for fostering stewardship in future generations. Since its 1990 formation, the Office of Environmental Education of the North Carolina Department of Environment and Natural Resources (NCDENR) has led the environmental education initiative within North Carolina. In 1996, NCDENR established the first environmental education certification program in the nation, and it is also responsible for integrating environmental education into the NC Department of Public Instruction's Curriculum Standards in 1997.

Transportation, land use, and resource protection issues must be considered together and are evaluated in detail in this Plan. Environmental education and other stewardship opportunities will be promoted in tandem with the Statewide Pedestrian and Bicycle Plan by involving the expertise and perspective of NCDPR and NCDENR as planning partners.

Timeline of Major Local Accomplishments

1973 Raleigh adopts first Greenway System plan in NC

1980 1st bicycle lane in North Carolina (Carrboro)

1989 The Town of Carrboro approves the Bicycle and Sidewalk Policies, which amended street standards to include bike lanes on all collector roads

2001 Carrboro first town in North Carolina to be ranked Bicycle Friendly Community

2005 First NCDOT-funded and managed pedestrian and bicycle plans are adopted

2007 Charlotte adopts its *Urban Street Design Guidelines* (a forerunner to the *NCDOT Complete Streets Planning and Design Guidelines*)

2008 North Carolina's first statewide advocacy group, North Carolina Active Transportation Alliance, is formed

Case Study: Charlotte Pedestrian and Bicycle Achievements

At the request of local bicycle advocates, the City of Charlotte, NCDOT, and the Mecklenburg-Union MPO funded a bicycle plan and a bicycle suitability map for the Charlotte area in 1999. While bicycle plans had been completed for Charlotte in prior decades, none had ever been accompanied by an implementation commitment. The City of Charlotte also committed to establish a standing Bicycle Advisory Committee and initiate and fund a Bicycle Program within the Charlotte Department of Transportation to the tune of $500,000 per year. The City also committed to hire the state's first municipal bicycle program manager, a position that has been in place since the year 2000. The staff position and the funding continue to be supported by the City. Since 2000, the City has overseen the installation of more than 120 miles of bicycle lanes and on-street bike routes, 40 miles of off-street paths, and released a second edition of its bicycle map, in addition to numerous programs and events to encourage bicycling. The City has also seen bike-rack-on-bus usage increase from 19,000 to nearly 90,000 trips per year since 2001.

The City has also hired a Pedestrian Program Manager to manage its $7.5 million per year Pedestrian Program, a program which funding has more than tripled since the year 2000. The City is developing a "Walkability Strategy" and is working on a Pedestrian Safety Action Plan. In all, the City has more than three full-time staff dedicated exclusively to pedestrian and bicycle programs.

During the last ten years, Charlotte has developed a nationally renowned Complete Streets policy and program known as The Urban Streets Design Guidelines. In addition to its bicycle and pedestrian programs, the City funds the implementation of bicycle and pedestrian infrastructure in all of its streets projects

2010 Wilmington creates first bicycle boulevard in the state

2011 Davidson and Cary become two of the first ten Walk Friendly Communities in the United States

2012 Asheville becomes 10th Bicycle Friendly Community in North Carolina

2012 Durham launches state's first bike and hike map for mobile devices

2012 North Carolina holds first statewide Bicycle Summit

2012 Charlotte creates state's first bike share program & first 'bike box'

2013 Raleigh completes 100 miles of greenways, creating the largest system of greenways in the state

based on the process and criteria in the USDGs. Recognized as one of the national best practice design standards for walking and bicycle projects, the USDGs include methodologies for measuring bicycle and pedestrian levels of service at intersections and determining the appropriate walkway and bikeway types based on the type of street and its transportation purpose and land use context. The USDGs have since been incorporated into the City and County's design standards for new development and are one of the base documents for development of the NCDOT Complete Streets Planning and Design Guidelines. Another notable accomplishment is the implementation of over 20 road diets, which have led to increased walking, bicycling, and roadway safety.

At the county level, the Department of Parks & Recreation's more than 30-year old greenway program has completed miles of urban greenways and hired its first Safe Routes to School coordinator. The County also continues to have staff dedicated to greenway planning and development, although the number of staff in this role has decreased significantly in recent years due to local funding cuts.

Finally, in the summer of 2012, Charlotte Center City Partners, in cooperation with the City of Charlotte and Blue Cross and Blue Shield of North Carolina, launched the Carolina's first large-scale urban bike share program with 200 bikes and 20 stations around downtown Charlotte.

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3 Pedestrian Infrastructure

Greenville, NC

Overview

Walkability is a critical element of North Carolina's mobility, economic development, public health, and environmental sustainability. Walking is an important mode of transportation for children, the elderly, people who cannot afford to own and operate a car, and those who choose not to own a car. In fact, according to the American Community Survey, more than 234,000 households (or around 6.5%) in North Carolina do not own an automobile. Walkability is important to a vibrant economy, while also providing people with an affordable way of incorporating physical exercise into their daily routine, and helping to fight obesity and related chronic diseases.

North Carolinians place a high value on their ability to walk throughout all parts of the state. The state has an impressive track record of supporting pedestrian planning. For example, the North Carolina Complete Streets policy and accompanying design guidelines focus heavily on strategies to improve pedestrian comfort and accessibility.

However, walking for transportation is not an equivalent choice to driving today in North Carolina. There remains a lack of pedestrian network connectivity, with sidewalk gaps, missing marked crosswalks, lack of curb ramps, excess driveway conflict areas, and disconnected land uses commonplace. In addition, thousands of pedestrians are struck by motorists every year.

In this Chapter

Overview

Types of Pedestrians

Pedestrian Preferences and Factors Discouraging Walking

Transportation Choices

Recommendations

Missing sidewalk in Jacksonville, NC

Lack of crossing facilities and median island in Columbia, NC

Missing sidewalk along bridge in Beaufort, NC

Common Pedestrian Issues throughout the State

Pedestrian plans funded through the Planning Grant Initiative detail a number of pedestrian issues that are common throughout the state. A few examples are listed below.

Charlotte Pedestrian Master Plan (2009/not adopted)

"Inside Route 4, one finds a robust sidewalk network, planting strips, connectivity between destinations, pedestrian signals, transit and a range of land uses in close proximity. Outside Route 4, the road network consists of thoroughfares and collector roadways that lack sidewalks or crossing facilities, disconnected local streets, and separated land uses that prevent residents from walking to the store, park, or their child's school."

Holly Springs Pedestrian Plan (2007)

"The majority of sidewalks found within the Town of Holly Springs are concentrated in individual neighborhoods… However, pedestrian connections between neighborhoods/subdivisions, the downtown, and schools are inadequate with many gaps, or non-existent, particularly along arterial roadways."

Hertford Comprehensive Pedestrian Plan (2007)

"Sidewalks in Hertford are primarily located within the downtown area… Although there are adequate sidewalk facilities in downtown Hertford, it is clear that the Town will need pedestrian access from residential areas to major destinations such as the Perquimans County Recreation Center and schools."

Wilmington Pedestrian Plan (2011)

"The pedestrian experience varies dramatically in different parts of Wilmington. The historic downtown area has a rich system of sidewalks, marked crosswalks, signalized intersections, and other accommodations for walkers… However, along many of the city's major arterials, people must walk along busy roadways, and there are many areas where there are no sidewalks or crosswalks, resulting in an unpleasant pedestrian environment."

While not necessarily comprehensive, these statements demonstrate the broad range of pedestrian conditions that exist throughout the state, as well as within each

Residents and community leaders in Holly Springs, NC, discuss pedestrian connectivity issues as part of their planning grant from NCDOT.

community. For example, the plans highlight that urban areas tend to have more sidewalks, traffic signals, access to transit, and land-use patterns that support walking. There are greenways, paved shoulders, and amenities such as traffic signals and crosswalks throughout the state; however, there are notable pedestrian-related challenges in rural areas and in areas that are transitioning, for example from rural to suburban. These include the lack of sidewalks, limited opportunities to cross the road, higher speed traffic, and more distance between destinations.

Types of Pedestrians

Everyone is a pedestrian at some stage in their daily travel. This means pedestrians are a highly diverse road user group which includes children, adults, senior citizens, teenagers, joggers, the disabled and mobility impaired, transit riders, and people using wheeled toys or recreational devices such as skateboards, rollerblades and foot scooters.

Pedestrians have a variety of characteristics so the transportation network should accommodate a variety of needs, abilities, and possible impairments. Age is one major factor that affects pedestrians' physical characteristics, walking speed, and environmental perception. Children have low eye height and walk at slower speeds than adults walk They also perceive the environment differently at various stages of their cognitive development. Older adults walk more slowly and may require assistive devices for walking stability, sight, and hearing. The table at right summarizes common pedestrian characteristics for various age groups.

Sources: AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities (July 2004), Exhibit 2-1, and the US Census Bureau, Interim State Population Projections, 2005. See Chapter 1 of this plan for more on the North Carolina Population Pyramid for 2000 and 2030.

Pedestrians Characteristics by Age and NC Population	% NC Population, 2000	% NC Population, 2030
Ages 1-4		
• Learning to walk • Requires constant adult supervision • Developing peripheral vision and depth perception	24% (under 18)	25.2% (under 18)
Ages 5-8		
• Increasing independence, but still requires supervision • Poor depth perception	24% (under 18)	25.2% (under 18)
Ages 9-13		
• Susceptible to "dart out" intersection dash • Poor judgment • Sense of invulnerability • Improved awareness of traffic environment	24% (under 18)	25.2% (under 18)
Ages 14-18		
• Poor judgment	24% (under 18)	25.2% (under 18)
Ages 19-40		
• Active, fully aware of traffic environment	41% (18-44)	34.6% (18-44)
Ages 41-65		
• Slowing of reflexes	22.5% (45-64)	22.4% (45-64)
Ages 65+		
• Difficulty crossing street • Vision loss • Difficulty hearing vehicles approaching from behind	12% (65+)	17.8% (65+)

3

Pedestrian preferences and factors discouraging walking

In 2012, the WalkBikeNC project website allowed visitors to select preferences for pedestrian facility types. Using information collected through NCDOT's Bicycle and Pedestrian Planning Grant Initiative, it is also possible to gauge the factors that discourage walking in North Carolina, with lack of sidewalks and trails being the leading factor in each city/MPO. The table below shows the results from more than 3,000 comment forms, collected in eight different communities, from 2005-2012.

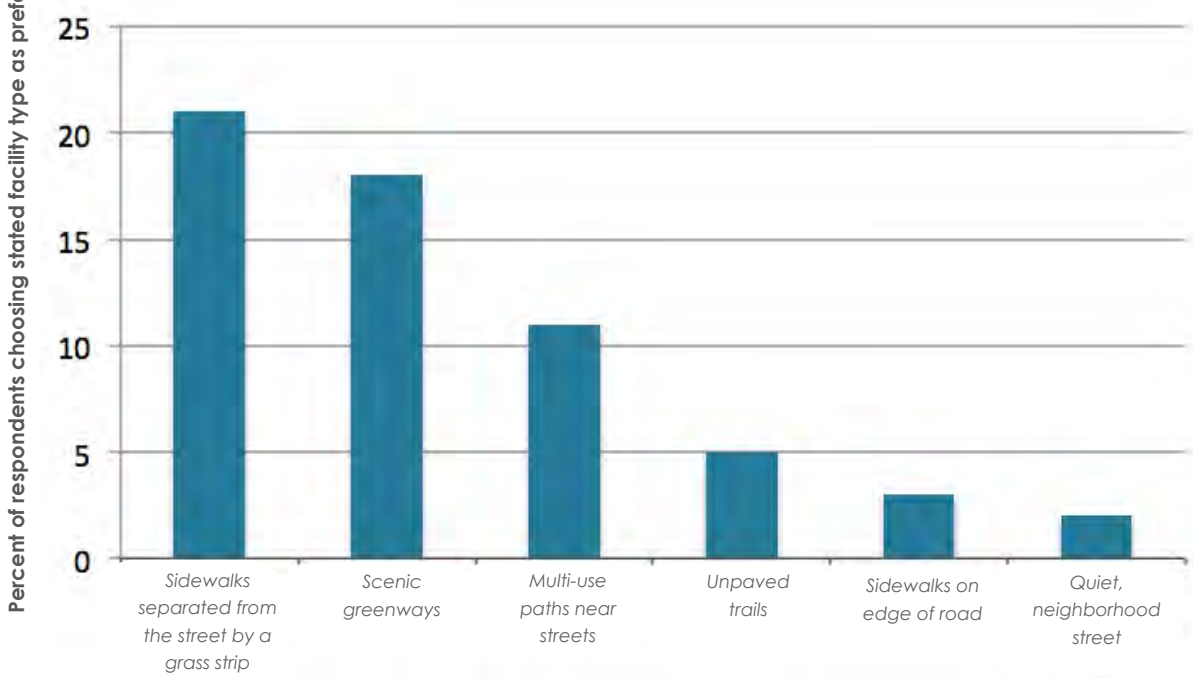
Top Factors Discouraging Walking in North Carolina Communities

	Lack of sidewalks and trails	Pedestrian unfriendly streets and land uses	Automobile traffic and speed	Unsafe Crossings	Criminal Activity	Aggressive motorist behavior
Greenville Area MPO *694 respondents/2011*	#1	#2	#3	-	-	-
Greensboro Urban Area MPO *609 respondents/2005*	#1	#2	#3	-	-	-
City of Rocky Mount *570 respondents/2011*	#1	-	#3	-	#2	-
City of Burlington *413 respondents/2012*	#1	-	#2	-	-	#3
Jacksonville Urban Area MPO *293 respondents/2008*	#1	#2	-	#3	-	-
City of Roxboro *243 respondents/2008*	#1	-	#2	#3	-	-
City of Belmont *234 respondents/2009*	#1	#3	#2	-	-	-
Town of Holly Springs *195 respondents/2007*	#1	#2	-	#3	-	-

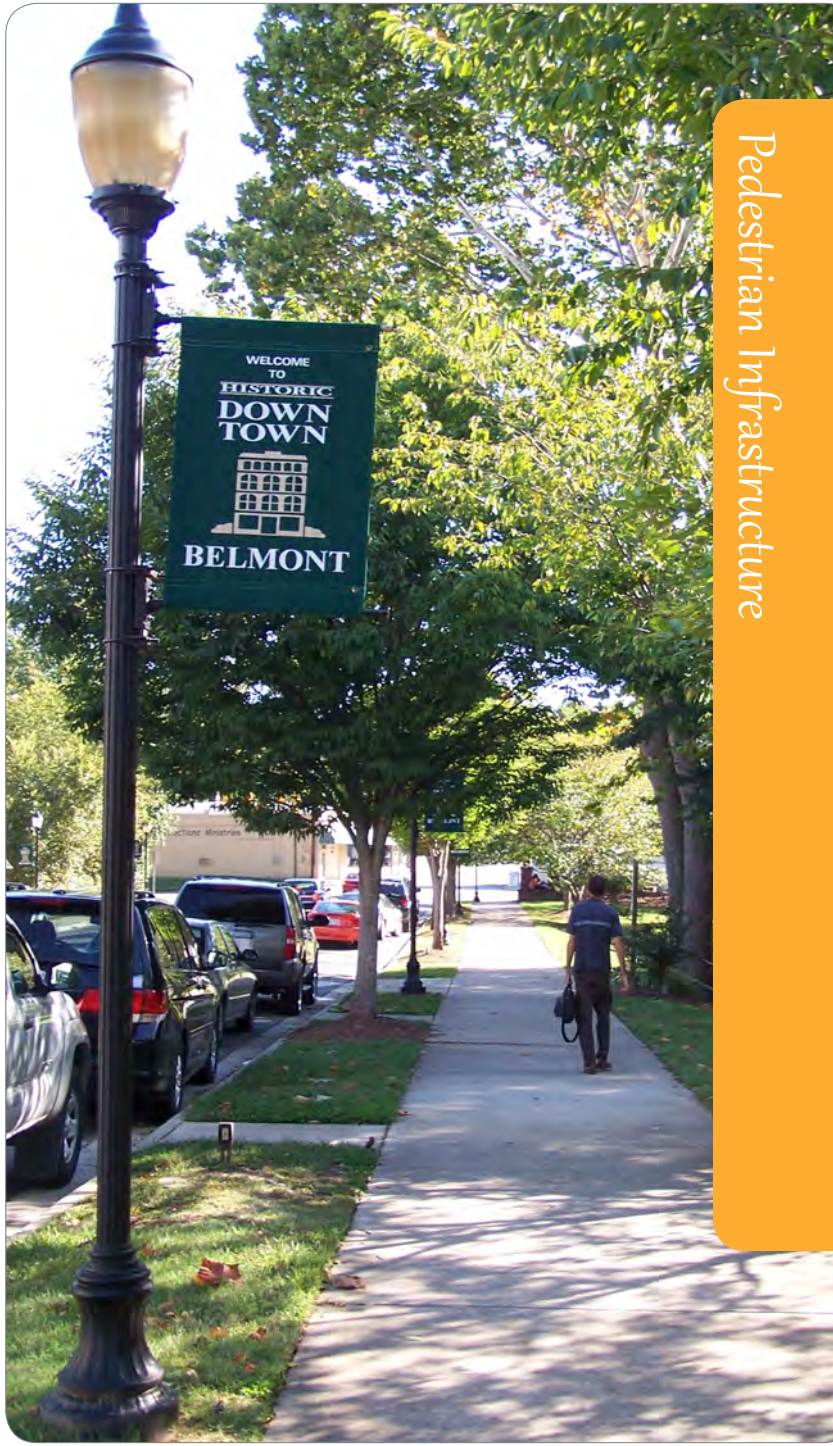
Source: Public comment forms from each of the above communities, collected as part of their pedestrian transportation planning processes (2005-2012).

The results in the table below show a preference for sidewalks with grass buffers and for multi-use paths. The table also shows walking in the street and walking on sidewalks without buffers as being the least preferred. See Chapter 6 for descriptions of pedestrian facility types, and the following pages for how these facilities (or their absence) affect North Carolina's walking environment.

Walking Preferences in North Carolina



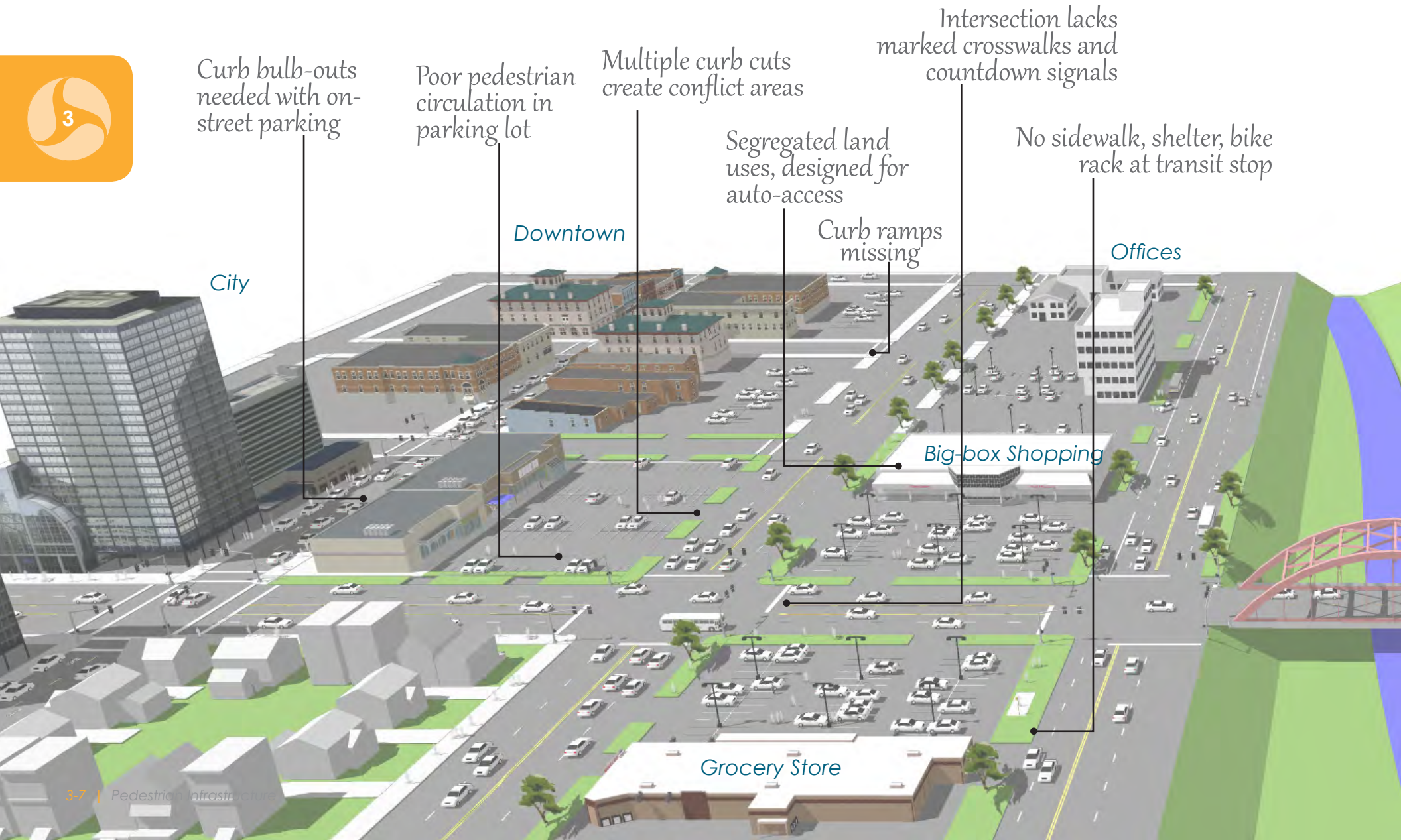
Source: WalkBikeNC Public Input from MindMixer, 2012

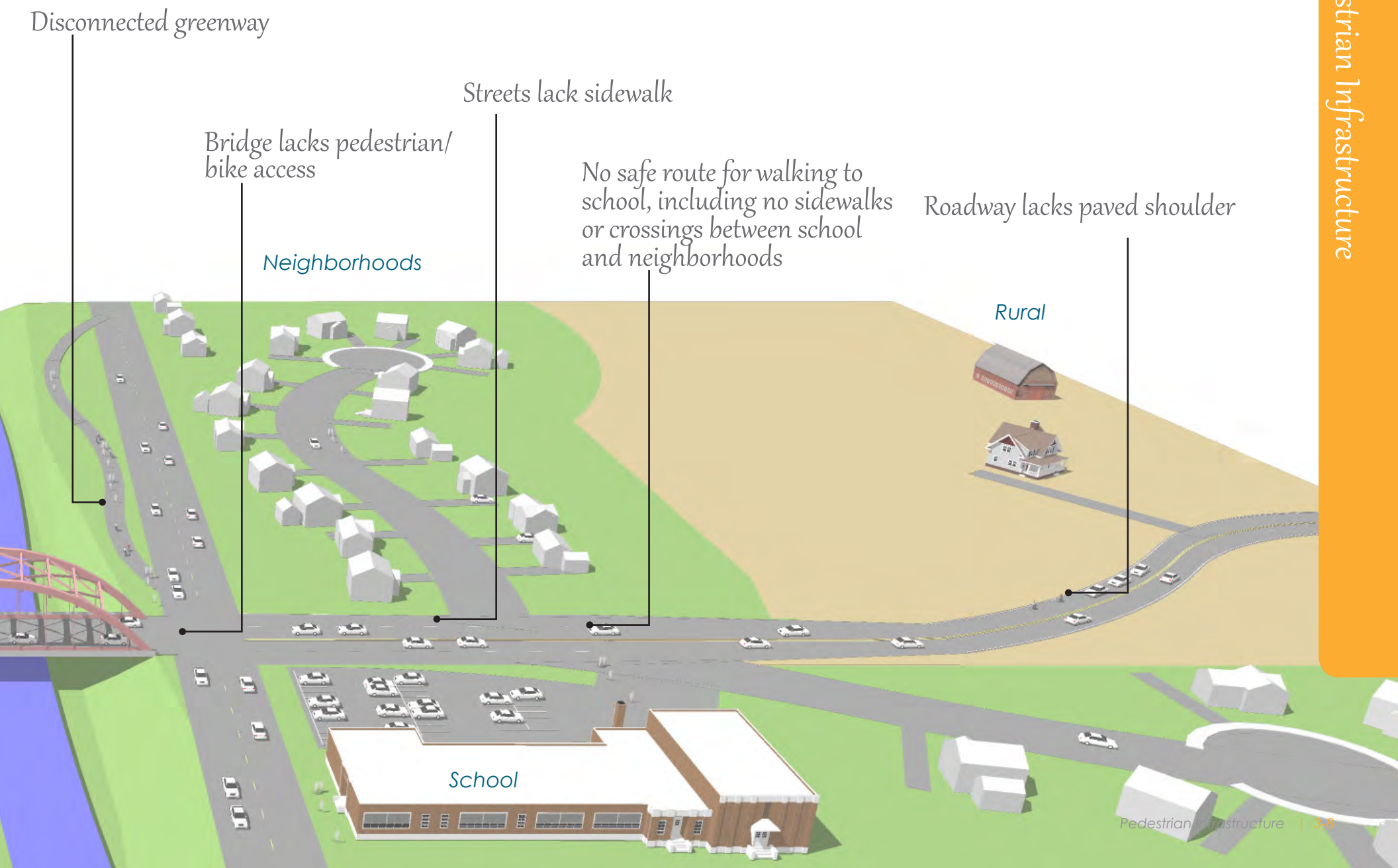


Sidewalk, with grass buffer, street trees, and pedestrian-scale lighting in Downtown Belmont, NC.

TRANSPORTATION CHOICES: WALKING vs. DRIVING IN NORTH CAROLINA

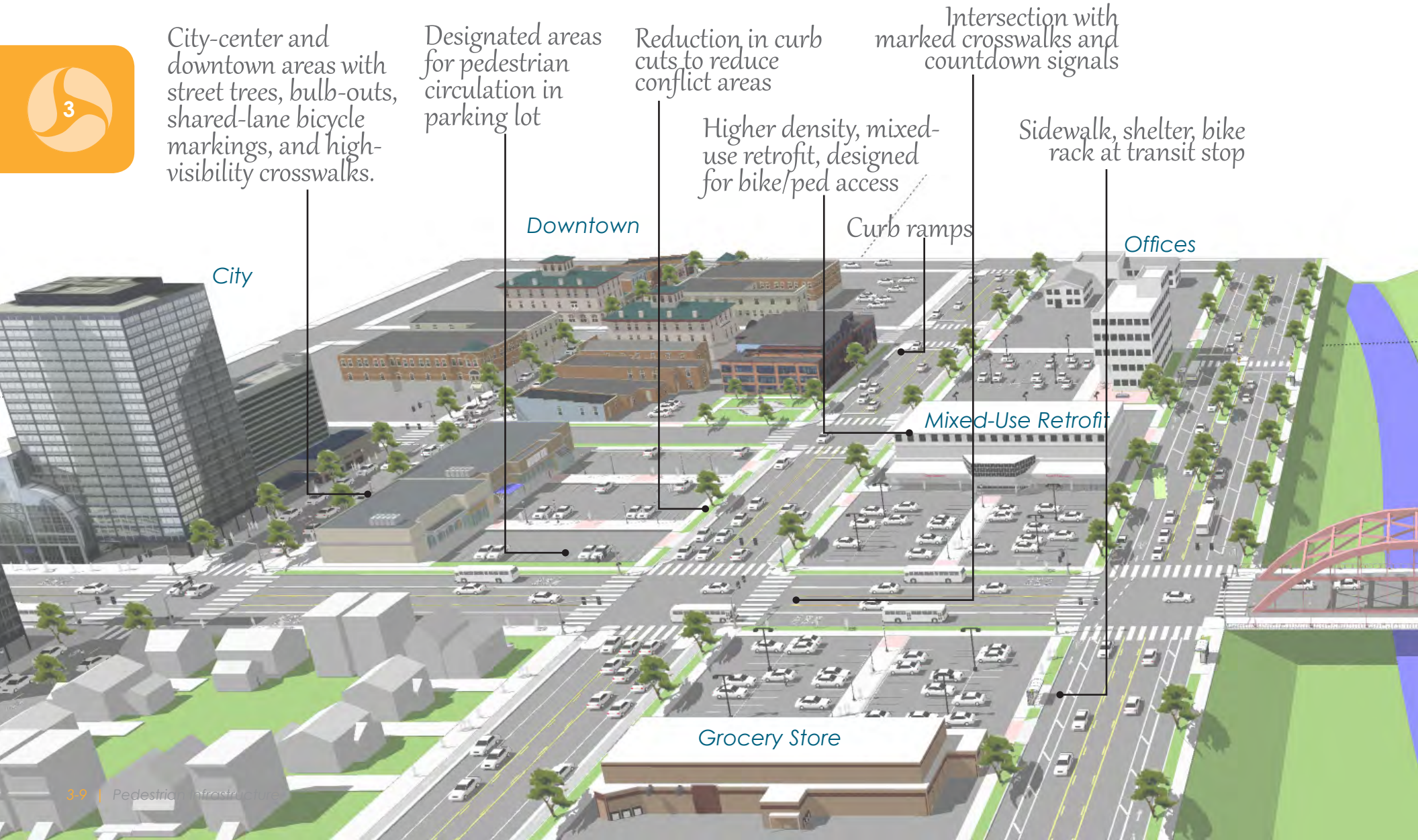
This graphic illustrates how most urban, suburban, and rural areas in North Carolina are designed primarily for the automobile. Driving an automobile is currently the most convenient mode of travel for many North Carolinians because our roadway network is designed for driving and our land uses tend to be segregated and separated by long distances, making walking from origin to destination challenging. North Carolina currently lacks a contiguous, interconnected and consistent network of pedestrian facilities and services that would encourage walking as a viable choice for transportation.

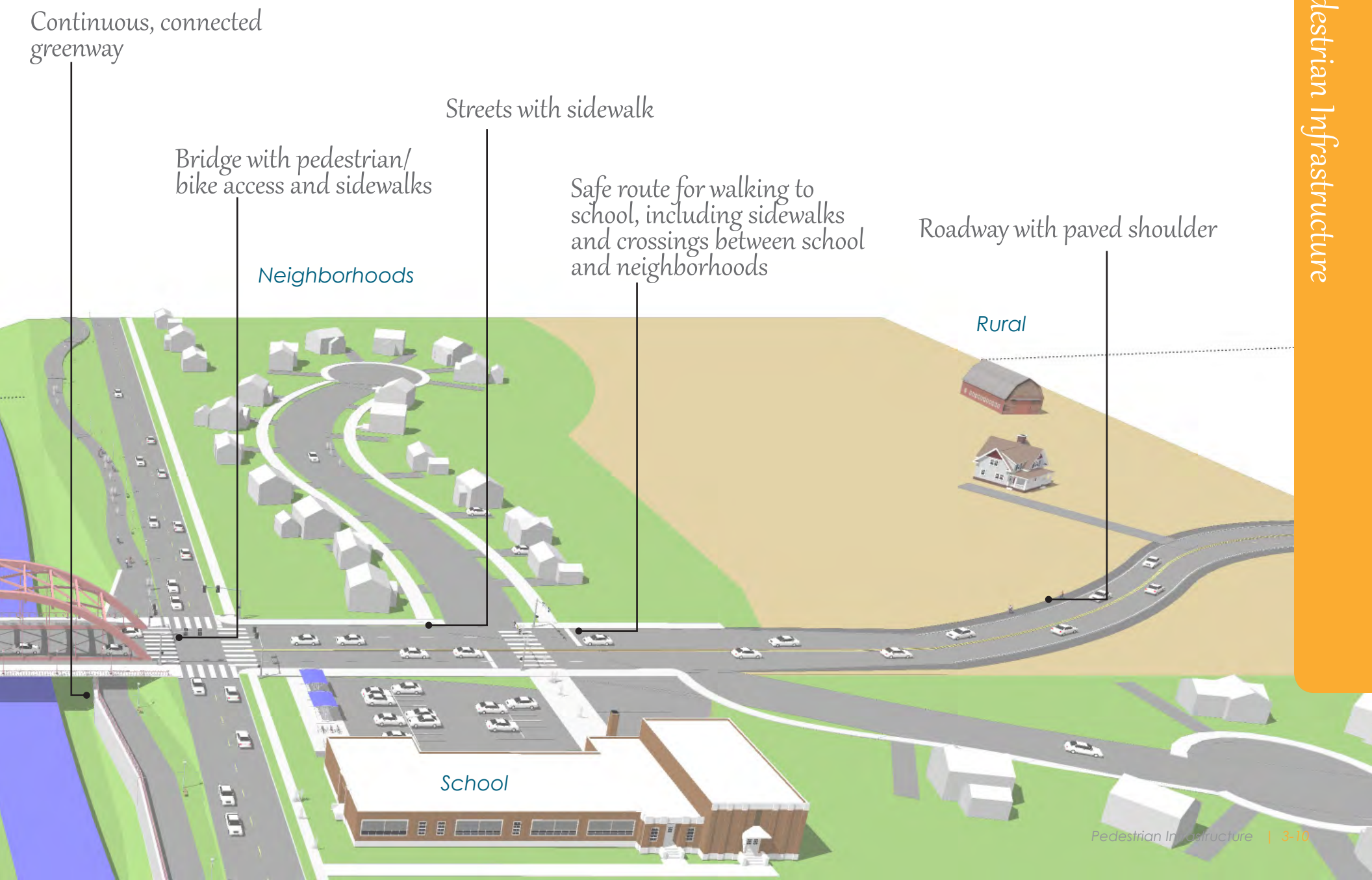



Disconnected greenway
Bridge lacks pedestrian/ bike access
Streets lack sidewalk
No safe route for walking to school, including no sidewalks or crossings between school and neighborhoods
Roadway lacks paved shoulder
Neighborhoods
Rural
School

TRANSPORTATION CHOICES: IMPROVING NORTH CAROLINA'S WALKING ENVIRONMENT

This graphic illustrates how most urban, suburban, and rural areas in North Carolina can be retrofitted to better serve all of NCDOT's transportation 'customers'. In addition to the pedestrian project examples below, issues with land use and trip distances will also need to be addressed, mostly on the local and regional level. This could include a greater mix of land uses, higher densities of land use, infill development, and reinvestment in NC's downtown areas. Land use and development strategies such as these serve to not only reduce infrastructure costs and preserve open space, but they also shorten daily trip distances, making walking a more viable choice for everyday transportation.




Continuous, connected greenway
Bridge with pedestrian/ bike access and sidewalks
Streets with sidewalk
Safe route for walking to school, including sidewalks and crossings between school and neighborhoods
Roadway with paved shoulder
Neighborhoods
Rural
School

Example of current conditions for pedestrians.

Example improvements for pedestrians, including a connected and continuous greenway trail, high visibility marked crosswalks, sidewalks, bridge access, and pedestrian countdown signals.

Example of current conditions for pedestrians.

Example improvements for pedestrians, including street trees, high visibility marked crosswalks, and curb bulb-outs. Note the shared-lane markings for bicyclists as well.

RECOMMENDATIONS

NCDOT's Complete Streets Policy emphasizes that the agency is committed to "providing an efficient multi-modal transportation network in North Carolina such that the access, mobility, and safety needs of motorists, transit users, pedestrians, and bicyclists of all ages and abilities are safely accommodated." The *Complete Streets Design Planning and Design Guidelines,* published in 2012, informs the design and implementation of complete streets elements as part of all ongoing and upcoming projects. The recommendations below (along with other plan recommendations summarized in Chapter 8 and Appendix 9.10) will serve as the next steps in the state's efforts to improve walking conditions. The recommendations below include pedestrian-related policy, design, and process elements.

1. Safety and Data Analysis

Issue: NCDOT collects and analyzes pedestrian and bike crash data on an ongoing basis. The agency's crash-data related efforts are a model for other state Departments of Transportation. For example, NCDOT has fourteen years of crash data that are categorized into crash types. The data contain linked variables and web-based query functionality. These data inform some budgeting and project programming decisions, although this link could be improved. The University of North Carolina Highway Safety Research Center is a national leader in developing pedestrian crash data analysis tools and countermeasures, and has assisted NCDOT over the years to design and populate this robust crash data system. However, in many cases, pedestrian and bicycle crash data are reported incorrectly or incompletely by law enforcement. Also, countermeasures are often implemented in a reactive manner only after a pedestrian death or rash of crashes.

Policy Direction: NCDOT should continue to serve as a national leader in the collection and analysis of pedestrian and bicycle crash data. The agency should continue to use crash data to prioritize investments, through independent and routine accommodations.

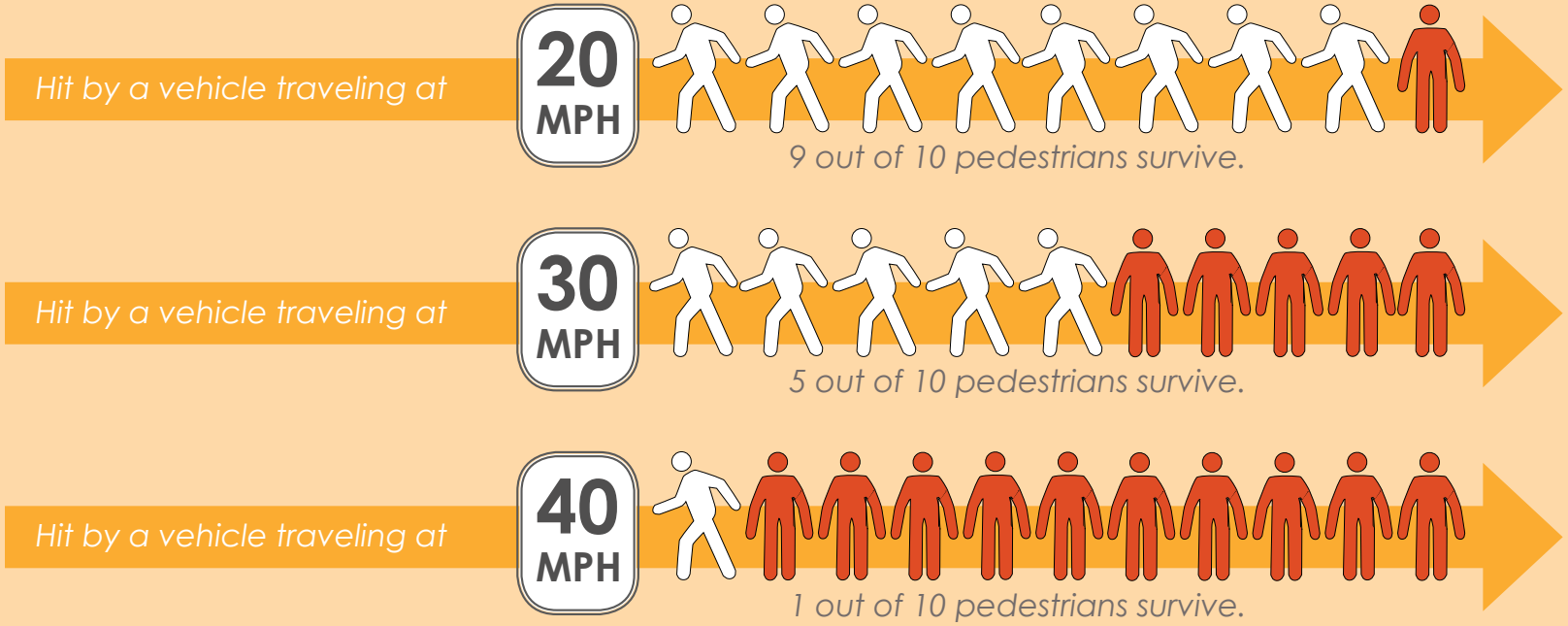
NCDOT should move forward with two distinct, but equally important, sets of actions: 1) Use data and research to proactively prevent pedestrian crashes, and 2) Improve crash reporting/data and use of information to prioritize future infrastructure investments.

Action Items/Proactive Safety Strategies:

A. Implement "Complete Streets" approach consistently with appropriate roadway projects to ensure a connected, accessible, and safe pedestrian network.

B. Develop strategy to advertise and educate NCDOT Division staff, MPOs/RPOs, cities, counties, advocates, and law enforcement staff across the state about HSRC crash analysis and data and trends in North Carolina. As part of this, consider developing a mapping application available on DBPT's website to show crash information.

C. Maintain the NCDOT Traffic Safety Unit approach to review high crash locations. This team should be proactive using pedestrian/bicycle crash data regularly.



Speed Kills

The National Highway Traffic Safety Administration (NHTSA) has determined that excessive speeding is a factor in nearly one-third of all traffic fatalities and that the most dangerous roads are those with posted speed limits of 60 mph or higher. Speeding in residential areas is also a major cause of bicycle and pedestrian fatalities – chances of survival if hit by a vehicle traveling at 20 mph are 95 percent, yet drop to 50 percent at 30 mph and just 15 percent at 40 mph. For more information see:

Adapted from "Killing Speed and Saving Lives", UK Dept. of Transportation, London, England

D. Develop an injury minimization approach for setting speed limits on new roadways and major roadway reconstruction projects. The approach should identify the intended operational speed at the outset of a project based on the context and local preferences.[1]

E. Implement education, encouragement, and enforcement programs as detailed in Chapter 7.

F. Engage more stakeholders in a comprehensive approach to improving safety for pedestrians. Hold Pedestrian and Bicycle Safety Summits every two years to discuss new trends and evaluate progress.

Pedestrian Crash Reduction Factors

Design Treatment / Intervention	Crash Reduction Rate
Provide a minimum 4' paved shoulder to avoid walking along roadway	71% (pedestrian crashes)
Increase enforcement to reduce speed	70% (pedestrian crashes)
Install sidewalk to avoid walking along roadway	65-89% (pedestrian crashes)
Install pedestrian refuge islands	56% (pedestrian crashes)
Install raised median + crosswalk	46% (pedestrian crashes)
Improve lighting at intersections	42% (pedestrian injury crashes)
Add exclusive pedestrian phasing to signalized intersection	34% (pedestrian crashes)
Restrict parking near intersections	30% (pedestrian crashes)
Convert unsignalized intersection to roundabout	27% (pedestrian crashes)
Improve/Install pedestrian crossing	25% (pedestrian crashes)
Install pedestrian countdown signal heads	25% (pedestrian fatal/injury crashes)
Increase enforcement related to motorist yielding in marked crosswalks + public education campaign	23% (pedestrian crashes)
Install pedestrian overpass/underpass at unsignalized intersection	13% (pedestrian crashes)

Source: Federal Highway Administration. Desktop Reference for Crash Reduction Factors. http://safety.fhwa.dot.gov/

Action Items to Improve Safety Data:

A. Continue to explore ways to improve the quality and completeness of pedestrian crash data, including working with municipalities, hospital systems/ emergency response, law enforcement, HSRC, and MPOs/RPOs to more consistently and accurately record crash events and to share data. The STRUCK study in New Hanover County is one new approach to this collaboration and analysis.

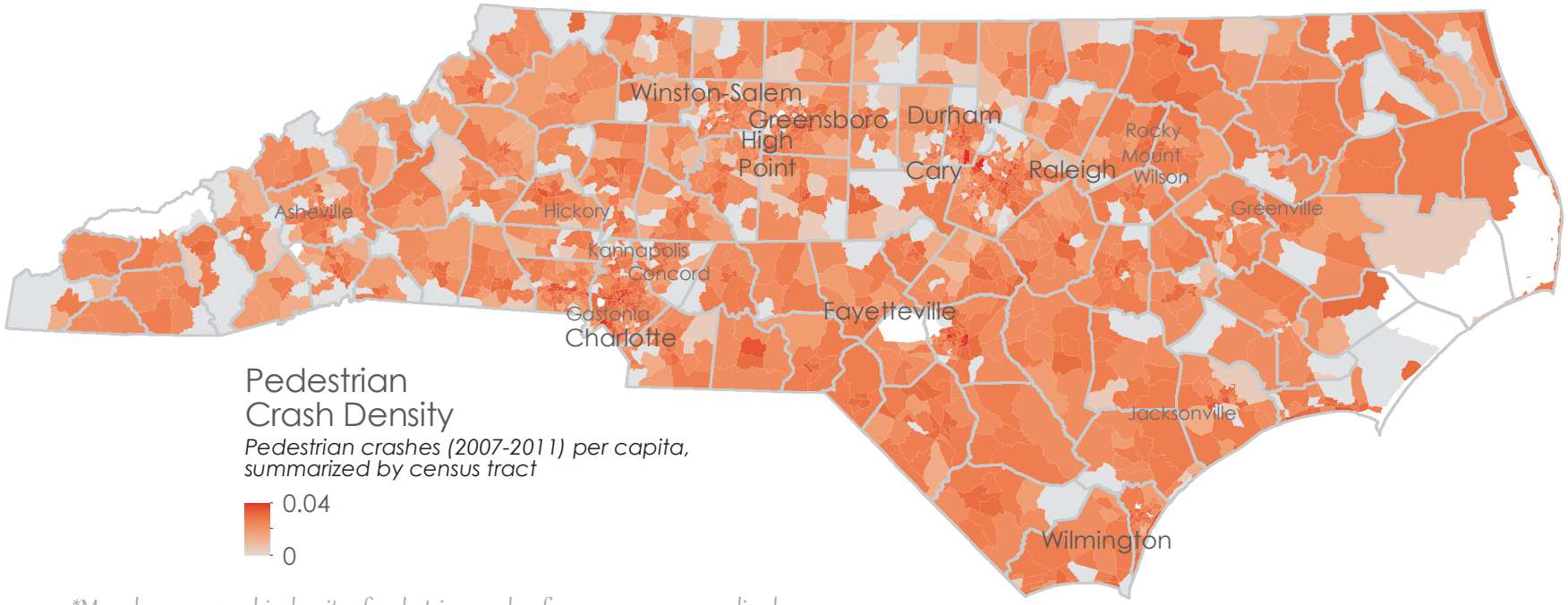
- As part of increased engagement as suggested above, establish a Statewide Pedestrian and Bicycle Safety Consortium to develop consistent, thorough recording of crashes that will allow for more comprehensive, consistent databases. The Consortium could also support WatchForMeNC program.

B. Evaluate the existing HSIP prioritization and project programming process to improve relationship between bicycle and pedestrian crash data and project selection.

C. Incorporate ongoing HSRC crash typing and geocoding efforts into decision-making and prioritization.

2007-2011 Pedestrian Crash Density Map, NC

Source: 2013 NCDOT Crash Data*



*Map shows geographic density of pedestrian crashes from 2007-2011 normalized by population and summarized at the census tract level.

D. Conduct studies at high pedestrian and bicycle crash locations and coordinate results with the HSIP process to provide pedestrian countermeasures in these locations. The agency should explore the development of a model to estimate pedestrian and bicyclist volumes, with the purpose of developing better prioritization methods that account for crash rates in addition to crash frequency. If possible, the model should be compatible and/or coordinated with analytical models currently used by other state agencies.

2. Transit Access

Issue: Existing transit-related policies do not fully account for the critical link between transit and pedestrian and bicycle transportation. Some NCDOT policies make it difficult to improve pedestrian access to transit. It is critical that transit access facilities maintain safety for all roadway users, including pedestrians and bicyclists.

Policy Direction: Strong pedestrian connections to transit stops and stations are integral to the success of North Carolina's transit systems. NCDOT should reassess policies with an eye toward ensuring roadways and transit stations/stops are accessible, attractive to pedestrians, and safe.

Action Items:

A. Ensure clear/breakaway zone policies allow transit amenities including signage, benches, shelters, bike racks and other items at urban, suburban and rural transit stops in a way that maintains safety for all users.

B. Expand access to transit planning program to include focus on high-crash areas, high-volume transit services, and major transit terminals

C. Clarify policies with regard to ADA-compliant transit stops to ensure the stop itself is compliant, but also to provide an accessible and safe path of travel to sidewalks and intersections in the vicinity of the stop. Policies should also address the pros and cons of near-side versus far-side transit stops, and provide methods to accommodate necessary pedestrian crossings of wide streets at controlled and uncontrolled locations to access transit stops on the other side of the street.

D. Per the recommendations for the Roadway Design Manual (RDM), provide detailed design guidance for the placement of benches and shelters, as well as bike parking associated with longer term transit facilities such as park-and-ride lots.

3. ADA Transition Plan

Issue: NCDOT's *Americans with Disabilities Act (ADA) Transition Plan* is limited in scope and does not fully address the US Access Board's *Public Rights-of-Way Accessibility Guidelines* (PROWAG).

Policy Direction: Update Departmental policies to reflect current best practices and prepare for the issuance of forthcoming guidance (PROWAG).

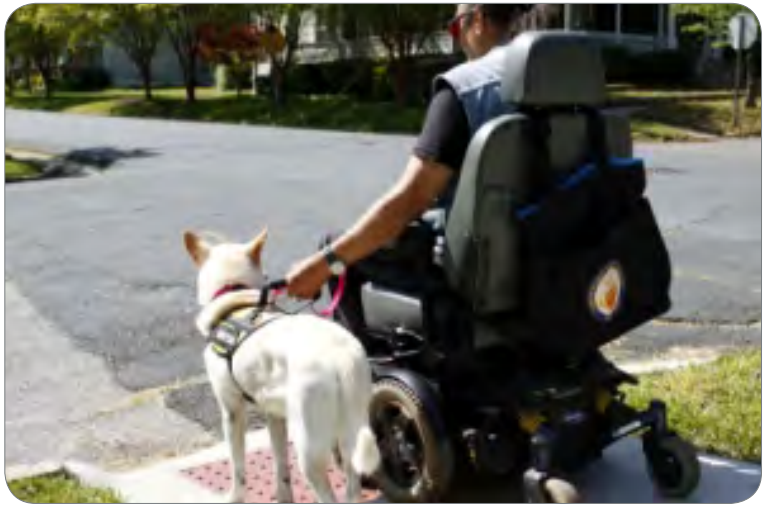
Action Items:

A. Adopt the U.S. Access Board's Draft PROWAG and incorporate the guidelines into the new RDM and all roadway design projects. This should include guidelines for accessibility in work zones. [2]

B. Prepare a Transition Plan for State-Owned Public Right-of-Way in North Carolina, and develop a monitoring program for ongoing self-evaluation. This should include a GIS inventory and evaluation of sidewalks, signals and crossings. It should identify routine inclusion of curb ramp retrofits during road resurfacing projects, and prioritize projects needed to bring existing pedestrian facilities into compliance with PROWAG.[3]

C. Conduct staff training on the new PROWAG. This should include an initial round of training for staff in the central and division offices, as well as periodic follow-up training for new staff.

D. Update the Transition Plan described above on a two-year cycle.



▲ *Retrofitting for curb ramps is an important part of an ADA transition plan. Photo: Salisbury, NC (Permission needed from Salisbury Post)*

4. Safe Routes to School Infrastructure

Issue: Safe Routes to School (SRTS) is an international movement that encourages and enables children to walk and bicycle to school. The federal SRTS program has provided funding that has been used for the "planning, design, and construction of infrastructure-related projects that will substantially improve the ability of students to walk and bicycle to school, on any public road or any pedestrian or bicycle pathway or trail within approximately 2 miles of a primary or middle school." Funds can also be used for "non-infrastructure related activities to encourage walking and bicycling to school, including public awareness campaigns and outreach to the press and various community leaders, traffic education and enforcement, student training, and funding for training, volunteers, and managers of SRTS programs."

SRTS is an eligible program under MAP-21 Transportation Alternatives Program. Also, remaining SRTS funds from SAFETEA-LU are still eligible for projects under those guidelines. However, under MAP-21, SRTS is now considered optional for each state. SRTS coordinators are not required under MAP-21 as under SAFETEA-LU.

SRTS is a key program of DBPT and has successfully funded infrastructure, non-infrastructure, and planning projects across North Carolina. In 2013, a new SRTS program is being launched through a collaboration between DBPT and the Department of Health and Human Services (DHHS). This effort will place one regional SRTS coordinator for every ten counties of North Carolina to be stationed with DHHS staff to help communities address important policy topics like school siting, and help educate communities, promote engineering, education, encouragement, and enforcement programs.

Policy Direction: NCDOT should continue to support SRTS efforts within DBPT under new MAP-21 legislation. By doing so, NCDOT may continue serving as a national leader in the SRTS movement.

Action Items:

A. Maintain the Safe Routes to School program. The existing SRTS program should be expanded to reach more of North Carolina's schools. A North Carolina SRTS website should be developed to advertise the program, highlight success stories, and build awareness.

B. Maintain Safe Routes to School staffing as part of the Division of Bicycle and Pedestrian Transportation.

C. Initiate a new public health collaboration with DHHS/ Community Transformation Grant in order to reach more communities and schools around the state. As part of this collaboration, engage Department of Commerce, Board of Education, Department of Public Instruction, and DHHS. Evaluate the program immediately to document successes and opportunities for improvement.

D. Explore ways to simplify and streamline SRTS grant and implementation processes.

5. GIS Data Standardization for Pedestrian Facilities

Issue: GIS data files describing pedestrian facilities are generated by many different individuals and organizations. Data are created for each plan funded through the planning grant program. However, formats vary significantly depending on the individual consultant and municipality completing the work. Further, many individual towns and cities create and maintain their own GIS datasets, which also vary widely in format and level of detail. The wide variation in data format makes data transfer and coordination difficult, and hinders regional efforts to catalog existing pedestrian facilities.

Policy Direction: NCDOT should adopt a GIS framework covering both pedestrian and bicycle datasets that clearly defines the attributes to be inventoried and an associated nomenclature for each attribute. This framework should be mandatory for data created through the Planning Grant Initiative and the Comprehensive Transportation Planning process.

Action Items:

A. Evaluate the framework developed by ITRE and enhanced through this planning process and revise and/or expand as needed. The framework is detailed in the following tables.

B. Meet with GIS staff from selected major municipalities to review the draft framework in comparison to their current data formats. Modify as necessary to ensure the framework will meet the needs of local governments.

C. Once finalized, train Bicycle & Pedestrian Division staff on this framework and direct them to ensure its use during each planning process.

D. Provide online mapping application for viewing pedestrian and bicycle routes and facilities for officials and public.

E. Distribute the framework to municipalities around the state and encourage them to generate and maintain data in this format going forward.

F. Re-evaluate attributes and nomenclature bi-annually and update to incorporate new facilities as they are developed.

6. GIS Data Transfer and Data Maintenance

Issue: Outside of the Bicycle & Pedestrian Division, GIS data covering pedestrian and bicycle facilities are used in two other areas of NCDOT: the Transportation Planning Branch and the Strategic Prioritization Process. While data are currently provided by the Bicycle & Pedestrian Division to the Transportation Planning Branch for incorporation into Comprehensive Transportation Plans, and later to the GIS staff involved in the prioritization process, it comes in a piecemeal format and can be difficult to use.

Policy Direction: Two previous policy recommendations will partially address this issue. The data format framework above will ensure that all data are consistent and therefore easy to merge, and modifications to the format used for pedestrian and bicycle components of Comprehensive Transportation Plans will make these plans more consistent with standalone pedestrian and bicycle plans. To further support smooth transfer of data between agencies within the DOT, one central database should be maintained exclusively for pedestrian and bicycle data and updated every time a pedestrian plan, bicycle plan, or comprehensive transportation plan is completed.

Action Items:

A. Modify existing datasets to match the selected framework, leaving gaps where they exist, and merge into one master database. The database should include locally-owned roadways and both on-road and off-road pedestrian and bicycle facilities.

B. Assign staff resources to manage and maintain the comprehensive pedestrian & bicycle database.

A central database should be maintained and updated every time a pedestrian plan, bicycle plan, or comprehensive transportation plan is completed.

Recommended Format for *Linear* Pedestrian GIS Layers

Attribute	Possible Entries
Jurisdiction	Municipality or County
Roadway Ownership	Municipality or NCDOT
Last Update	
Existing Facility	Sidewalk, Multi-Use Path
ADA Compliant	1/0
Condition	Good, Fair, Poor
Characteristics	Ex: Debris, many driveways
Width	
Buffer Width	
Material	Asphalt, Concrete, Gravel, Brick, Natural
Proposed Facility	Sidewalk, Multi-Use Path, ADA Improvement, Resurface
Proposed Project	New Construction, Traffic Calming, Widening

Recommended Format for *Point* Pedestrian GIS Layers

Attribute	Possible Entries
Crosswalks	Existing, Needs Improvement, Proposed
Median Islands	Existing, Needs Improvement, Proposed
Ramps	Existing, Needs Improvement, Proposed
Signals	Existing, Needs Improvement, Proposed
Barrier	
Characteristics	Other

C. Communicate the existence and goals of the database with local GIS staff around the state.

D. Set up a process by which data is exported from the master database for each pedestrian plan, bicycle plan, or comprehensive transportation plan, and data updates made during these plans are then added to the database at the end of each planning process (web-based process should be considered)

E. Make built environment/GIS data available to DHHS and researchers for their analysis of health impacts.

7. Main Street Program (Department of Commerce)

Issue: The N.C. Main Street Program is part of the Office of Urban Development in the North Carolina Department of Commerce. The program assists selected communities across the state in restoring economic vitality to their historic downtowns. The Main Street Four-Point Approach is a comprehensive revitalization process designed to improve all aspects of a downtown, producing both intangible and tangible benefits. The four elements are: organization, promotion, design, and economic restructuring. While pedestrian, bicycle, and Complete Streets elements have become parts of the design element, they are not explicitly part of the Main Street Program. An opportunity exists for collaboration between the Department of Commerce and NCDOT.

Policy Direction: The Department of Commerce should work with NCDOT to expand the Main Street Program to include a Complete Streets element.

Action Items:

A. Establish the Main Street Program as a collaboration, involving NCDOT more thoroughly in future projects to address Complete Streets transportation elements of projects. These projects can also serve pedestrian and bicycle connectivity to the Downtown from surrounding communities.

B. NCDOT should work jointly with the Department of Commerce. These projects serve as an opportunity for pilot projects for Complete Streets implementation.

▲ The Town of Clayton is one of many Main Street Program successes. Among recent projects, they designed and built an all-brick walkway to the Civil War Trails marker. Photo: http://downtownclayton.blogspot.com/

C. The Department of Commerce should continue to partner with state agencies (through interagency collaboration) along with local health departments and walking/biking groups as part of the Main Street Program.

D. The Department of Commerce should update its design element of the Main Street Program to include language about "Complete Streets."

E. NCDOT should communicate with and provide educational opportunities for Department of Commerce staff regarding Complete Streets and its health and economic benefits. One opportunity is presenting at the annual Commerce meeting.

8. Small Town Economic Prosperity Program (STEP)

Issue: The North Carolina Small Town Economic Prosperity program (NC STEP) was established in Spring 2006 to aid in the economic revitalization component of the state's small towns initiative. The STEP program takes a four-step comprehensive process to aid participating towns in revitalizing their economy, from preliminary evaluations and recommendations to staff trainings to project and program implementation. The four elements of the program are: coaching assistance, training scholarships, planning grants and project implementation grants. The STEP program provides extensive context-sensitive guidance and coaching to towns, but does not specifically address transportation needs, nor draw on the expertise of NCDOT. A valuable opportunity exists to guide towns in the implementation of Complete Streets as a tool in economic revitalization.

Policy Direction: The NC Rural Economic Development Center should work with NCDOT to expand the STEP program to include the infrastructure and programmatic needs of bicycles and pedestrians as an effective approach to aid in the economic revitalization of participating towns.

Action Items:

A. Incorporate technical workshops and training sessions on integrating bicycle and pedestrian accommodations into a town's transportation network into the training element of STEP.

B. Incorporate an NCDOT presence in the coaching phase of STEP. This DOT partnership will educate towns about the far-reaching benefits and relatively low costs of bike/ped projects and programs, citing the striking economic benefits noted in other rural regions of North Carolina.

C. Identify grant opportunities specifically for the planning and implementation of Complete Streets to jump start the revitalization of Main Street.

9. Community Transformation Grant (CTG)

Issue: The North Carolina Division of Public Health received $7.4 million as a part of the Department of Health and Human Services (DHHS) Community Transformation Grant. This funding is allotted to be used throughout the state to expand efforts in promoting tobacco-free living, active living and healthy eating, and quality clinical and other preventive services. These initiatives describe the efforts made to engage partners in various sectors including education, transportation and business. However, given the goal of improving health through active living, the

role and relationship with DOT is not explicitly explored or identified. There is a great opportunity to formalize the relationship and cooperation across agencies, including NCDOT and DBPT, for the betterment of participating communities.

Policy Direction: Ensure that NCDOT is not only present, but serves as a key player from start to end of the community-level health intervention process, beginning with the design all the way to the implementation and evaluation of projects.

Action Items:

A. Provide awarded communities with technical assistance provided by NCDOT to ensure that physical activity is made safer and more accessible through bicycle and pedestrian projects.

B. Add to "Strategic Direction II A: Active Living" an explicit mention of the incorporation of bicycle and pedestrian projects as a sub-goal for this effort.

C. The CTG program is led by the Health Department, thus CTG coordinators and staff members come primarily from health-focused backgrounds. Create an additional position for a transportation professional, or properly train coordinators with the necessary skill set to guide community's in the implementation of bicycle and pedestrian projects.

10. North Carolina Parks and Recreation Trust Fund (PARTF)

Issue: The NC Parks and Recreation Trust Fund (PARTF) was established in 1994 to fund improvements to the state parks system, to fund grants for local government park and recreation projects, and to improve public access to the state's beaches and estuarine shorelines. The PARTF local grant program is administered by the NC Division of Parks and Recreation (DPR), and through this program, hundreds of grants have been awarded for trail and greenway projects, including bicycle and walking paths that are primarily used for recreation. The purpose of PARTF is focused on recreation, but many of these projects may also serve transportation needs. PARTF is an important partner in providing bicycle and pedestrian opportunities in North Carolina.

Action Items:

A. NCDOT should work closely with PARTF and DPR to explore ways to coordinate and enhance the assistance that each program can provide local governments in implementing bicycle and pedestrian projects. The interface between recreation and transportation purposes can help to advance statewide goals for walking and biking.

11. Accountability

Issue: Existing benchmarks and performance measures for pedestrian and bicycle issues are limited and are not always tracked on a statewide basis.

Policy Direction: NCDOT should identify and track progress over time on the goals and objectives identified in this Plan. The agency should use a defined set of data to benchmark progress on a statewide level, as well as at the local and division levels.

Action Items:

A. Adopt the priority performance measures in Chapter 8 and collect baseline data to establish a starting point where data does not exist. For instance, evaluate usage of specific bicycle facility types (Count technologies should be considered).

B. Coordinate data collection efforts with MPOs and local governments to ensure a coordinated and cohesive approach.

C. Continue report card effort that assesses progress on the performance measures. Expand pedestrian and bicycle performance metrics.

Endnotes

1. See the FHWA report, Methods and Practices for Setting Speed Limits: An Informational Report (FHWA-SA-12-004)

2. Minnesota Department of Transportation has developed best practices for pedestrian accessibility in work zones.

3. The Maryland State Highway Administration (SHA) provides a best practice in this regard. The location of sidewalks on state roadways is mapped in GIS, along with the width of the facility and compliance with the Americans with Disabilities Act (ADA). Pedestrian improvements are prioritized based on ADA compliance and access to transit. The data that have been collected aid in selecting these projects.

4 Bicycle Infrastructure

Hertford, NC

Overview

The nature of cycling has changed. The most energy-efficient form of transportation and the reason that we initially paved our roads, cycling was once the darling of European and American trend-setters. The advent of the automobile pushed cycling and cyclists to the roadway edges, but the pure advantages of the bicycle – ease of use, convenience, comfort, range, and cost-efficiency – did not allow the bicycle to fade into obscurity. Our planning, design, and maintenance processes, as well as land development practices, are all heavily skewed towards motor vehicle mobility and access, and this fact has hampered the growth of cycling still further. The following chapter considers how to reverse a long-standing trend and create more complete, safer, and more community-oriented transportation systems for small towns, cities, and rural areas in our state.

There have been many bicycle-related successes in North Carolina. For example, the state has identified nine different bicycle routes traversing over 3,000 miles of North Carolina's Piedmont plains, mountains, and coastal areas. The state's annual Cycle North Carolina ride covers all three terrains in just a week. Small towns from Scotland Neck to Marion host annual bicycle rides, and count on these to help boost their economies. North Carolina has supported the development of bicycle plans throughout the state by providing funds for planning grants, administering the Safe Routes to School Program, and providing facilities from bicycle-safe railing treatments on bridges to wide outside lanes to pedestrian/bicycle overpasses of major facilities.

However, bicycling for transportation is not an equivalent choice to driving today in North Carolina. There is a lack of connected bicycle facilities across North Carolina communities. Urban and suburban roads generally lack bicycle lanes, multi-use sidepaths, sharrows, or cycle tracks. Rural roadways lack paved shoulders (Approximately 6.7% of the North Carolina state bike route system features paved shoulder). In addition, thousands of bicyclists are struck by motorists every year.

In this Chapter

Overview

Types of Bicyclists

Bicycling Preferences and Factors Discouraging Bicycling

Transportation Choices

Methods of Implementing/ Constructing Bicycle Facilities

Recommendations

Common Bicycling Issues throughout the State

The sampling of statements from various bicycle plans and planning documents underscores the degree of support for bicycling in North Carolina by municipalities, counties, universities and our state.

Wrightsville Beach Bicycle Corridor Study (2009)

"While current land use and existing infrastructure offer ample opportunity to provide bicycling connections to/from Wrightsville Beach and between local destinations, the provision of accessible bicycle facilities also entails a number of challenges including three major bridges, high-traffic roads and intersections, an environmentally-sensitive landscape and potential right-of-way constraints. All of these factors ultimately played a part in the selection of the recommended treatments and are key components of any context-sensitive design that addresses local needs, budget limitations and environmental conservation issues. While challenges to implementation do exist, this study provides a sustainable design approach that addresses the community's need to provide safe, accessible and convenient bicycle facilities for town residents and visitors of all cycling skill levels."

UNC-Greensboro Bicycle Master Plan (2008)

"With anticipated campus development of more than 1.5 million square feet and future campus enrollment numbers of nearly 22,500 full-time students by 2025, it is important for the University to focus on opportunities to increase bicycling and other sustainable transportation options to and around campus.[1] The Campus Bicycle Master Plan aims to evaluate current bicycling conditions at UNCG and recommend projects, programs and policies to improve bicycle-friendliness."

▲ UNCG was the first school in the state recognized as a Bicycle Friendly University. Photo: www.uncg.edu.

1 UNCG Campus Master Plan: www.uncg.edu/fpl/CampusMasterPlan.html

Winston-Salem Comprehensive Bicycle Master Plan (2005)

"Many factors go into determining the quality of life for the citizens of a community: the local education system, prevalence of quality employment opportunities, and affordability of housing are all items that are commonly cited. Increasingly though, citizens claim that access to alternative means of transportation and access to quality recreational opportunities such as parks, trails, greenways, and bicycle routes, are important factors for them in determining their overall pleasure within their community. Communities that are attractive for residents can also attract new businesses and industries, and in turn, additional residents."

Haywood County Comprehensive Bicycle Plan (2012)

"…Rapid growth creates a variety of conflicts among transportation modes and interests as pressures mount on state and local agencies to improve traffic conditions as the needs of bicyclists and pedestrians are sometimes overlooked when new neighborhoods or shopping centers are approved. Historically the needs of bicyclists have been a secondary consideration across the United States but have received more attention in the past 10 years due to changes in policies at the federal level and increases in bicycling as a recreational and commuting activity."

NCDOT Complete Streets Planning and Design Guidelines (2012)

"Providing for bicycle quality of service may vary based on context. The surrounding land use, the speed of cars on the street, and the directness of the route connecting destinations are all important factors in identifying the appropriate elements for bicycle facilities. In addition, there are different types of bicyclists with varying levels of expertise. While bicyclists have the legal right to use the traffic lanes, some cyclists will be more comfortable than others riding in mixed traffic. Creating viable transportation options means that a variety of types of facilities should be provided to create a bicycling network. Creating bicycling networks is often an incremental process, and facilities should be provided where appropriate."

From this range of entities – university, state, town, city, coastal plain to mountains – it is possible to see that the diversity of interest does not translate into a diversity of commitment. North Carolina is unusual even among most of its peer southeastern states in that it owns and maintains a disproportionate amount of the transportation system: approximately 75% and over 80,000 lane-miles of roadway are managed by a single entity. This extraordinary level of ownership, and the associated level of low ownership of other government agencies, particularly North Carolina's counties, has produced a dynamic that forces North Carolina to be both cautious while simultaneously enabling it to rapidly implement new ideas once they are adopted. North Carolina's primacy in the provision and maintenance of the public's transportation facilities, whether directly or through financial contributions, also positions it to be a strong leader in creating innovative bicycle facilities, programs, and treatments.

Types of Bicyclists

It is important to consider bicyclists of all skill levels when creating a non-motorized plan or project. Bicyclist skill level greatly influences expected speeds and behavior, both in separated bikeways and on shared roadways. Bicycle infrastructure should accommodate as many user types as possible, with decisions for separate or parallel facilities based on providing a comfortable experience for the greatest number of people. A framework for understanding the characteristics, attitudes, and infrastructure preferences of different bicyclists in the US population as a whole is illustrated below.

Types of Bicyclists

Strong and Fearless (approximately 1% of population)

Characterized by bicyclists that will typically ride anywhere regardless of roadway conditions or weather. These bicyclists can ride faster than other user types, prefer direct routes and will typically choose roadway connections -- even if shared with vehicles -- over separate bicycle facilities such as shared use paths.

Enthused and Confident (5-10% of population)

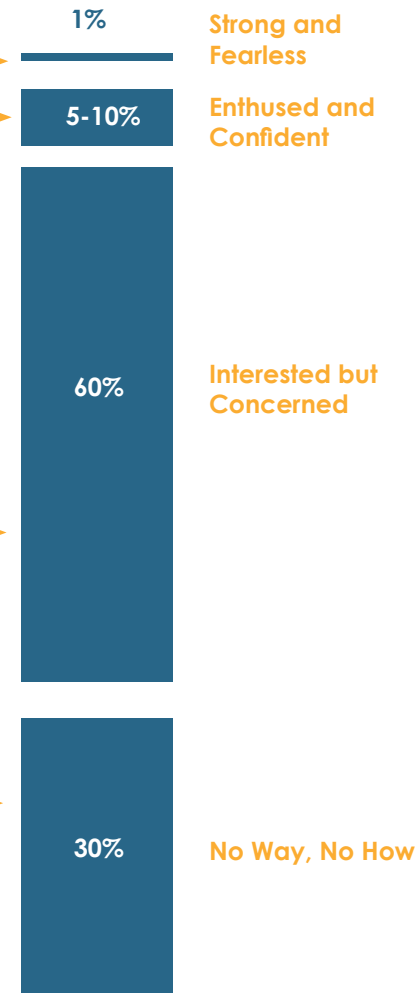
This user group encompasses bicyclists who are fairly comfortable riding on all types of bikeways but usually choose low traffic streets or multi-use paths when available. These bicyclists may deviate from a more direct route in favor of a preferred facility type. This group includes all kinds of bicyclists such as commuters, recreationalists, racers and utilitarian bicyclists.

Interested but Concerned (approximately 60% of population)

This user type comprises the bulk of the cycling population and represents bicyclists who typically only ride a bicycle on low traffic streets or multi-use trails under favorable weather conditions. These bicyclists perceive significant barriers to their increased use of cycling, specifically traffic and other safety issues. These people may become "Enthused & Confident" with encouragement, education and experience.

No Way, No How (approximately 30% of population)

Persons in this category are not bicyclists, and perceive severe safety issues with riding in traffic. Some people in this group may eventually become more regular cyclists with time and education. A significant portion of these people will not ride a bicycle under any circumstances.



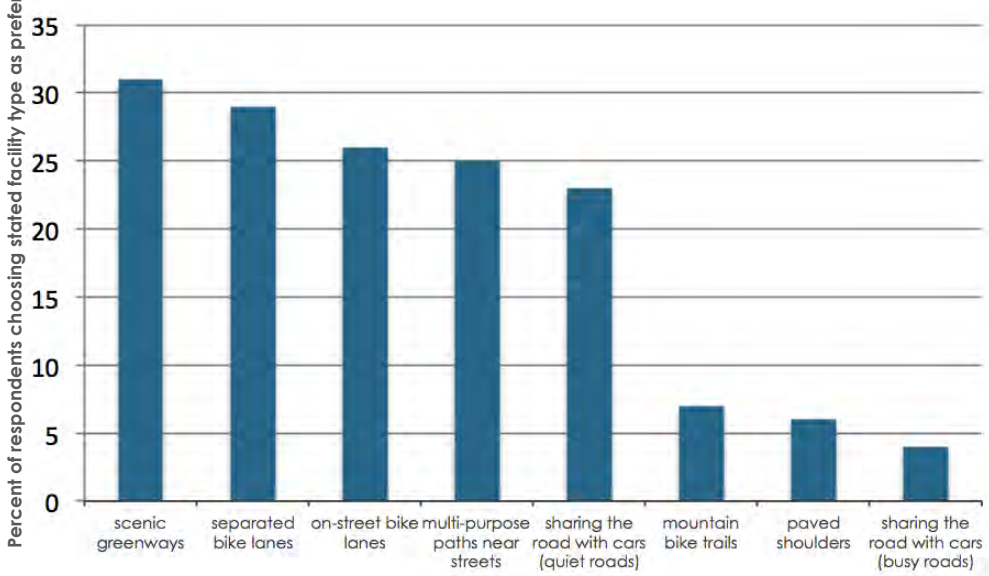
Source: Four Types of Cyclists. (2009). Roger Geller, City of Portland Bureau of Transportation. Supported by data collected nationally since 2005.

Bicycling Preferences and Factors Discouraging Bicycling

In 2012, the WalkBikeNC project website allowed visitors to select preferences for bicycle facility types. The results in the table at right show a preference for separated facilities, with paved shoulders and busier roads being the least preferred (see Chapter 6 for descriptions of facility types).

Using information collected through NCDOT's Bicycle and Pedestrian Planning Grant Initiative, it is also possible to gauge the factors that discourage bicycling in North Carolina. The table below shows the results from more than 3,000 comment forms, collected in six different communities, from 2005-2011. Similarly, in a 2012 comment form for the *Wilmington/New Hanover Greenway Plan*, more than 3,700 residents indicated a 'lack of safe connections to greenways' and 'unsafe street crossings' as the biggest factors discouraging greenway use.

Bicycling Preferences in North Carolina



Source: WalkBikeNC Public Input from MindMixer, 2012 (open comment form; not a statistical survey)

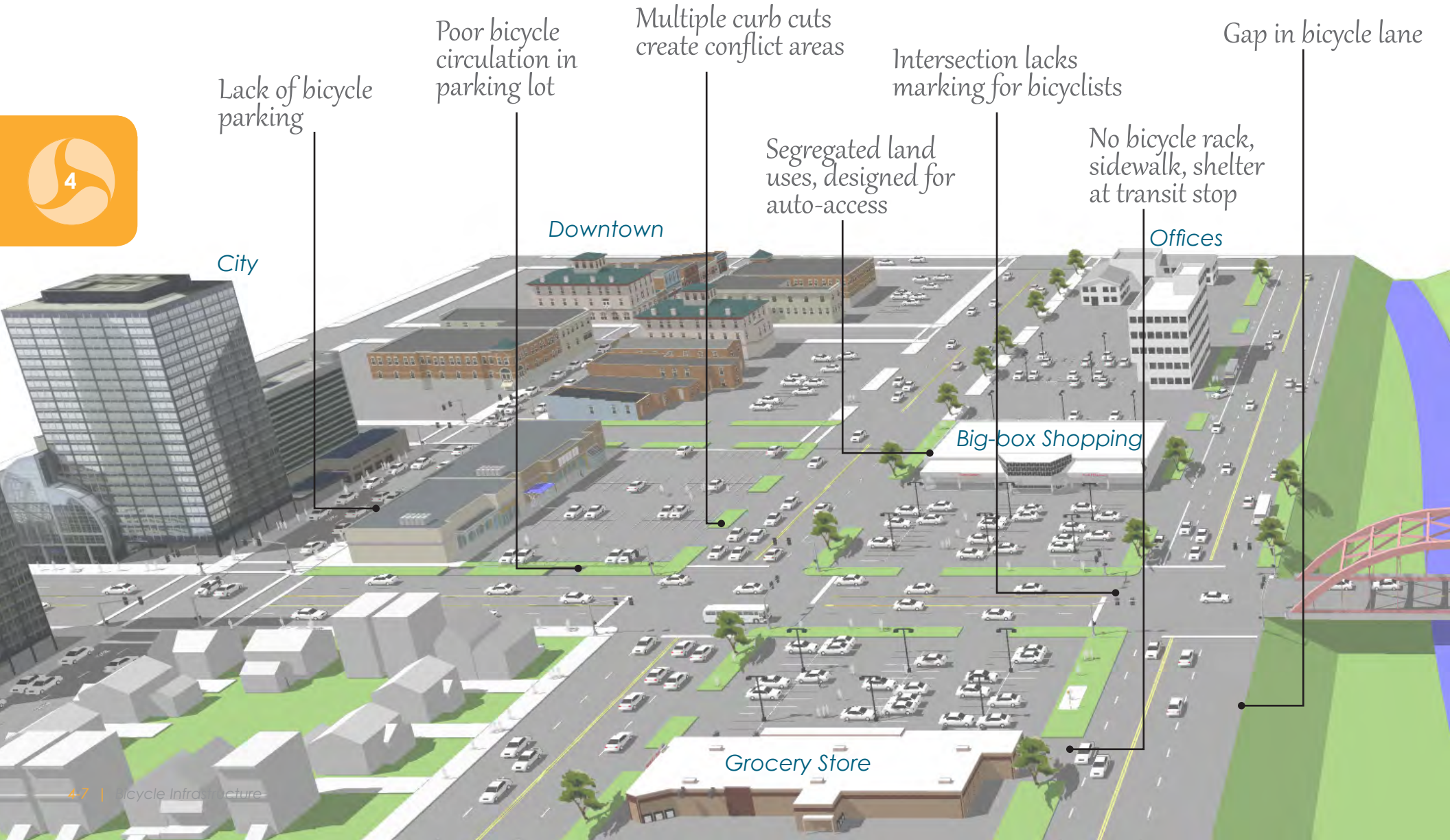
Top Factors Discouraging Bicycling in North Carolina Communities

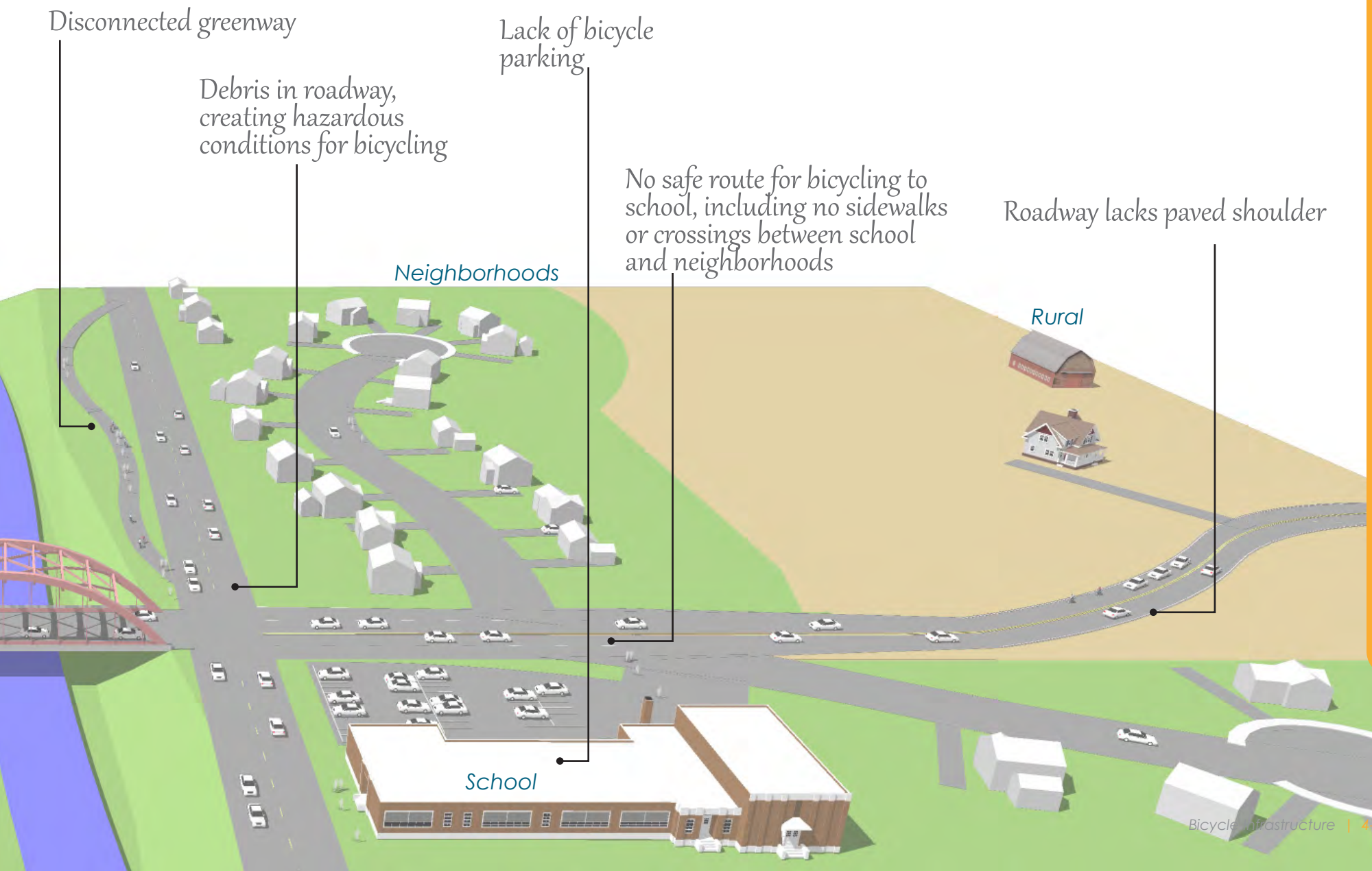
	Lack of bicycle lanes, shoulders, or paths	High-Speed Traffic	Narrow Lanes	Inconsiderate Motorists	Heavy Traffic	Gaps in Bicycle Facilities	Crossing Busy Roads
City of Raleigh *701 respondents/2009*	#1	-	#3	#2	-	-	-
Greenville Area MPO *694 respondents/2011*	#1	#2	-	#3	-	-	-
Greensboro Urban Area MPO *609 respondents/2005*	#1	#2	-	#3	-	-	-
City and County of Durham *604 respondents/2006*	#1	#2	-	-	#3	-	-
Town of Carrboro *328 respondents/2008*	#1	-	#2	-	-	#3	-
Town of Southern Pines *320 respondents/2010*	#1	-	#2	-	-	-	#3

Source: Public comment forms from each of above communities, collected as part of their bicycle transportation planning processes (2005-2011).

TRANSPORTATION CHOICES: BICYCLING vs. DRIVING IN NORTH CAROLINA

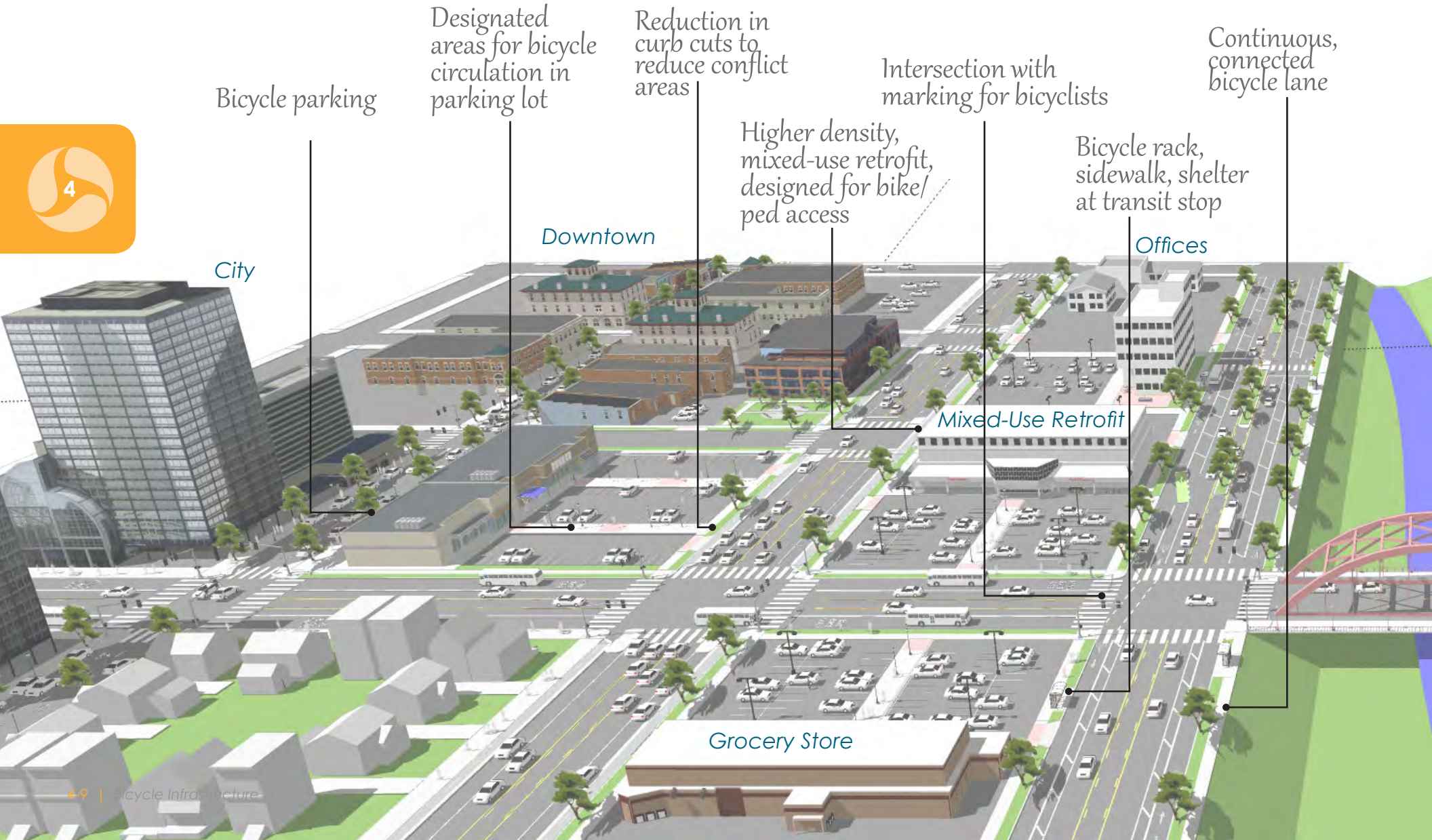
This graphic illustrates how most urban, suburban, and rural areas in North Carolina are designed primarily for the automobile. Driving an automobile is currently the most convenient mode of travel for many North Carolinians because our roadway network is designed for driving and our land uses tend to be segregated and separated by long distances, making bicycling from origin to destination challenging. North Carolina currently lacks a contiguous, interconnected and consistent network of bicycle facilities and services that would encourage bicycling as a more viable choice for transportation.

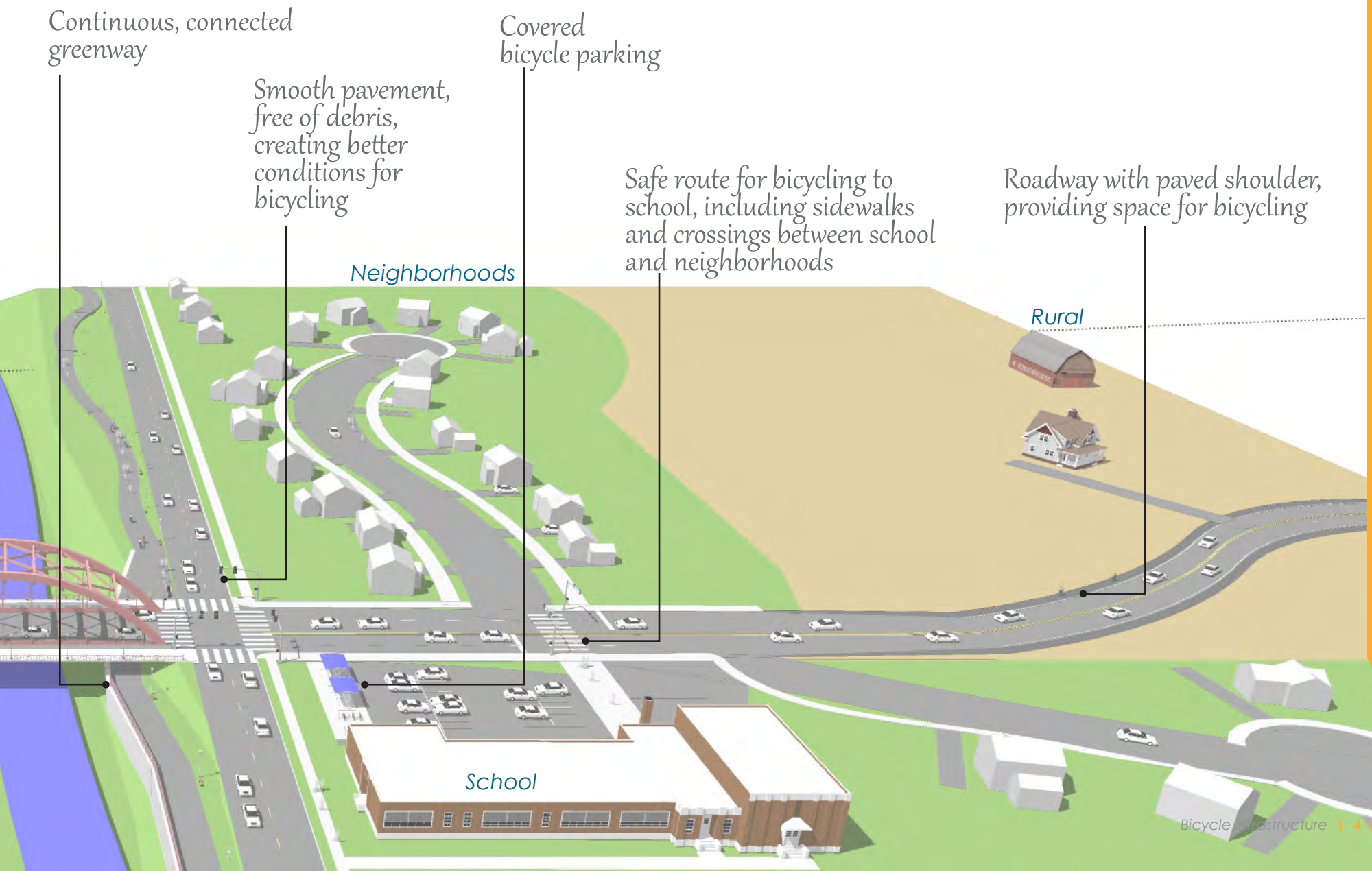


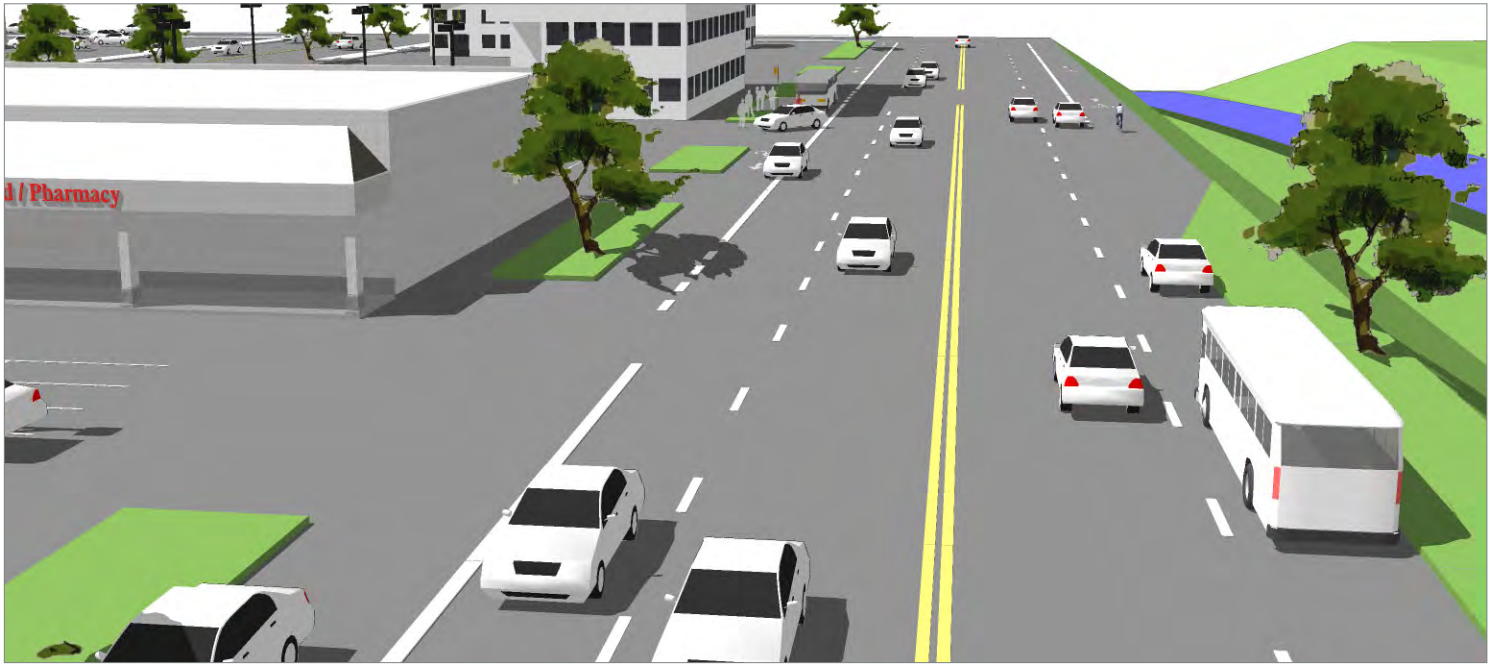

Disconnected greenway
Debris in roadway, creating hazardous conditions for bicycling
Lack of bicycle parking
No safe route for bicycling to school, including no sidewalks or crossings between school and neighborhoods
Roadway lacks paved shoulder
Neighborhoods
Rural
School

TRANSPORTATION CHOICES: IMPROVING NORTH CAROLINA'S BICYCLING

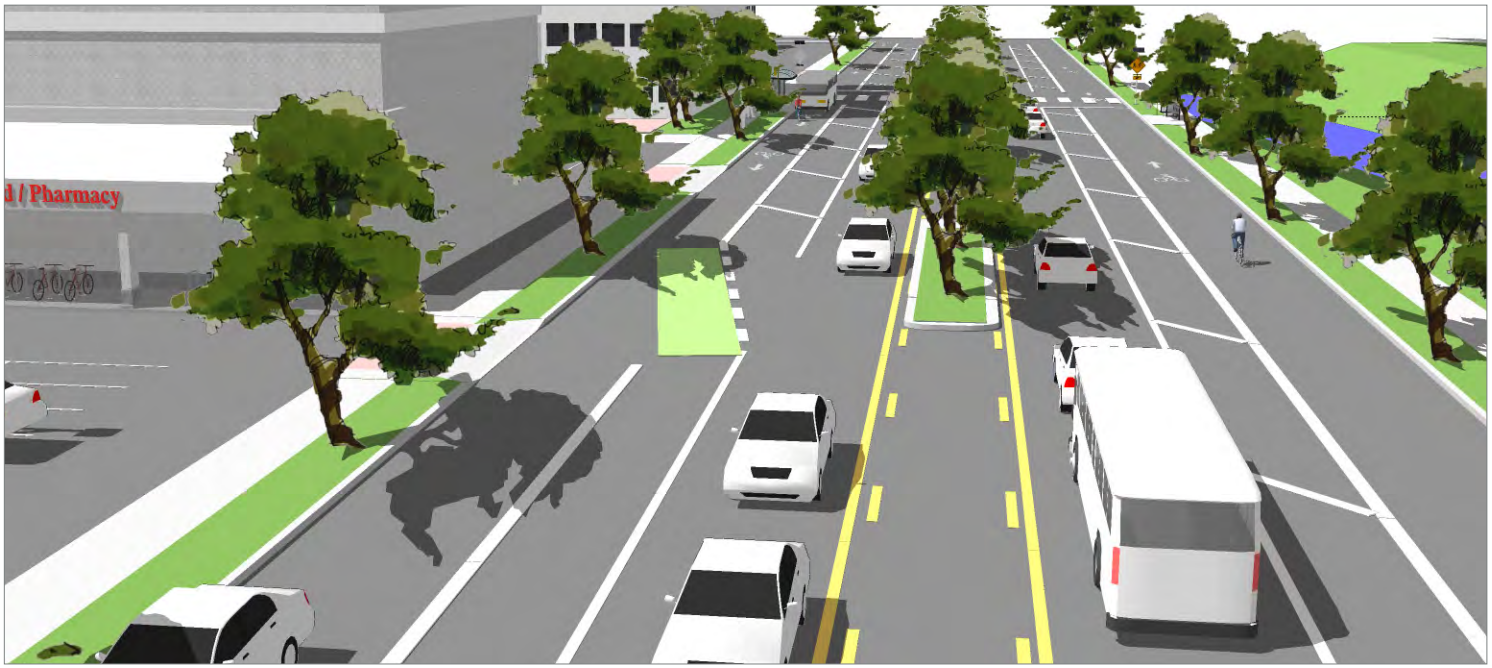
This graphic illustrates how most urban, suburban, and rural areas in North Carolina can be retrofitted to better serve all of NCDOT's transportation 'customers' including the full range of bicyclist types. In addition to the bicycle project examples below, issues with land use and trip distances will also need to be addressed, mostly on the local and regional level. This could include a greater mix of land uses, higher densities of land use, infill development, and reinvestment in NC's downtown areas. Land use and development strategies such as these serve to not only reduce infrastructure costs and preserve open space, but they also shorten daily trip distances, making bicycling a more viable choice for everyday transportation.




Continuous, connected greenway
Smooth pavement, free of debris, creating better conditions for bicycling
Covered bicycle parking
Safe route for bicycling to school, including sidewalks and crossings between school and neighborhoods
Roadway with paved shoulder, providing space for bicycling
Neighborhoods
Rural
School

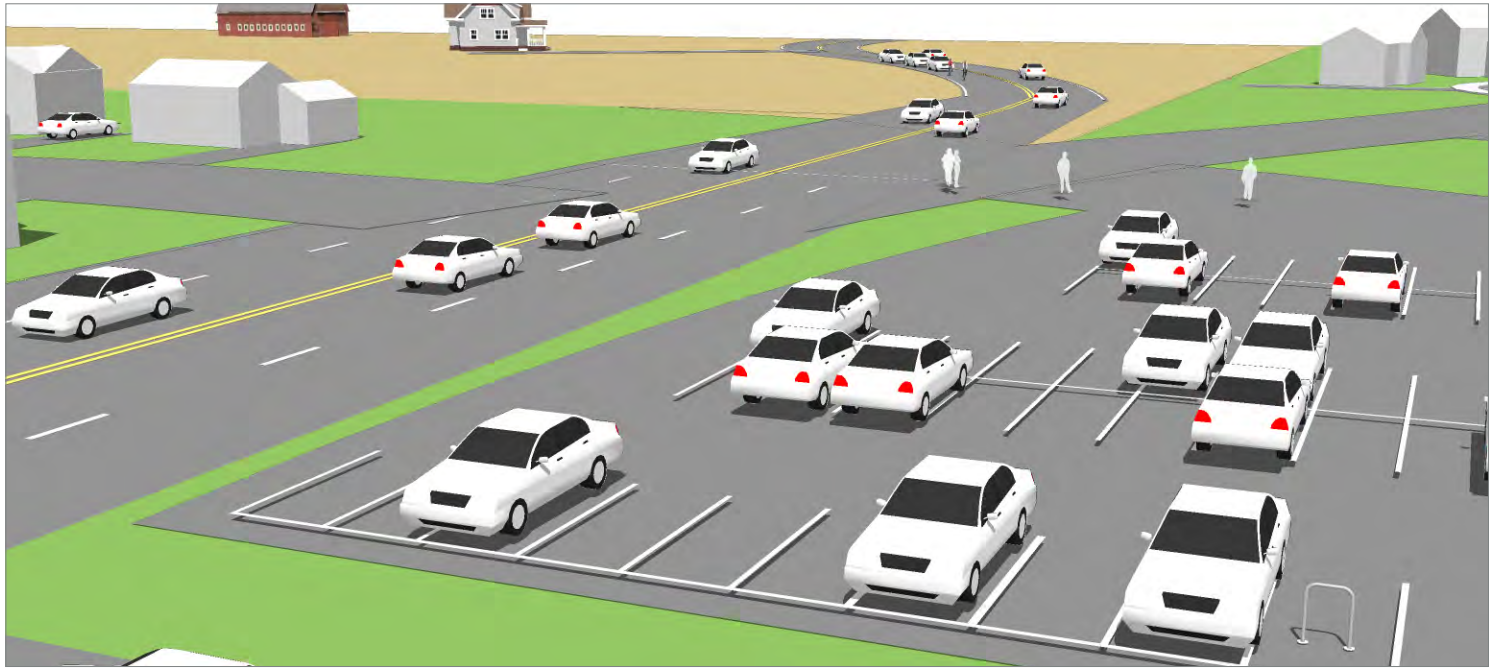


Example of current conditions for bicyclists.



Example improvements for bicyclists, including buffered bicycle lanes and colorized pavement markings for high conflict transition areas.

Example of current conditions for bicyclists.



Example improvements for bicyclists, including covered bicycle parking, neighborhood-to-school crossing, and paved shoulders on rural roads.

METHODS OF IMPLEMENTING/ CONSTRUCTING BICYCLE FACILITIES

Programmed Roadway Construction/Resurfacing

Roadway reconstruction and resurfacing projects offer a cost-effective clean slate for revising pavement markings. When a road is repaved, roadways may be restriped to provide space for bike lanes and shoulders. In addition, if the spaces on the sides of non-curb and gutter streets have relatively level grades and few obstructions, an option may be to widen pavement width to include paved shoulders. The same can be done with bridge replacement projects, which typically occur every 50-75 years, to accommodate pedestrians and bicyclists.

Striping and Restriping

The simplest type of restriping project is the addition of bicycle lanes, edgelines, or shoulder stripes to streets without making any other changes to the roadway (striping project). Bicycle lanes, edgelines, and shoulder stripes can also be added by narrowing the existing travel lanes (restriping). Roadways may be restriped at any time or during a resurfacing project. This method represents an opportunity for adding pedestrian and bicycle facilities while working within the construct of an existing right-of-way width. For additional information and current research on travel lane widths to accommodate bicycle lanes, see Appendix 9.7.

"Road Diet"

Some roads may require a "road diet" solution in order to accommodate bicycle facilities. Road diets can involve removing vehicle travel lanes and replacing these lanes with on-road bicycle facilities and sidewalks or sidepaths. These are generally recommended only in situations where roadway capacity exceeds demand and vehicular traffic count can be safely and efficiently accommodated with a reduced number of travel lanes.

The City of Charlotte has completed almost 30 road diets in the last ten years (2003-2013), with an additional 20 being studied. The City has conducted road diets successfully on roadways with over 20,000 ADT. These projects have been successful by creating more vibrant communities, economic development, and increased safety for all roadway users.

▲ *Before and after a 'road diet' in New Bern, NC that includes bicycle lanes, median islands, and on-street parking.*

Recommendations

NCDOT's Complete Streets Policy emphasizes that the agency is committed to "providing an efficient multi-modal transportation network in North Carolina such that the access, mobility, and safety needs of motorists, transit users, pedestrians, and bicyclists of all ages and abilities are safely accommodated." The *Complete Streets Planning and Design Guidelines,* published in 2012, inform the design and implementation of complete streets elements as part of all ongoing and upcoming projects. The recommendations below (along with other plan recommendations summarized in Chapter 8 and Appendix 9.10) will serve as the next steps in the state's efforts to improve bicycle conditions. The recommendations below include bicycle-related policy, design, and process elements.

1. Safety and Data Analysis

Issue: NCDOT collects and analyzes bike crash data on an ongoing basis. Currently, NCDOT, with the assistance of the Highway Safety Research Center, is geocoding the locations of historical data. Municipalities also often maintain a separate database of crash information that are coded in a unique way. Analysis reports of crash types have been developed but need to better inform countermeasures and design decisions. In certain cases, bicycle crashes are reported incorrectly by law enforcement or not reported at all. Finally, countermeasures are often implemented in reactive manner as opposed to preventative method.

Policy Direction: NCDOT should continue to expand its collection and analysis of bicycle crash data. The agency should continue to use crash data to better understand trends and how they can be improved and to prioritize investments, through independent and routine accommodations. The agency should also work with municipalities, hospital systems, and DHHS Injury Prevention to gain more data about pedestrian and bicyclist injuries. Efforts should be made to "get ahead" and prevent crashes rather than reacting to crash fatalities.

NCDOT should move forward with two distinct, but equally important, sets of actions: 1) Pro-active strategies for preventing bicycle crashes based on established research, North Carolina-based data, and crash occurrences and 2) Strategies to improve crash reporting/data and using that information to prioritize infrastructure investments in the future.

Action Items/Proactive Safety Strategies:

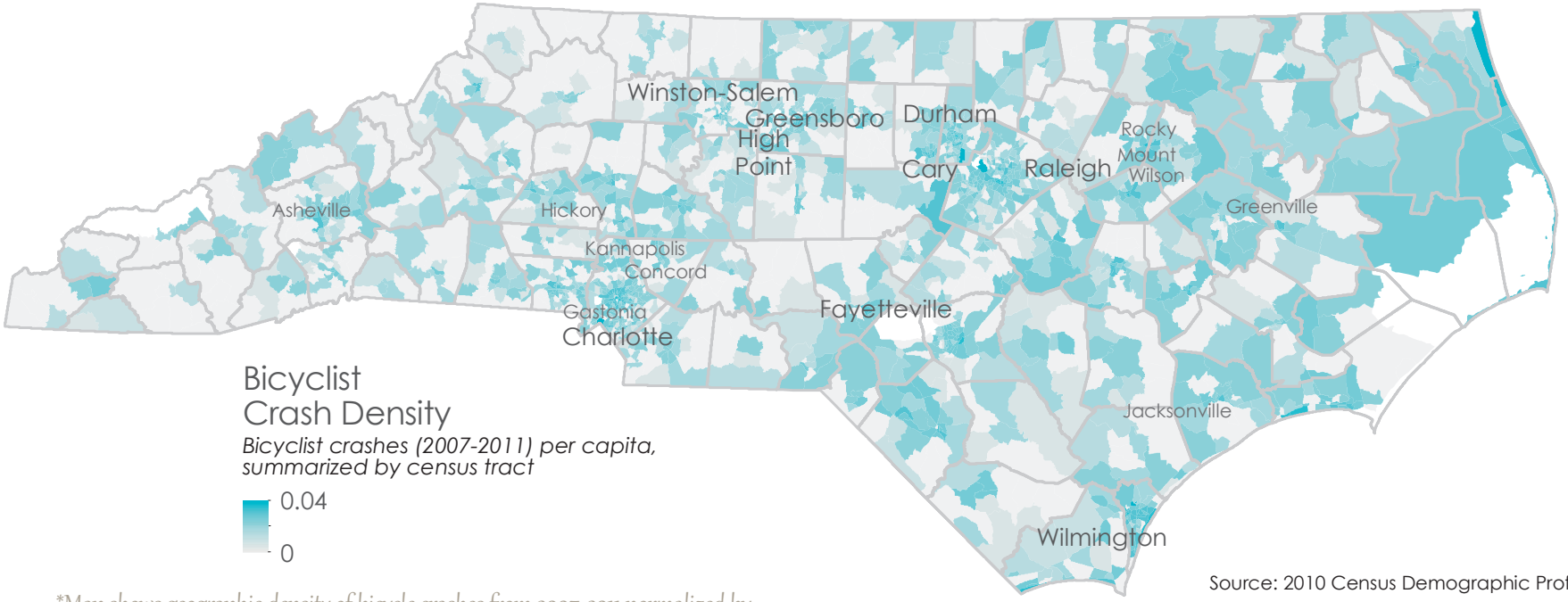
A. Implement "Complete Streets" approach consistently with appropriate roadway projects to ensure a connected, accessible, and safe pedestrian and bicycle network. Evaluate facilities and programs for their capability to improve motorist/pedestrian/bicyclist compliance and safety. Utilize national studies to support design solutions for safety improvement (see Chapter 6 - Pedestrian & Bicycle Toolbox).

B. Develop a strategy to advertise and educate NCDOT Division staff, MPOs/RPOs, cities, counties, advocates, and law enforcement staff across the state about HSRC crash analysis and data and trends in North Carolina. As part of this, consider developing a mapping application available on DBPT's website to show crash information.

C. Maintain the NCDOT Traffic Safety Unit approach to review high crash locations. This team should be proactive using pedestrian/bicycle crash data regularly.

2007-2011 Bicycle Crash Density Map, NC

*Source: 2013 NCDOT Crash Data**



Source: 2010 Census Demographic Profile

*Map shows geographic density of bicycle crashes from 2007-2011 normalized by population and summarized at the census tract level.

Case Study:
STRUCK Crash Project

STRUCK, a 2012/2013 joint venture project between New Hanover Regional Medical Center's Injury Prevention department, New Hanover County's 9-1-1 Call Center, New Hanover County GIS, and the Wilmington MPO, is an effort to compare NCDOT bicycle/pedestrian crash data with pedestrian and bicyclist injuries reported to 9-1-1. It is known that there are more crashes called in to 9-1-1 than are on record in the NCDOT database. The 9-1-1 Call Center has geocoded locations of crashes and the New Hanover Regional Medical Center (NHRMC) is relating that data on severity of patient injury. NHRMC will publish a paper on this project. The Wilmington MPO plans to utilize this data, combined with NCDOT data to prioritize and justify bicycle/pedestrian investments.

Bicycle Crash Reduction Factors

Design Treatment / Intervention	Impact
Provide bicycle lanes	36% reduction in bicycle crashes[A]
Provide protected bicycle lanes	40% reduction in crashes for all users[B]
Provide colored bicycle lanes in conflict areas	15% motorist yield rate increase and 36% motorist turn signal rate increase[C]
Provide bicycle box (advance stop bar to leave dedicated space for bicyclists)	36% reduction in bicycle crashes[A]
Provide cycle tracks	28% lower injury rate[D]
Provide shared lane markings (sharrows)	Motorists more likely to change lanes when passing and are less likely to pass [E]; 80% reduction in wrong-way bicycling. [F]

A. Federal Highway Administration. Desktop Reference for Crash Reduction Factors. http://safety.fhwa.dot.gov/
B. Wolfson, H. (2011). Memorandum on Bike Lanes. City of New York, Office of the Mayor.
C. Brady, J., Mills, A., Loskorn, J., Duthie, J., Machemehl, R., Center for Transportation Research. (2010). Effects of Colored Lane Markings on Bicyclist and Motorist Behavior at Conflict Areas. City of Austin, Texas.
D. Lusk, A., Furth, P., Morency, P., Miranda-Moreno, L., Willett, W., Dennerlein, J. (2010). Risk of Injury for Bicycling on Cycle Tracks Versus in the Street. Injury Prevention.
E. The Center for Transportation Research, The University of Texas at Austin. (2010). Effects of Shared Lane Markings on Bicyclist and Motorist Behavior Along Multi-Lane Facilities.
F. San Francisco Department of Parking and Traffic. (2004). San Francisco's Shared Lane Pavement Markings: Improving Bicycle Safety.

D. Develop an injury minimization approach for setting speed limits on new roadways and major roadway reconstruction projects. The approach should identify the intended operational speed at the outset of a project based on the context and local preferences.

E. Implement education, encouragement, and enforcement programs as detailed in Chapter 7.

F. Engage more stakeholders in a comprehensive approach to improving safety for bicyclists. Remain current with research regarding bicycle safety as bicycle planning and design is evolving rapidly in the United States (for example, the NACTO 2012 Guide is being used more regularly across the United States).

G. Address safety needs of different types of bicyclists described earlier in this chapter. Bicycle networks should be planned and designed by NCDOT, with cooperation from MPOs/RPOs and municipalities, to create connected networks that provide facilities along arterials/collectors but also provide separated facilities such as multi-use paths and lower traveled roadways such as bicycle boulevards.

Action Items to Improve Safety Data:

A. Continue to explore ways to improve the quality and completeness of bicycle crash data, including working with municipalities, hospital systems/emergency response, law enforcement, HSRC, and MPOs/RPOs to more consistently and accurately record crash events and to share data.

B. As part of increased engagement as suggested above, establish Statewide Pedestrian and Bicycle Safety Consortium to develop consistent, thorough recording of crashes that will allow for more comprehensive, consistent databases. The Consortium could also support WatchForMeNC program.

C. Evaluate the existing HSIP prioritization and project programming process to improve relationship between bicycle and pedestrian crash data and project selection.

D. Conduct studies to isolate high pedestrian and bicycle crash locations and coordinate results with the HSIP process to provide pedestrian countermeasures in these locations. The agency should explore the development of a model to estimate pedestrian and bike volumes, with the purpose of developing better prioritization methods that account for crash rates in addition to crash frequency. If possible, the model should be compatible and/or coordinated with analytical models currently used by other state agencies.

2. Transit Access

Issue: Existing transit-related policies do not fully account for the critical link between transit and bicycle transportation. Some NCDOT policies make it difficult to improve access to transit. It is critical that transit access facilities maintain safety for all roadway users, including pedestrians and bicyclists.

Policy Direction: Strong bicycle connections to transit stops and stations are integral to the success of North Carolina's transit systems. NCDOT should reassess policies with an eye toward ensuring roadways and transit stations/stops are safe, accessible, and attractive to bicyclists.

Action Items:

A. Ensure clear/breakaway zone policies allow transit amenities including signage, benches, shelters, bike racks and other items at urban, suburban and rural transit stops in a way that maintains safety for all users.

B. Per the recommendations for the Roadway Design Manual (Chapter 6), provide detailed design guidance for the placement of bike parking and bike lockers associated with longer term transit facilities such as park and ride lots.

C. Work with regional and local public transportation agencies to ensure bike-on-bus and bike-on-train opportunities are available along with education and ease of use. Encourage Amtrak to allow bikes on all trains without being boxed (this is a significant barrier to train/bicycle travel between the state's two largest metropolitan areas).

D. Improve communication between DBPT and Public Transportation Division to ensure meeting of pedestrian/bicyclist/transit customers needs.

3. Regional Greenway Trails

Issue: North Carolina features multiple regional trail initiatives that have successfully led to the development of long-distance trail systems such as the Appalachian Trail, Mountains-to-Sea State Trail, Carolina Thread Trail, and East Coast Greenway. These trail systems are well-known statewide and nationally and promote stewardship and economic development. These trails can serve as means for both long-distance, recreational journey opportunities and local, utilitarian trips. Each trail initiative and system has different goals, serves different functions, and features different surfaces to accommodate different users. As these trails continue to be planned and expanded, numerous obstacles exist such as land ownership, right-of-way constraints, environmental constraints, and funding. In many cases, these systems need to utilize roadway rights-of-way and often cross roadways creating conflict.

Policy Direction: NCDOT, with support from DENR and other state agencies, should prioritize regional trail systems, connectivity to regional trail systems, and regional trail crossings of roadways.

Action Items:

A. NCDOT (especially DBPT) should build relationships and establish regular communication with the East Coast Greenway Alliance, Friends of the Mountains-to-Sea State Trail, Carolina Thread Trail, and DENR. This collaboration can help build upon these trail systems to address alignments, signage, roadway crossings, and connectivity to and away from these trail systems.

NC's Major Trail Systems

Mountains-to-Sea State Trail
Hiking trail for pedestrians, typically along natural surface trail, but sometimes on multi-use paved surface (above: Smithfield, NC).

East Coast Greenway
Multi-use trail geared to bicyclists, preferably in off-road paved greenway and sometimes along roadways with paved shoulders or bike lane.(above: Durham, NC).

Carolina Thread Trail
Mixture of paved and un-paved, multi-use and hiking only, mountain biking trails (above: Mecklenburg County, NC).

B. Find ways to encourage funding prioritization toward regional systems, such as regional greenways or bike routes.

C. Representative agencies for these regional trails should reach out to state agencies, counties, and municipalities to discuss the goals of the regional trail systems and establish partnerships for future growth and enhancement of these systems.

D. Consider optimizing the environmental benefits of greenway design to integrate the greenway into regional green infrastructure and provide more environmental services benefits. DENR, WRC, and local land trusts could assist in this design.

4. GIS Data Standardization for Bicycle Facilities

Issue: GIS data files describing bicycle facilities are generated by many different individuals and organizations. Data are created for each plan funded through the planning grant program and formats vary significantly depending on the individual consultant and municipality completing the work. Further, many individual towns and cities create and maintain their own GIS datasets, which also vary widely in format and level of detail. The wide variation in data format makes data transfer and coordination difficult, and hinders regional efforts to catalog existing bicycle facilities.

Policy Direction: NCDOT should adopt a GIS framework covering both pedestrian and bicycle datasets that clearly defines the attributes to be inventoried and an associated nomenclature for each attribute. This framework should be mandatory for data created through the planning grant program or the Comprehensive Transportation Planning process.

Recommended Format for *Linear* Bicycle GIS Layers

Attribute	Possible Entries
Jurisdiction	Municipality or County
Roadway Ownership	Municipality or NCDOT
Last Update	
Existing Facility	Bicycle Lane, Buffered Bicycle Lane, Cycle Track, Paved Shoulder, Wide Outside Lane, Sharrow, Signage, Bicycle Boulevard, Multi-Use Path
Condition	Good, Fair, Poor
Characteristics	Ex: Hazardous Grates, few driveways
Width	*Where appropriate*
Parking	On-street parking present or not present
Material	Asphalt, Concrete, Gravel, Brick, Natural
Proposed Facility	Bicycle Lane, Buffered Bicycle Lane, Cycle Track, Paved Shoulder, Wide Outside Lane, Sharrow, Signage, Bicycle Boulevard, Multi-Use Path, New Grates, Resurface
Proposed Project	New Construction, Traffic Calming, Widening

Recommended Format for *Point* Bicycle GIS Layers

Attribute	Possible Entries
Bicycle Parking	Short-Term, Long-Term
Crossing treatments	Pavement marking, overpass, underpass, bicycle signal detection, etc.
Barriers	

Action Items:

A. Implement the GIS geodatabase framework developed by ITRE/NCDOT, focusing on data created through the municipal and regional planning programs.

B. Meet with GIS staff from selected major municipalities to review the draft framework in comparison to their current data formats. Modify as necessary to ensure the framework will meet the needs of local governments.

C. Once finalized, train Bicycle & Pedestrian Division staff on this framework and direct them to ensure its use during each planning process.

D. Distribute the framework to municipalities around the state and encourage them to generate and maintain data in this format going forward.

E. Re-evaluate attributes and nomenclature bi-annually and update to incorporate new facilities as they are developed.

For recommendations related to GIS Data Transfer and Data Maintenance, see page 3-19 of this Plan.

5. State Bicycle Routes

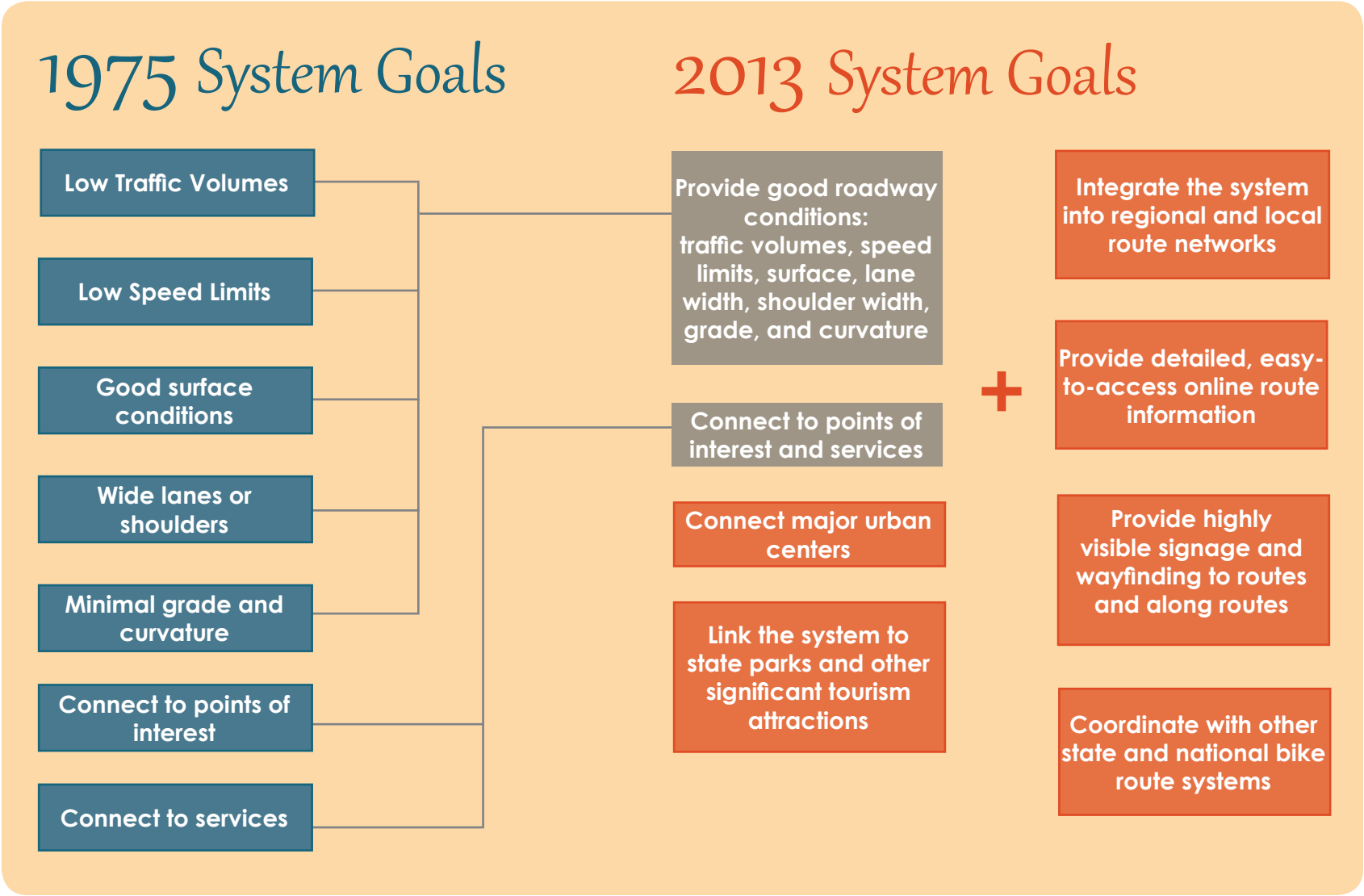
See the full appendix report (Appendix 9.3) for comprehensive information on the existing conditions, methodology, analysis, and recommendations for statewide bicycle routes.

Issue: North Carolina's bicycle route system was developed in response to the 1974 Bicycle and Bikeway Act. The bicycle route system located those roads across North Carolina that were safer for bicycling, designating a network of ''Bicycling Highways'' that provided access to small towns, state parks, historic sites, and other points of interest. The current network consists of nine different routes covering nearly 3,000 miles. The 700+ mile NC 2 Mountains to Sea route is the main artery of the system, connecting east and west as well as most of the system's routes. Bicycle tourists and adventurers use maps created for each route to navigate the state.

Given the extensive development that has occurred across North Carolina since the 1970's and associated changes to the roadway network, NCDOT recognized the need to re-evaluate and update the state bike route system as part of this 2013 plan. State bike route signage has generally not been maintained and is missing in some locations. There are also new opportunities to modernize the system by connecting to new regional and adjacent-state routes and destinations, enhancing wayfinding, and creating easily-accessible route mapping and information technology.

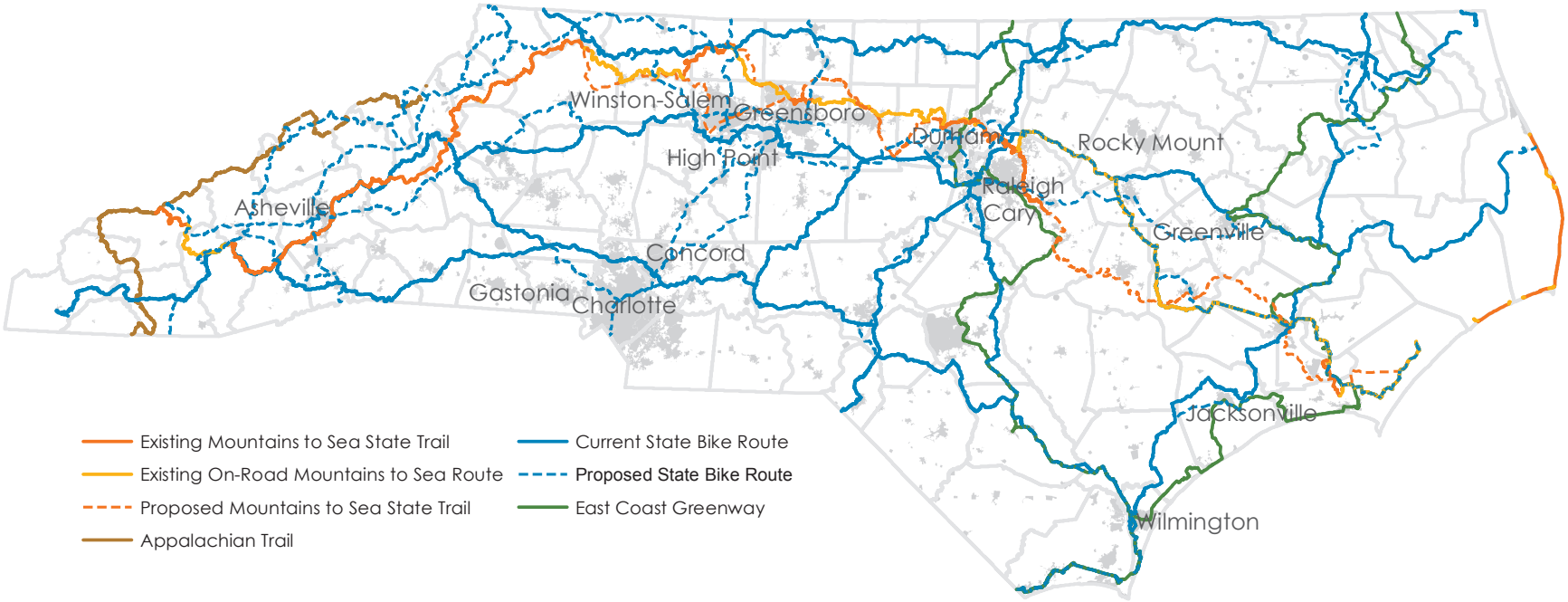
▲ *Project planners collected input on the statewide bicycle routes by interviewing those who use them most.*

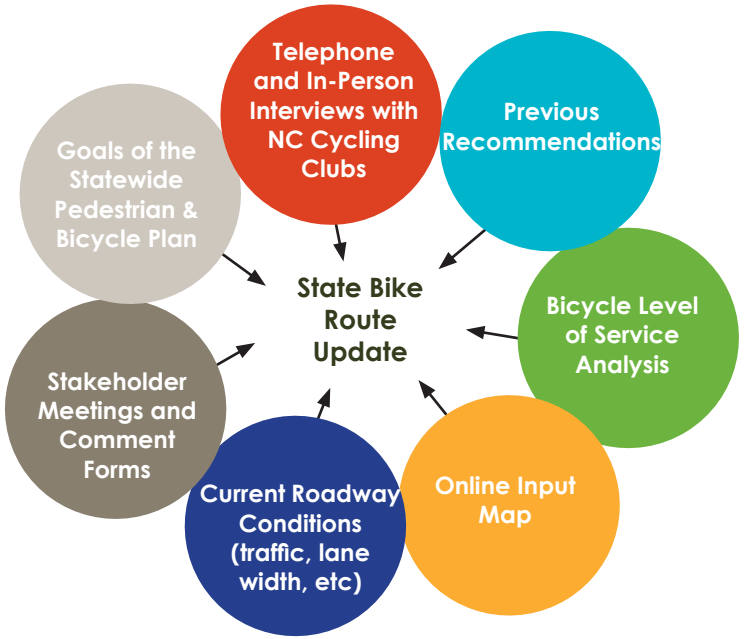
North Carolina Statewide Bicycle Route System Goals: 1975 vs. 2013



NC Statewide Bicycle Routes (Existing and Proposed Routes)

Refer to Appendix 9.3 for details.





An extensive stakeholder and public outreach process was conducted to determine areas of safety concern and potential route modification. The figure at left details the many inputs used during that process. A quantitative, data-driven analysis was combined with qualitative, stakeholder-driven input to ensure a complete evaluation.

Key input received from stakeholders for the new bicycle route system include:

- Re-route where development has changed the character of the existing routes
- Routes should include bicycle facilities
- Routes should connect major cities in North Carolina

- Ensure routes link to necessary amenities
- Routes should be clearly marked for both cyclists and motorists, and easy to follow
- Route information should be easy to access, up to date, and available online

Policy Direction: NCDOT should maintain the core state bicycle route system that was established in the 1970s, but re-route it in some locations in keeping with the original intent of the system in order to provide better connectivity to North Carolina cities. The routes should also be modernized to update signage and mapping technologies. NCDOT should also prioritize improvements to statewide bicycle routes with the goal of providing paved shoulders along all state routes.

Action Items:

A. Develop strategic plan for transitioning from existing statewide bicycle route network to expanded network.

B. State "business routes" should be developed to complement bicycle routes where they avoid cities.

C. Consideration for wayfinding signage and maintenance of signage should be explored.

D. Market the NCDOT "Contact Us" and "DOT4YOU" system to improve online form for individuals to report missing signs. Additionally, NCDOT should designate one point person within the Bicycle and Pedestrian Transportation Division to field these reports and communicate them to the appropriate division.

E. Promote statewide and regional bicycle routes through online viewers and and smartphone applications.

F. Roadway improvements should be prioritized along state bicycle routes to provide paved shoulders.

G. Connectivity should be improved between state parks and natural areas.

6. Rail-Trail Projects

Issue: Rails-to-trails and Rails-with-trails are effective and efficient approaches to providing bicyclists and pedestrians with connected facilities for commuting and recreating that are separated from motorized traffic. These trails can parallel existing railroads within the railroad corridor (rails-with-trails), thus providing an alternative transportation option and multi-modal connectivity; or they can be built atop inactive railroad corridors through the federal process of railbanking (rail-to-trails) making for an efficient interim use of the former rail right-of-way. Both types of trails offer scenic and favorable topography. Rail-trail projects continue to expand on the benefits of the five pillars—health, economics, stewardship, safety and transportation.

Implementation of rail-trail projects is made difficult by the number of different players involved in the process of acquiring and implementing a trail in the railroad right–of-way. These stakeholders include various railroad operators, NCDOT Rail Division, rail-trail advocacy groups, adjacent property owners, and the local community. Coordination between these groups, often with conflicting interests, can be difficult, and creates one of the largest barriers to trail implementation and maximizing the potential benefits of these corridors.

Some of the other issues that impede rail-trail implementation are: railroad company disinterest in negotiating right-of-way

purchase of inactive lines; private property encroaching on inactive railroad easements; dissent of private property owners adjacent to rail corridors; liability concerns with public safety on rail-trails; and various design barriers to providing safe bicycle/ pedestrian crossings of railroad and roadway rights-of-way.

Policy Direction: Increase the consistency, efficiency and success of rail-trail projects in North Carolina. This can be accomplished by improving the coordination between various interest groups involved in these projects and by providing documentation of best practices and protocol that can serve as a guide to rail-trails statewide.

▲ *The American Tobacco Trail in Durham, Wake, and Chatham counties, is a 22-mile rail trail.*

Action Items:

A. On a local level, involve the extensive list of stakeholders through a technical advisory committee or frequent communication via meetings, newsletters, phone calls, and e-mails, created uniquely to best fit the needs of each community and its respective stakeholders. Stakeholders may include railroad companies (including representatives of real estate, operations, maintenance, and legal departments), utility companies, law enforcement officials, other adjacent landowners, trail user groups, and North Carolina agencies including transportation, health, and parks and recreation.

B. Formalize a task force of rail-trails stakeholders that play a role at a state-wide level, including members from NCDOT, NC Division of Parks and Recreation, NC DHHS, railroad operators, NC Rails Division and North Carolina Rail-Trails group. This task force should research, monitor, and notify communities of inactive or potential abandonment status of NC rails.

C. Host an annual North Carolina Trails Summit that brings together various stakeholders and provides a forum to discuss and define mutual roles and set a direction for creating a connected network of rail-trails in the state.

D. Create a North Carolina Rail-Trails Guide that establishes best practices in planning and design, based on states with impressive mileage of rail-trails; the guide should also include a description of the necessary processes and roles and responsibilities of stakeholders. This guide will streamline the process of rail acquisition for trail purposes and provide recommendations for next steps. This report can also include a vision for the state's network of trails and goals for rail-trail projects.

E. Find a political champion who works at a state level to support efforts towards extending the trail network, specifically emphasizing the potential for rail-trail projects in the state. Have this high-level supporter launch an initiative for a connected trail system in the state—setting the tone for interagency cooperation.

Case Study:

Michigan Rail-Trails

Michigan leads the nation in rails-trails projects. It has 126 rails-to-trails and rails-with trails in all parts of the state that collectively stretch 2,379 miles, according to the Rails to Trails Conservancy. The state partakes in a number of initiatives, programs and legal processes that contribute to this overwhelming success in rail-trail implementation.

Firstly, Michigan law mandates a "Right of First Refusal," stating that abandoned rail lines must first be offered respectively to both Michigan Department of Transportation (MDOT) and the Michigan Department of Natural Resources (MDNR) before being sold to any other party. Rail corridors acquired by MDOT can be utilized for interim trail purposes. Putting rail corridors in the hands of the state DOT prioritizes the consideration of rail right-of-way towards recreation and trails. MDOT also makes special consideration for short segments of rail, always look for additional opportunities to spin off these segments that may not be critical to the viability of the overall state system, and which may have some potential for use as a recreational trail.

MICHIGAN SUCCESSES:

- **Governor is a champion of trail efforts**
- **Launched trails initiative called Discover Michigan Trails**
- **Hosted a state summit to provide a forum for stakeholders to work together**
- **Established 12 interagency and organization task forces on key issues facing trails**
- **MDOT funded research to demonstrate economic benefits of rail-trails**
- **Provide MDOT and MDNR with strong legal defense specific to rail-trail projects**

The highly coordinated effort made by various agencies, organizations and businesses within the state contributes greatly to the success of Michigan's trail system. Local businesses in Michigan are frequent partners in the promotion of trail projects in their area; they understand the benefits of trails to their business and often provide grants, meeting spaces or the company's services discounted. "Friends" and advocacy groups, such as the Michigan Trails and Greenway Alliance, support a project from inception to implementation—from funding to maintenance to education. After the trail has been established, MDOT works closely with MDNR to preserve the corridor for potential conversion back to rail use in the future.

Another important key to Michigan's success is the backing of state and local politicians, primarily former Governor Jennifer M. Granholm. She launched the trails initiative called Discover Michigan Trails. As a part of this initiative, the state works with the Michigan Natural Resources Trust Fund to link Michigan's trail system by building new trails and upgrading existing trails throughout the state. A 20-page report written by MDNR called "Michigan Trails at a Crossroads: A vision for Connecting Michigan" helps coordinate action at a statewide level among the many participating organizations. This report is supplemented by a case study funded by MDOT's Transportation Enhancement Program to assess the economic benefits of the Pere Marquette Rail-Trail. To face the difficult legal issues that arise with rail-trail projects, both MDOT and MDNR are backed by strong legal defense staff and training.

These relationships across state agencies, organizations and businesses were solidified through a statewide summit on the trail network that provided a collaborative forum for these stakeholders to discuss mutual roles in expanding the trail system, with special attention to utilizing rail corridors for trails. The summit also established twelve task forces comprised of a mix of stakeholders to focus on key issues.

7. Accountability

Issue: Existing benchmarks and performance measures for bicycle issues are limited and are not always tracked on a statewide basis.

Policy Direction: NCDOT should identify and track progress over time on the goals and objectives identified in this Plan. The agency should use a defined set of data to benchmark progress on a statewide level, as well as the local and division level.

Action Items:

A. Adopt the priority performance measures in Chapter 8 and collect baseline data to establish a starting point where data does not exist. For instance, evaluate usage of specific bicycle facility types (count technologies should be considered).

B. Coordinate data collection efforts with MPOs and local governments to ensure a coordinated and cohesive approach.

C. Continue report card effort that assesses progress on the performance measures. Expand pedestrian and bicycle performance metrics.

5 Policies and Practices

North Carolina State Legislative Building

Introduction

Policies have the greatest long-term implications of any action that a government can take to alter its future conditions. Policies have a tremendous long-term impact on pedestrian and bicycle options, particularly in the areas of financing and land development-transportation infrastructure relationships.

North Carolina grants municipalities and counties their current levels of authority over land development practices; if a method of control isn't explicitly mentioned in the N.C. General Statutes, it likely would not pass a legal challenge. Hence, major policy changes, including new revenue-generation tools or changes to the Equity Formula used for distributing funding across the state, would need an action taken by the N.C. Legislature.

A number of policies reside internally within NCDOT or are embedded in local tiers of government, either in ordinances or standards – or simply historic actions. For example, barely half (52.8%) of North Carolina municipalities that responded to a recent survey (n=73) stated that they required developers to reserve rights-of-way for planned pedestrian or bicycle accommodations. Over time, a lack of such a requirement would make interconnecting compatible land uses nearly impossible, both financially and politically.

Internal to NCDOT, a number of policy memoranda have addressed pedestrian and bicycle accommodations over the past two decades, but they have been loosely followed and enforced. The most recent 2009 Complete Streets Policy emphasizes that the agency is committed to "providing an efficient multi-modal transportation network in North Carolina such that the access, mobility, and safety needs of motorists, transit users, pedestrians, and bicyclists of all ages and abilities are safely accommodated." The NCDOT Complete Street Planning and Design Guidelines, published in 2012, inform the design and implementation of complete streets elements as part of all ongoing and upcoming projects.

In this Chapter

Introduction

- *Existing Federal and State Policies*

Policy Topics and Recommendations

- *Funding*
- *Planning*
- *Prioritization*
- *Design Guidance*
- *Roadway Maintenance*
- *Legislation*

Land Use and Transportation Integration

- *Why this is Important to Walking and Biking*
- *Current Land Use Approach*
- *Policy Direction*

Existing Federal and State Policies

United States Department of Transportation Policy Statement on Bicycle And Pedestrian Accommodation Regulations and Recommendations (March 2010)

Policy Statement Summary: "The DOT policy is to incorporate safe and convenient walking and bicycling facilities into transportation projects. Every transportation agency, including DOT, has the responsibility to improve conditions and opportunities for walking and bicycling and to integrate walking and bicycling into their transportation systems."

Recommended Actions: "The DOT encourages states, local governments, professional associations, community organizations, public transportation agencies, and other government agencies, to adopt similar policy statements on bicycle and pedestrian accommodation as an indication of their commitment to accommodating bicyclists and pedestrians as an integral element of the transportation system. In support of this commitment, transportation agencies and local communities should go beyond minimum design standards and requirements to create safe, attractive, sustainable, accessible, and convenient walking and bicycling networks. Such actions should include:

- Considering walking and bicycling as equals with other transportation modes
- Ensuring that there are transportation choices for people of all ages and abilities, especially children.
- Going beyond minimum design standards
- Integrating bicycle and pedestrian accommodation on new, rehabilitated, and limited-access bridges
- Collecting data on walking and biking trips
- Setting mode share targets for walking and bicycling and tracking them over time"

-Ray LaHood, United States Secretary of Transportation (2008-2013)

Key Pedestrian and Bicycle Polices and Laws in North Carolina

- Bicycle and Bikeway Act
- Bicycle Policy
- Bridge Policy
- Pedestrian Policy
- Pedestrian Laws
- School Crossing Guard Laws
- Bicycle Helmet Law
- Bicycle Racing Guidelines
- Considerations about Bicycling Where the Law is Silent
- Administrative Action to include Greenways Plans
- NCDOT Bicycle and Pedestrian Planning Grant Initiative
- Complete Streets Policy
- Comprehensive Transportation Planning

Summaries for each of these are on the following pages. For more detailed information, please see: www.ncdot.gov/bikeped/lawspolicies/

Bicycle and Bikeway Act (Adopted 1974)

The passage of the Bicycle and Bikeway Act of 1974, established North Carolina's program as the first comprehensive state bicycle program in the nation. The legislation granted authority for the North Carolina Bicycle Program (now the Division of Bicycle and Pedestrian Transportation) to undertake comprehensive bicycle planning and programming. The far-reaching legislation established provisions such as those supporting the legal definition that a bicycle is a vehicle; defined bicycle facilities as a bona fide highway purpose; and authorized the department to spend funds for these facilities. The Act also outlined duties and responsibilities that would enable the bicycle program, through policies, standards, and procedures to assist local governments in the planning, development and construction of bicycle facilities. The program was expanded to encompass pedestrian activities in 1992.

Bicycle Policy (Adopted 1978/Updated 1991)

In 1978, the North Carolina Board of Transportation adopted the nation's most comprehensive set of bicycle policies in response to the enabling legislation of 1974. These policies were unique at that time in that they detailed how the state DOT would institutionalize bicycle provisions into everyday departmental operating functions. They declared "bicycle transportation to be an integral part of the comprehensive transportation system in North Carolina" and formalized the inclusion of bicycle provisions in highway construction projects.

In 1991, the policy document was updated to clarify responsibilities regarding the provision of bicycle facilities on the 77,000-mile state-maintained highway system. The newer policy details guidelines for planning, design, construction, maintenance, and operations pertaining to bicycle facilities and accommodations.

Bridge Policy (Adopted August 1981, March 1985, and November 1994)

NCDOT's Bridge Policy establishes controlling design elements for new and reconstructed bridges on the state road system. It includes information to address sidewalks and bicycle facilities on bridges, including minimum handrail heights and sidewalk widths.

"Sidewalks shall be included on new bridges with curb and gutter approach roadways that are without control of access; in some cases, only one side may warrant a sidewalk. Sidewalks should not be included on controlled access facilities. A determination on providing sidewalks on one or both sides of new bridges will be made during the planning process according to NCDOT Pedestrian Policy Guidelines. Bridges within the Federal-aid urban boundaries with rural-type roadway sections (shoulder approaches) may warrant special consideration. To allow for future placement of ADA acceptable sidewalks, sufficient bridge deck width should be considered on new bridges in order to accommodate the placement of sidewalks.

When a bikeway is required, the bridge shall be designed in accordance with AASHTO standard bicycle accommodations and North Carolina Bicycle Facilities Planning and Design Guidelines, to give safe access to bicycles where feasible."

Pedestrian Policy (Adopted 1993/General Updated 1999/Guideline Update 2000/General 2001)

A sidewalk policy was initially developed in 1993 whereby NCDOT may participate with localities in the construction of sidewalks as incidental features of highway improvement projects. Prior to this policy, NCDOT participation in sidewalk construction was limited to replacing sidewalks that were disturbed during road construction. Now, at the request of a locality, state funds for a sidewalk are made available as part of an incidental project if matched by the requesting locality, which will be responsible for maintaining the sidewalk. The need for Pedestrian Facilities is based on seven criteria: 1) Local Pedestrian Policy, 2) Local Government Commitment, 3) Continuity and Integration, 4) Location, 5) Generators, 6) Safety, and 7) Existing or Projected Traffic.

Key aspects and requirements of this policy are:

- The Department will pay 100% of the cost to replace an existing sidewalk that is removed to facilitate the widening of a road.
- Incidental Projects
  - The municipality or County must notify NCDOT about the desire for sidewalk and will be responsible for evaluating need, public involvement, maintenance, and liability.
  - The municipality is responsible for easement and utility relocation
  - A cost sharing approach is used to demonstrate the Department's and the municipality's/county's commitment to pedestrian transportation (sidewalks, multi-use trails and greenways). The matching share is a sliding scale based on population as follows:

Municipal Population	NCDOT Participation	Local Participation
> 100,000	50%	50%
50,000 to 100,000	60%	40%
10,000 to 50,000	70%	30%
<10,000	80%	20%

Pedestrian Laws

Under North Carolina law, pedestrians have the right of way at all intersections and driveways. However, pedestrians must act responsibly, using pedestrian signals and crosswalks where they are available. When crossing the road at any other point than a marked or unmarked crosswalk or when walking along or upon a highway, a pedestrian has a statutory duty to yield the right of way to all vehicles on the roadway. It is the duty of pedestrians to look before starting across a highway, and in the exercise of reasonable care for their own safety, to keep a timely lookout for approaching motor vehicle traffic. On roadways where there is no sidewalk, pedestrians should always walk facing traffic.

School Crossing Guard Laws

According to the office of the North Carolina Attorney General, school crossing guards may be considered traffic control officers when proper training is provided. Law enforcement agencies responsible for recruiting and training school crossing guards are expected to adhere to the requirements of following statute, which governs traffic control officers.

Bicyclists under the age of 16 in North Carolina are required by law to wear helmets.

Bicycle Helmet Law

The 2001 "Child Bicycle Safety Act" requires every person under 16 years old to wear an approved bicycle helmet when operating a bicycle on any public road, public bicycle path, or other public right-of-way. The purpose of this law is to reduce the number of head-related injuries and deaths from bicycle crashes. In addition, this law specifies that all child passengers falling at or below 40 pounds/40 inches must be carried in a separate restraining seat.

Bicycle Racing Guidelines

Legislation passed in 1977 by the North Carolina General Assembly requires that all bicycle races involving state and local roads must be authorized by designated state and local authorities.

Considerations about Bicycling Where the Law is Silent

Laws pertaining to the operation of a bicycle vary from state to state. Below are three issues of bicycling that North Carolina law currently does not clarify.

- Bicycling on Interstate or fully controlled limited access highways, such as beltlines, is prohibited by policy, unless otherwise specified by action of the Board of Transportation. Currently, the only exception to the policy is the US 17 bridge over the Chowan River between Chowan and Bertie Counties.
- There is no law that requires bicyclists to ride single file, nor is there a law that gives cyclists the right to ride two or more abreast. It is important to ride responsibly and courteously, so that cars may pass safely.

There is no law that prohibits wearing headphones when riding a bicycle; however, it is not recommended. It is important to use all your senses to ensure your safety when riding in traffic.

Administrative Action to include Greenways Plans – (Adopted 1994)

In 1994 NCDOT adopted administrative guidelines to consider greenways and greenway crossings during the highway planning process. This policy was incorporated so that critical corridors which have been adopted by localities for future greenways will not be severed or cut off by highway construction.

Where the locality has justified the transportation importance of a greenway segment and there is no greenway alternative of equal importance nearby, the project planning report will suggest inclusion of the greenway crossing, or appropriate greenway element, as an incidental part of the highway expenditure.

NCDOT Bicycle and Pedestrian Planning Grant Initiative (Started 2004)

The NCDOT Division of Bicycle and Pedestrian Transportation and the Transportation Planning Branch created an annual matching grant program – the Bicycle and Pedestrian Planning Grant Initiative – to encourage municipalities to develop comprehensive transportation plans. This program was initiated in January 2004 and is currently administered through NCDOT-DBPT.

To date, a total of $3.6 million has been allocated to 134 municipalities through this grant program. Funding for the program comes from an allocation first approved by the North Carolina General Assembly in 2003 in addition to federal funds earmarked specifically for bicycle and pedestrian planning through the Department's Transportation Planning Branch.

The Division of Bicycle and Pedestrian Transportation expanded its municipal planning grant program in 2009, to include grants to councils of government for comprehensive regional bicycle plans. Funding had been set aside by the legislature in 2007 to begin this program.

For more on the NCDOT Bicycle and Pedestrian Planning Grant Initiative, including a list of all North Carolina communities with local pedestrian and/or bicycle plans, please see Chapter 2.

Complete Streets Policy (Adopted July 2009)

The NC Board of Transportation approval of the Complete Streets policy in 2009 required planners and designers to consider and incorporate multimodal alternatives in the design and improvement of all transportation projects within a growth area of a municipality. The policy expresses the need to develop an efficient multimodal transportation network for all transportation users, motorists, transit users, pedestrian and bicyclists of all ages and abilities; that meets their needs for safe access and mobility throughout the accommodation; while caring for the built and natural environments by promoting sustainable development practices that minimize impacts on natural resources and community values and sites of interest.

Under the Complete Streets policy, NCDOT is to collaborate with communities during the planning and design phase of new streets or improvement projects to decide how to provide transportation options needed to serve the community.

Comprehensive Transportation Planning

The North Carolina General Assembly amended the state transportation planning law in 2001 [NCGS 136-66.2] to reflect the desire to expand transportation planning options in North Carolina. This amendment replaced the thoroughfare plan requirement with the multi-modal Comprehensive Transportation Plan (CTP). The CTP represents a community's consensus on the future transportation system (including the existing system and improvements) needed to support anticipated growth and development over a 25- 30 year timeframe. The CTP is a mutually adopted legal document between the state and the local area partner(s). While roads will always be an important part of our transportation system, communities across North Carolina want to consider how other transportation modes can support their economic and quality-of-life goals.

Policy Direction Case Study: Virginia Department of Transportation's (VDOT) Policy for Integrating Bicycle and Pedestrian Accommodations

VDOT will initiate all highway construction projects with the presumption that the projects shall accommodate bicycling and walking. Factors that support the need to provide bicycle and pedestrian accommodations include, but are not limited to, the following:

A. Project is identified in a transportation or related plan.
B. Project accommodates existing and future bicycle and pedestrian use.
C. Project improves or maintains safety for all users.
D. Project provides a connection to public transportation services and facilities.
E. Project serves low income, children, people of color, older adults, and people with disabilities with limited transportation options.
F. Project provides a connection to bicycling and walking trip generators such as employment, education, retail, recreation, and residential centers and public facilities.
G. Project is identified in a Safe Routes to School program or provides a connection to a school.
H. Project provides a regional connection or is of regional or state significance.
I. Project provides a link to other bicycle and pedestrian accommodations.
J. Project provides a connection to traverse natural or man-made barriers.
K. Project provides a tourism or economic development opportunity.

Although not part VDOT's example, another supporting factor should be a project that enhances conservation of streams, wetlands, other priority wildlife habitats and natural areas. This case study informs the framework for implementing the policy recommendations outlined below.

Policy Topics and Recommendations

Funding

Issue: Perhaps, the most important strategy to building a more efficient bicycle and pedestrian transportation system is leveraging and maximizing funding to construct projects within that planned system. Traditional funding sources, such as federal transportation appropriations, are shrinking. Meanwhile, the need for bicycle and pedestrian improvements in North Carolina is increasing based on population changes. The need is much greater than the funding availability, so communiites will have to use multiple strategies and set specific priorities in order to see change.

From the smallest of gaps in a sidewalk along neighborhood streets, to the longest recreational hike-and-bike trails spanning multiple regions, likely billions of dollars will need to be spent developing the state's bicycle and pedestrian system over the next 50 years. It will be increasingly important for locals, state officials, private sector investors, and policy makers to work together, connecting funding to the projects needed most at all scales.

At the most local level, neighborhoods and small towns, sidewalks, bike lanes, neighborhood streets, foot trails, and signage all play an integral role in enabling bicyclists and pedestrians of all ages and abilities to safely walk and bike to schools, parks, work, shopping and other neighbors. Local governments will be largely responsible for funding and constructing these facilities, using locally-derived funding resources. This is the most significant area of influence for converting vehicle trips to bicycle and pedestrian trips. The main emphasis in the design of these projects should be to improve the safety of all road users and provide direct connections to local destinations.

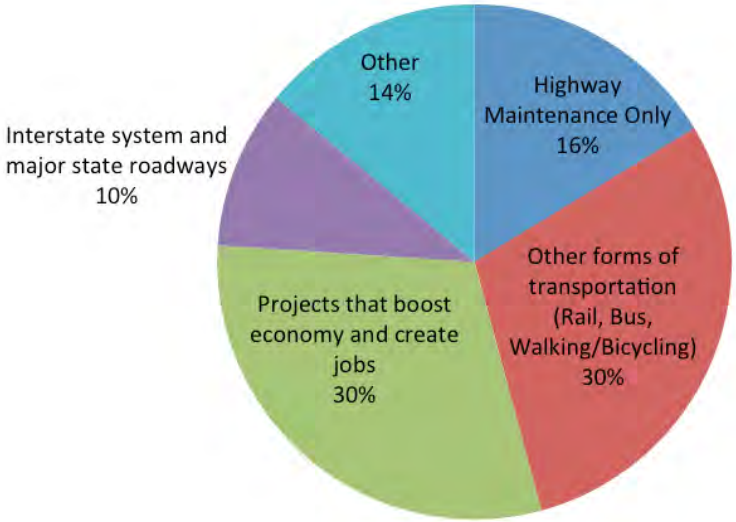
Local and regional transportation partners will need to collaborate on the next generation of regionally-significant bicycle and pedestrian projects. These signature projects serve as the spine to local networks, connecting people to places beyond their neighborhood or village. These projects stimulate tourism, land development, environmental conservation, and personal health. Given the tremendous need for investment, we must prioritize where to building bicycle and pedestrian projects connecting towns and counties. Projects should firstly meet the standard of a locally-significant project, improving user safety and mobility. If they serve a transportation purpose, regional bicycle and pedestrian projects should be scaled and designed according to logical project limits, project users, and available financing. On-road bicycle routes and off-road multi-use paths will continue to transform travel patterns, public health, and recreational tourism. These projects are the best fit for state or federal funding sources, provided the effort required to administer these funds and create lasting multi-jurisdictional partnerships to foster support and growth of the network.

MAP-21

Effective as of federal fiscal year 2013, new transportation legislation called the Moving Ahead for Progress in the 21st Century Act (MAP-21) contains a new funding program called the Transportation Alternatives Program (TAP). The TAP program is very similar to the Transportation Enhancements program in previous transportation authorizations, but there are some differences of significance to North Carolina DOT and local government partners.

Per MAP-21, North Carolina communities and NCDOT continue to have several options for funding bicycle and pedestrian projects. The new federal legislation produced few changes affecting bicycle and pedestrian project eligibility within the CMAQ, STP, and highway safety federal funding programs. The biggest changes were to the administration of the newer version of the Transportation Enhancement (TE) program, now called Transportation Alternatives (TA). TA funds can be used on a number of eligible project types, but bicycle and pedestrian improvements are most often mentioned by policy makers and programmers.

NC Citizen's Preference for NCDOT Funding Distribution (from NCDOT 2040 Plan, survey of 3,500 citizens)



Economic Impact of Pedestrian and Bicycle Infrastructure Investments

Positive economic impacts of walking and bicycling investments include upfront construction stimulus, ongoing use/tourism, direct use value, health care cost reduction, and commuting gains (reducing traffic congestion).

Investing in walking and bicycling paths and lanes stimulates the local economy by generating tourism revenue, supporting local business, and creating jobs. In the Outer Banks, a one-time public investment of $6.7 million in paths and wide paved shoulders has generated $60 million in annual tourism revenue from bicyclists.

Relatively low-cost walking and bicycling improvements generate a high return on investment and job creation. According to a report from the Policy Economy Research Institute at the University of Massachusetts Amherst, bicycle projects create 11.4 jobs for every $1 million invested (46% more than car-only road projects). Pedestrian-only projects create 10 jobs per $1 million while roadway projects create 7.8 jobs per $1 million. See *Appendix 9.5 Economics* for detail about estimated economic impacts of implementing this Plan.

Policy Action Items:

A. Ensure that planning is conducted at the statewide, regional, and local scales so that a vision and recommendations are articulated. The best way to capitalize on a pedestrian or bicycle plan is to develop engineering documents for priority projects so that good information about land acquisition and cost estimates are available.

B. Consider changes to policies affecting the inclusion, funding, and preparation for planned pedestrian and bicycle facilities. At the State level, the NCDOT Complete Streets policy will make pedestrian and bicycle projects more affordable as part of roadway projects. Locally, governments can adopt policies for dedication of rights-of-way for future on-road and greenway corridors for pedestrians and bicyclists. In addition, local policies such as Capital Improvement Programs, can set aside dollars to match outside funding sources for pedestrian and bicycle projects.

C. Compete for state, federal, and other funding sources through open calls and prioritization methodologies. Having preliminary engineering work complete, land acquired, and a local match can make the project more competitive. Projects should serve a strong local transportation purpose but also serve the community or region as a whole by drawing economic development and health benefits.

D. Maintain pedestrian and bicycle facilities once they are built. This is largely a local government responsibility. Well planned maintenance maximizes the original investment and lessens the time for replacement.

Planning

Issue: There are new opportunities for advancing pedestrian and bicycle planning efforts beyond the success of the Planning Grant Initiative started in 2004. For example, after funding and completing 135 pedestrian and bicycle plans, an opportunity exists to plan pedestrian and bicycle

infrastructure for strategic, small areas and corridors. ADA transition planning, a federal requirement, has been largely absent from the planning and design efforts exhibited across the state as well. Natural resource protection should also be considered as part of the pedestrian and bicycle planning process.

In addition, there is a lack of consistency across NCDOT divisions in terms of following recommendations from Long-Range Transportation Plans (LRTPs), Comprehensive Transportation Plans (CTPs), and locally adopted pedestrian and bicycle plans. A consistent approach and balance are needed so that these planning efforts and documents do not conflict or override one another.

Policy Action Items:

A. Modify DBPT pedestrian and bicycle planning grant program to accomplish the following:
   1. Continue pedestrian and bicycle planning grants.
      - Notify communities to update their plans every five years (re-application already allowed after five years).
      - Notify communities who do not have pedestrian and bicycle plans to apply for grants.
      - Allow communities with less than 25,000 in population to develop combination pedestrian & bicycle plans (Currently, communities of less than 5,000 population may apply for combination plans).
      - Streamline process and Plan outlines currently prescribed for pedestrian and bicycle plans to reduce costs and provide to more communities.
   2. Create grant for ADA transition planning.
   3. Develop corridor/small area planning grants for pedestrian and bicycle improvements.
   4. Maintain regional planning initiative especially geared towards rural counties where municipality resources are limited, and where regional trail planning would significantly enhance bicycle and pedestrian transportation.
   5. Develop program grants for municipalities to lead local education, encouragement and enforcement efforts.
   6. Encourage local division staff to participate actively in pedestrian and bicycle planning process, potentially as plan steering committee members.
   7. Increase the funding levels for this grant program.

B. Locally-adopted pedestrian and bicycle plans should support CTPs when local division staff consider project development and implementation. CTPs should reference and defer to locally adopted pedestrian and bicycle plans when they exist.

C. When greenways are being planned, involve the local land trust to assist in obtaining conservation easements or additional land protection.

D. When greenways are being planned, involve the local land trust to assist in obtaining conservation easements or additional land protection.

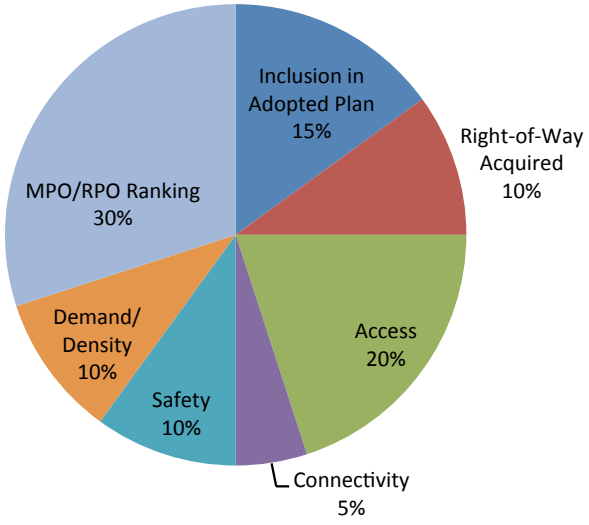
E. Work closely with NCDOT division offices during the development of bicycle and pedestrian plans to understand the constructability of projects included in the plans.

Prioritization

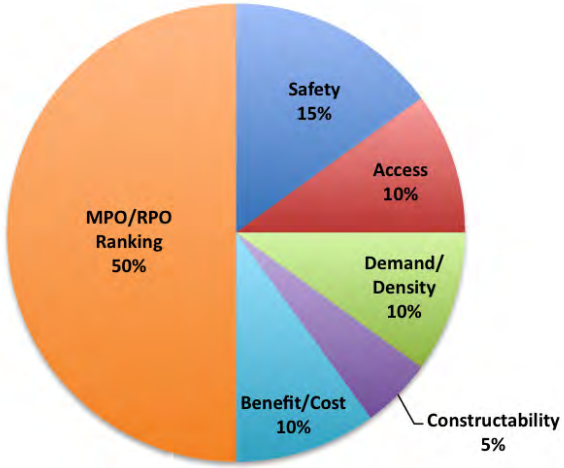
Per MAP-21, North Carolina communities and NCDOT continue to have several options for funding bicycle and pedestrian projects. The new federal legislation produced few changes affecting bicycle and pedestrian project eligibility within the CMAQ, STP, and highway safety federal funding programs. The biggest changes were to the administration of the newer version of the Transportation Enhancement (TE) program, now called Transportation Alternatives (TA). TA funds can be used on a number of eligible project types, but bicycle and pedestrian improvements are most often mentioned by policy makers. Safe Routes to School (SRTS) projects are eligible under the TAP, but a dedicated funding program for SRTS no longer exists under MAP-21.

There are several connections between how TAP funding will be administered in North Carolina and the new state law directing all capital transportation investments. The Strategic Transportation Investments (STI) formula (H 817) was signed into law in June 2013. The new law will realign state funding or state-administered, federal funds toward projects selected through a data-driven process. A new slate of projects will be selected, starting in early 2014, using a prioritization process for programming in FY 16 and beyond. All modes compete for funding. The proposed formula breaks down projects and funding into three categories: statewide, regional and division level.

▼ *Previous NCDOT Prioritization Categories for Pedestrian and Bicycle Projects (Prioritization 3.0)*



▼ *Current NCDOT Prioritization Categories for Pedestrian and Bicycle Projects*



Statewide Level

- Projects of statewide significance will receive 40% of the available revenue, totaling $6 billion over 10 years.
- The project selection process will be 100% data-driven, meaning the department will base its decisions on hard facts such as crash statistics and traffic volumes. Factors such as economic competitiveness and freight movement will be taken into consideration to help support and enhance logistics and economic development opportunities throughout the state.
- A variety of interstate-level highway projects, major commercial airports and some freight rail corridors will be eligible to compete at this funding level.

Regional Level

- Projects of regional significance will receive 30% of the available revenue, equaling $4.5 billion over a decade based on regional population. Projects on this level compete within specific regions made up of two NCDOT Transportation Divisions.
- NCDOT will select applicable projects for funding using two weighted factors. Data will comprise 70% of the decision-making process and local rankings by area planning organizations and the NCDOT Transportation Divisions will round out the remaining 30% at this level.
- All statewide level projects, in addition to highway projects along US and NC routes, all commercial airports, some ferry projects, and multi-county rail/transit projects are eligible to compete at this funding level.

Division Level

- Projects that address local concerns such as safety, congestion and connectivity will receive 30% of the available revenue, or $4.5 billion, shared equally over NCDOT's 14 Transportation Divisions.
- The department will choose projects based 50% on data and 50% on local rankings.
- All statewide and regional level projects, in addition to all other roadway, ferry, aviation, rail, public transit and bicycle-pedestrian projects will be eligible to compete at this funding level.

Strategic Transportation Investments (STI) provides several specific conditions for bicycle and pedestrian project funding in the future:

- Bicycle and pedestrian projects, independent of a separately-funded roadway improvement or construction project, will be funded within the Division Needs funding category.
- Bicycle and pedestrian projects will not be eligible to receive state funding match from NCDOT. Local match (usually an added 20% to the federal funding request) can be provided by local governments through traditional means (new flexibility provides the use of Powell Bill funding for local match).
- The quantitative points will be calculated for up to 20 bicycle and pedestrian projects submitted by each MPOs and RPO. The online scoring model will use local and statewide data points to calculate quantitative project scores on the fly.
- Local input points will be the product of collaboration between MPO/RPO members and Division Engineers.

- The bicycle and pedestrian prioritization process will be used to program federal funds, such as TAP, SRTS and STP, on eligible projects.
- TAP funding allocated to a division for an eligible activity, such as a bicycle or pedestrian project, will count toward the Division Needs budget for the local division.
- TAP-funded projects may use a different selection process from the one used to prioritize bicycle and pedestrian projects.
- Several other federal funding programs traditionally used to build bicycle and pedestrian projects, such as CMAQ, STP-DA, and HSIP will have alternative scoring criteria and may or may not be subject to the STI.
- Bicycle and pedestrian projects submitted which are eligible for SRTS funding, as still available to NCDOT through unobligated apportionments of SAFETEA-LU, may be funded by SRTS funding.

The criteria to be used to rank bicycle and pedestrian projects represents an evolution of the criteria used in SPOT 1.0 and 2.0, as well as inputs gathered from the state's MPOs and RPOs and other state DOTs for scoring bicycle and pedestrian projects. The criteria also had to pass a strict test of being data-driven (and therefore having available data) and providing scalable scores per criteria. A summary of criteria used in the bicycle and pedestrian scoring methodology are as follows:

- Safety
- Access
- Demand/Density
- Constructability
- Benefit-Cost

Safety represents 15 percent of project score. This criterion attempts to identify projects designed to remedy potential safety concerns by providing an improved transportation corridor or alternative travelling option that reduces vehicle-bicycle/pedestrian crash and creates a safer transportation environment. This criterion uses bicycle and pedestrian crash data and speed limit information along project corridors to determine the existing safety need. Calculation of crash points is based on a range of the number of crashes along the project corridor with five or more crashes serving as the maximum scoring range. Calculation of speed limit is based on a range of posted speed limits along the project corridor with a speed limit of 55 and over serving as the maximum scoring range. Crash score and speed limit score are weighted equally to determine overall safety score.

Access represents 10 percent of project score. This criterion is structured to identify projects that are in close proximity to multiple destinations and that provide the most community benefit or highest potential for mode share. This criterion utilizes user input regarding various major and secondary centers that are within 0.5 miles of pedestrian projects and 1.5 miles of bicycle projects. For major centers within the buffered distance, a project receives ten points per destination with a cap of seventy points; for secondary centers within the buffered distance, a project receives five points per destination with a cap of thirty points. Access benefit is also measured by the proximity of the project to the most significant identified destination with points scaled based on mileage distances using the same modal distance thresholds stated above. Destination number/type score and destination distance score are weighted equally to determine overall access score.

Demand/Density represents 10 percent of project score. This purpose of this criterion is to identify projects in areas where the presence of higher concentrations of residents and employees can potentially benefit a higher number of users. This criterion uses US Census data to calculate the density of population and employment within 0.5 miles of pedestrian projects and 1.5 miles of bicycle projects. Population density score and employment density score are weighted equally to determine overall demand/density score.

Constructability represents 5 percent of project score. This criterion measures project readiness and the ease of constructing a project. This criterion uses local user input and local NCDOT Highway Division input to determine the percentage of right-of-way acquired, the percentage of preliminary engineering completed and the anticipated level of environmental impact of the project. Right-of-way and preliminary engineering are both scored on a scalable range of 0 to 100 percent, while environmental impact is assessed by the anticipated NEPA documentation required. Right-of-way score is weighted at 50 percent, while preliminary engineering and environmental impact are both weighted at 25 percent to derive overall constructability score.

Benefit-Cost represents 10 percent of project score. The purpose of this criterion is to evaluate a project's cost effectiveness. This criterion combines the Access and Demand/Density scores to generate a benefit score. The benefit score is then divided by the estimated project cost to derive a project's benefit-cost score.

Under STI, incidental improvements to highway projects may also be submitted per the highway scoring model by including bicycle and pedestrian elements in the proposed highway project type and cross section. However, these incidental improvements, such as on-road bike lanes, must be part of a highway project which will compete well against other highway projects per the selected highway scoring model. Criteria such as cost-benefit, safety and congestion relief are used to score highway projects.

The outcomes of the new prioritization model are unclear. There is no way to calculate the amount of funds that will be available for bicycle and pedestrian projects until they have been scored, programmed and implemented. The degree to which incidental bicycle and pedestrian improvements are made as part of roadway projects will depend on the application of Complete Streets policies and design guidelines. However, the prioritization model will be more effective in selecting the most economical, timely and transportation-focused projects funded through NCDOT for cyclists and pedestrians.

NCDOT Prioritization Process for Pedestrian and Bicycle Projects

CRITERIA			POINTS
ACCESS (A AND B)			***100 (Maximum)***
Providing a facility that connects to popular origins/destinations will have greater potential in serving more users.			
(A) Destination Type (within 0.5 miles of pedestrian facility/within 1.5 miles of bicycle facility)			***50% Weight x Total Pts***
Major Centers (municipal center, transit station, major employment center, mixed use commercial, university or college, tourist destination, high-density multi-family residential, high-density residential neighborhood, arts, entertainment or sports venue) ***Each Destination = 10 points with cap of 70 points***			***Based on cumulative points of both primary and secondary centers.***
Secondary Centers (minor employment center, schools, parks, municipal site, fixed-guideway / fixed-route systems, low-density multi-family residential, low-density residential neighborhood) ***Each Destination = 5 points with cap of 30 points***			
(B) Distance to Prime Destination – Distance is measured from the length of the un-built facility to the described destination (see above for acceptable destinations). If the specific project is not directly adjacent to the indicated destination, the project must be part of a greater bicycle or pedestrian system which connects to the destination.			***50% Weight x Total Pts***
Mode	*Miles to Destination*		*Point Scale*
Pedestrian	0.0 to 0.5		***100 to 0***
Bicycle	0.0 to 1.5		***100 to 0***
CONSTRUCTABILITY			***100 (Maximum)***
Local jurisdictions will be directed to communicate with local Highway Divisions to assist in determining project's constructability. The primary factor is ***Right-of-Way Acquired -*** Projects should have full right of way acquired / easements secured or ability to secure funding and acquire full right-of-way by projected construction year. ***Environmental Impacts*** (anticipated environmental documentation) and ***Preliminary Engineering*** (PE and project feasibility/design work completed) are also measured.			
		Points/Scale	*Weight*
Right-of-Way Acquired	***0 to 100%***	***0 to 100***	***50%***
Preliminary Engineering/Project Design	***0 to 100%***	***0 to 100***	***25%***
Environmental Impacts	***CE Type I/II***	***100***	***25%***
	EA	***50***	
	EIS	***0***	
SAFETY (A AND B)			***100 (Maximum)***
Projects that attempt to address a safety concern are of significant importance in order to create safer transportation options and to establish greater confidence from potential users.			
(A) Crashes –Bicycle or pedestrian crashes within last 5 years along the corridor. For multi-use projects, both bike and pedestrian crash data will be used. For new off-road facilities, crash data for parallel routes will be used.			***50% Weight x Total Pts***
		5 or more crashes	***100***
		4 crashes	***80***
		3 crashes	***60***
		2 crashes	***40***
		1 crash	***20***
(B) Speed Limit – Posted speed limit			***50% Weight x Total Pts***
		55 and over	***100***
		40 to 50	***50***
		30 to 40	***25***
		25	***10***

DEMAND/DENSITY (A AND B)		***100 (Maximum)***
Projects located in areas of higher residential and employment density can potentially benefit more users. Persons and employees per square mile within 1.5 miles of a bike facility and 0.5 miles of a pedestrian facility are calculated. Calculated by dividing buffered population by square miles of buffered region around the project.		
(A) Persons per Square Mile		***50% Weight x Total Pts***
	Point Scale	***0 to 100***
(B) Employees per Square Mile		***50% Weight x Total Pts***
	Point Scale	***0 to 100***
BENEFIT/COST		***100 (Maximum)***
Access and Demand/Density can be used as measures to determine potential project usage and benefit. Estimated preliminary engineering and construction costs are the primary costs (aside from right-of-way acquisition) associated with bike and pedestrian projects.		
(Access Points + Demand/Density Points) / Estimated Project Cost = Project Benefit-Cost		
	Point Scale	***0 to 100***
	Total Score	***500 (Maximum)***

Design Guidance

Issue: As mentioned earlier, the advent of a complete streets policy and guidelines was a major advancement for pedestrians and bicyclists. The way in which complete streets is implemented by division offices and within the Roadway Design Unit will be crucial to its ultimate success. These guidelines do show basic cross-sectional information, but could be enhanced with intersection, constrained rights-of-way, and bridge/structural contextual information. Perhaps most importantly, the "complete streets paradigm shift" has to occur to the point where pedestrian and bicycle facilities and accommodations are considered simultaneously with and in equal importance to automobile facilities.

Existing pedestrian and bicycle design policy and guidance is dispersed in many different documents and directives of NCDOT. It tends to lack sufficient design level and at times does not reflect the latest design guidance and national best practice. There are instances where guidance from different sources is conflicting or inconsistent. These issues are highlighted briefly below.

- *Disbursed design policy and guidance:* Existing pedestrian planning and design guidance is disbursed throughout numerous sources, including design guidelines, the Roadway Design Manual, and policy memoranda. It is not always clear which design guidelines reflect NCDOT's official policy and there is variation across the state regarding the interpretation of existing planning and design policies.
- *Level of detail:* Existing guidance, including the new Complete Streets Guidelines, are generally high-level discussions of pedestrian and bicycle design strategies. More detail is needed for designers to clearly understand how to implement these strategies.
- *Conflicting guidance:* Existing sources are not always aligned and at times are directly in conflict with the Complete Streets Guidelines.
- *Dated Design Guidance:* Existing pedestrian and bicycle policies and design guidance do not always reflect the latest design guidance and national best practices. Toolboxes of pedestrian and bicycle facilities are limited.
- *Implementation Process:* The existing pedestrian and bicycle infrastructure development process is not always leading to the outcomes that are envisioned in the Complete Streets Design Guidelines.

The Complete Streets Planning and Design Guidelines provides the "big picture" vision moving forward; the next step will be to update all sources of design guidance to provide more detail, ensure consistency, and better align them with the complete streets policy and guidelines. More guidance and design details should be provided to make the guidelines easier to implement at the project level. Additionally, targeted changes to the existing pedestrian and bicycle infrastructure development process should be implemented to ensure better outcomes.

Policy Action Items:

A. Conduct a comprehensive comparative assessment of current policies and identify and correct conflicts and deficiencies. For example, the current landscape policy contradicts the Complete Streets Design Guidelines with regards to setback requirements and the use of landscape buffers. Additionally, the Sidewalk and Pedestrian Policy, the Subdivision Roads Minimum Construction Standards, and the Guidelines for Planting in Highway ROW are not fully aligned with the goals and approach set forth in the Complete Streets Design Guidelines.

B. Unify the current policies into a comprehensive, single set going forward and incorporate this information along with concepts from the VDOT case study highlighted earlier in this chapter.
C. Develop a strategy and timeline for updating all state design resources to comply with guidance provided in the Complete Streets Design Guidelines.
D. Clarify pedestrian and bicycle needs on bridge structures in urban, rural, and transitioning areas that reflect the lifespan of bridges (NCDOT).
E. Update the *Roadway Design Manual* (RDM): The RDM should be updated to ensure that the design details contained within are aligned with the Complete Streets policy. The RDM should incorporate and build upon the complete street typology in the *Complete Streets Design Guidelines* and to provide more detailed, prescriptive guidance on pedestrian and bicycle facility design. Design guidance does not need to address every possible scenario, but should address the most common urban, suburban and rural scenarios. The RDM will need to comprehensively address issues such as funding, rural treatments, latent demand, and access to transit. See the table below for detailed recommendations related to the RDM.
F. Update NCDOT Bicycle and Pedestrian Facility Guidelines by working with DENR, Division of Water Quality (DWQ) and multiple departments within NCDOT (including Hydraulics) to ensure coordination and agreement on facility types such as greenways and for consideration of low impact development practices.
G. Conduct audits of Complete Streets implementation and compliance with Complete Streets.

Recommended Design Updates	Details
Include a list of the current authoritative source for pedestrian and bicycle planning and design elements.	Similar to the Wisconsin Department of Transportation, the RDM should include a consolidated list of the current authoritative source for the full range of existing pedestrian and bicycle planning and design elements in North Carolina. This section should highlight when and where specific policies were overwritten by newer policies. It should clarify the relationship between pedestrian and bicycle plans at the state, regional, and local levels. It should also document the difference between official policies and standard institutional practices.
Develop design guidance that explain the appropriate use and how to design various complete streets elements.	Ensure that Complete Streets v. 2.0 and the Roadway Design Manual contain the latest thinking on bicycle and pedestrian facilities. It should cite relevant portions of the *AASHTO Guide for the Development of Bicycle Facilities, NACTO Urban Bikeway Design Guide*, the MUTCD, and other resources. In addition to highlighting local examples throughout, it should also include context and design considerations such as crash mitigation factors and relevant research. Additional information on this recommended design toolbox resource within the RDM is provided as Chapter 6.
Include standard cross sections	Include standard street and roadway cross sections and other technical details that clearly indicate all travel modes.
Provide information and instructions on cost sharing agreements for roadway projects.	It should be clear that pedestrian and bicycle facilities will no longer be treated as standalone elements to be funded separately, but an integral component of the project.

Provide more detail on the collaborative process	View the collaborative process outlined in the *Complete Streets Design Guidelines* as a starting point.
Provide clear guidance regarding the inclusion of Complete Streets elements in roadway projects.	The agency should develop a matrix that clearly outlines whether and to what extent projects can be changed to better meet complete streets objectives. Elements of such a policy directive will likely include: • Any project that has not yet reached the design public hearing stage should be updated to incorporate complete streets elements. • Projects that are past the design public hearing stage can still be changed, but there are practical limitations on how much they can change. • For example, lane diets and road diets can potentially still be accommodated, but the curb lines and amount of right-of-way to be obtained will not likely change after the design public hearing stage. Real world project examples should be referenced for clarification. For example, a recent project in Boone, NC can serve as an example of a project that was reconsidered after the public hearing stage in order to narrow lanes and add bike lanes.
Include official policy statements in areas such as lane widths, liability, and the preference for bike lanes over wide outside lanes.	For example, lane widths will be encouraged to be narrowed to enable the inclusion of bike lanes and wider paved shoulders during road reconstruction and resurfacing projects and pedestrian and bicycle recommendations are encouraged to be included on NCDOT roads in local and regional plans.
A standard protocol is needed to require a proactive review of lane widths and capacity during new construction, reconstruction and resurfacing projects with the purpose of determining if bike lanes or wider paved shoulders can be implemented as a part of the project.	This will provide a cost effective method of improving conditions for all modes on NCDOT roadways, without compromising safety for other users. The official protocol should provide general guidance on locations where lane diets (reducing travel lane widths) and road diets (removal of travel lanes) may be an option during retrofit projects. The 2012 AASHTO Guide for the Development of Bicycle Facilities should be referenced in developing this policy. Municipalities play an active role in reviewing resurfacing lists and agreeing on suggested changes; however, the primary responsibility for identifying and implementing lane and road diet opportunities will rest with NCDOT. Appendix 9.7 presents design considerations for lane widths on state-owned roads in North Carolina. It includes a review of current lane width guidance and relevant research.
Develop and publish new crosswalk marking guidelines consistent with the MUTCD.	The guidelines should identify additional measures that will be taken to ensure uncontrolled crossings are safe, including the use of median islands, advance stop bars, rapid-flash beacons, in-street pedestrian signs, pedestrian hybrid beacons, and other crossing measures.

Clarify the complete streets appeals process, only through exception	For example to document who can make appeals, what information is needed, how and to whom it should be submitted, and how appeals will be evaluated.
Establish a yearly budget for research and develop a process for identifying new projects each year, in partnership with local governments and universities.	Progressive DOTs that are leaders in terms of their work on pedestrian and bicycle issues have one thing in common – they are willing to invest time and effort into researching the best and most effective approaches. NCDOT has done this in the past, such as with the research studies that were conducted on the economic impact of bicycle facilities. North Carolina has many institutions of higher learning that could serve as partners in research efforts. Local governments are also interested in implementing innovative pedestrian and bicycle designs as pilot projects.
Document the relationship between the Complete Streets policy and the Main Streets program.	The goals of each program should be presented in relation to each other and potential conflicts should be identified. A detailed discussion of the Main Street program and its relationship to the Complete Streets policy should be provided.

5

Roadway Maintenance

Issue: The maintenance and operations of our transportation system keenly impacts pedestrian and bicycle travelers. Maintenance is critical to the safety and efficient movement of all travelers. As an example issue, detector loops that are not set to detect modern road bicycles can create illegal or risky moves, while opportunities are missed altogether when a roadway is widened without considerations for the potential to improve pedestrian and bicycle travel. Maintenance activities, cumulatively, can make a much larger impact than changing the relatively few "new" projects identified on the State Transportation Improvement Program (STIP). Maintenance agreements with counties, and even schools or private sector partners, need to be explored to help cover the costs associated with both motorized and non-motorized forms of transportation infrastructure.

Policy Action Items:

A. Develop and promulgate standard maintenance agreements and work with Division Offices to understand how they work and are applied to non-traditional partners (NCDOT; land planning institute at a university).
B. Initiate regular communication between NCDOT division offices and local governments regarding upcoming bridge replacement and road resurfacing projects to coordinate planned facility needs.
C. Develop guidelines for setting magnetic induction loop detectors to increase the range of sensitivity to cyclists.
D. Improve bicycle lane and paved shoulder sweeping programs as a collaborative effort between NCDOT and municipalities.

Legislation

Issue: North Carolina has enjoyed both recent and historical successes in producing laws and policies, which may need to be re-examined with regards to providing funding for bicycle and pedestrian projects as well as for the safety for bicyclists and pedestrians. Revenue generation mechanisms like impact fees and assessment districts have been challenging, but may be a tool for financing bicycle and pedestrian projects at the local level.

Finally, North Carolina is one of only five states that still have contributory negligence tort laws (Alabama, Virginia, Washington, D.C., and Maryland are the others). It is conceivable under this legal system to envision a situation where a cyclist that fails to have a rear taillight (a legal requirement in N.C.) and is subsequently struck head-on by a drunken motorist crossing completely over a center stripe would not be compensated for the injuries inflicted by the driver of the motor vehicle. Most states have some version of comparative negligence, where the degree of damages is related to the degree of fault of both parties. This situation has occurred in pedestrian and bicyclist court cases (or threatened to be introduced to reduce the amount of the settlement) and is a major barrier to sending clear messages to negligent drivers of the penalties related to their bad behavior. As with other legislative changes, changing this legal policy should benefit everyone, not just pedestrians and bicyclists.

Policy Action Items:

A. Evaluate state legislation that deals with minimum passing requirements, lane positioning, and hand signaling; reconsider the contributory negligence law

▲ *Georgia was the 18th state to pass a three-foot law in 2011. As of the end of 2013, there were 21 states with a three-foot passing law and one state, Pennsylvania, with a four-foot passing law. While controversial, state and advocacy efforts have brought attention and education to this important topic.*

Land Use and Transportation Integration

Why This is Important to Walking and Biking

The integration of land use development infrastructure – or lack thereof – is a relevant, debated topic today across the United States. Simply put, planners and decision-makers in the 20th century (and to an extent, the 21st century) have segregated land uses and accepted sprawl and lack of connectivity as a primary way to grow communities. These separate land uses can often only be reached by car, even those that are complimentary like offices, shopping centers, schools, and neighborhoods. A better mixing of complimentary land uses can reduce trip lengths for all modes of travel, as well as reduce construction and operation costs for the provision of public services. As evidenced throughout this Plan, providing walkable communities can promote economic growth, improve the health of North Carolina residents, increase safety, and reduce automobile emissions.

Pedestrians and bicyclists are impacted directly by land use and transportation decisions which are often made separately. Walking and biking distances play a major role in one's determination of making that trip by foot or bicycle. Many studies have analyzed the willingness of Americans to walk or bike certain distances. In 2011, the Federal Transit Administration (FTA) established ½ mile as their catchment area for access to transit for pedestrians, and 3 miles for bicyclists. Another study found that the average walking trip length in the United States was 1.2 miles (with between 47% and 60% of walking trips less than 0.5 miles). The average trip length for bicycling is 4 miles and 57% of trips are less than 2 miles (Walking and Cycling International Literature Review, 2009, Dr Kevin J. Krizek, Dr Ann Forsyth, Laura Baum).

Macro-scale and micro-scale development patterns not only impact distances people have to travel to reach basic services, recreation, and work, but also impact connectivity and safety. Connected, grid street networks remain in most Downtowns in North Carolina but suburban development outside Downtowns resulted in disconnected, cul-de-sac neighborhoods connected by wide arterial roadways. These roadways often feature an excess of driveway entrances creating more conflict points for motorists, pedestrians, and bicyclists. The current environment presents a number of barriers making walking and biking not so safe or pleasant.

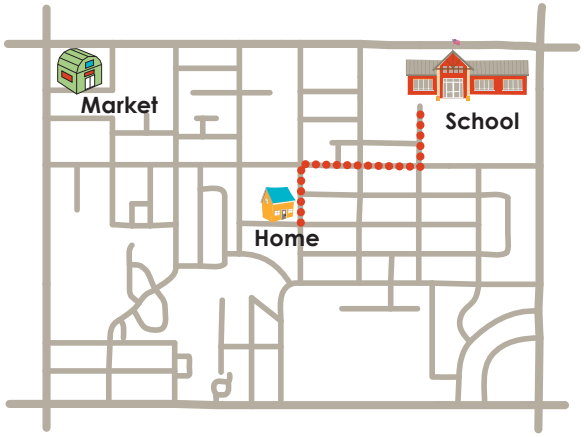
Often, the appearance and design of land uses are what makes them locally unacceptable. This fact has given rise to the development of "smart codes," or form-based code that emphasizes the forms, design, and spatial relationships to improve the value of surrounding properties, not just seek to do them no harm. Almost 20% of North Carolina municipalities that responded to a recent survey (n=72) stated that they already have some elements of form-based regulation in their land use plan now.

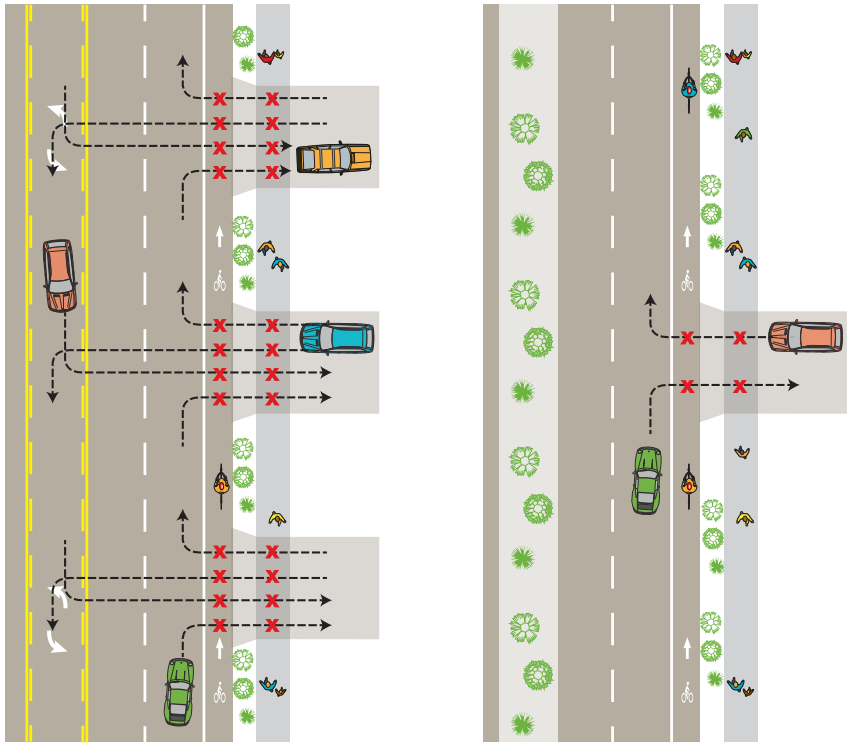
Places that are successful in achieving walkable and bikeable communities should be rewarded for their efforts in terms of waiving or reducing the cost-share for transportation facilities that resonate with the character of their community – hopefully these include making their communities attractive to younger residents that are looking for a return to places to make a home that don't require a car for every trip. It is in these places where new and expanded roadway infrastructure is likely to have the longest life, and where pedestrian and bicycle modes realize the greatest cost-effectiveness.

NCDOT Policy on Street and Driveway Access to NC Highways

The NCDOT policy on 'Street and Driveway Access to North Carolina Highways' provides examples on how to reduce conflict points between motor vehicles and pedestrians and bicyclists. It also considers access management for both future development and retrofits to existing development: www.ncdot.org/doh/preconstruct/altern/value/manuals/pos.pdf

▼ Land use patterns and their associated street networks impact distances traveled by all users (see red lines in diagrams below). Even relatively small differences in a distance to a destination (as well as busy intersections shown in red circles) can impact the decision to walk, bike, or drive.





▲ Land use also affects the safety and comfort of pedestrians and bicyclists. The image above at left shows potential conflict points in red, due to the turning movements presented by multiple driveway access points combined with two-way center turn lane. This is a typical cross section in many of North Carolina's major suburban commercial corridors, often carrying the land use designation of 'highway commercial'. The alternative at right shows fewer conflict points, which can be accomplished by consolidating driveways, adding a landscaped median, and using other access management strategies.

Current Land Use Approach

In urbanized areas the Metropolitan Planning Organization (MPO) takes the lead on developing the Long-Range Transportation Plan, now called the Metropolitan Transportation Plan (MTP), with cooperation from NCDOT, local counties and communities. These local stakeholders provide data such as employment, goals, population growth and land use and this information is used to develop various modeling scenarios for the long-range transportation plan for the region. This cooperation should allow for establishing a comprehensive transportation plan, integrating land use with transportation planning and creating a common long range vision among the partners.

Land use planning is done by local communities to ensure that community character, local vision, goals and others are maintained, and corridor or small area plans are sometimes completed to supplement the overall land use strategies of the communities. Funding for developing these local land use and small area plans are typically the local community responsibility. In a larger urbanized area such as Charlotte, the Charlotte area MPO (MUMPO) provides staff to assist with transportation planning challenges typically associated with large cities. MUMPO also provides financial assistance to communities to develop their land use or small area plans. There is also funding for pedestrian and bicycle plans and for construction projects.

Since developing and implementing land use plans are the local communities' responsibility and plans may be hard to come by in rural areas, transportation plans may rely on outdated land use or zoning plans. Therefore, communities should find ways to describe forward-thinking land use goals in preparation for long range transportation plans.

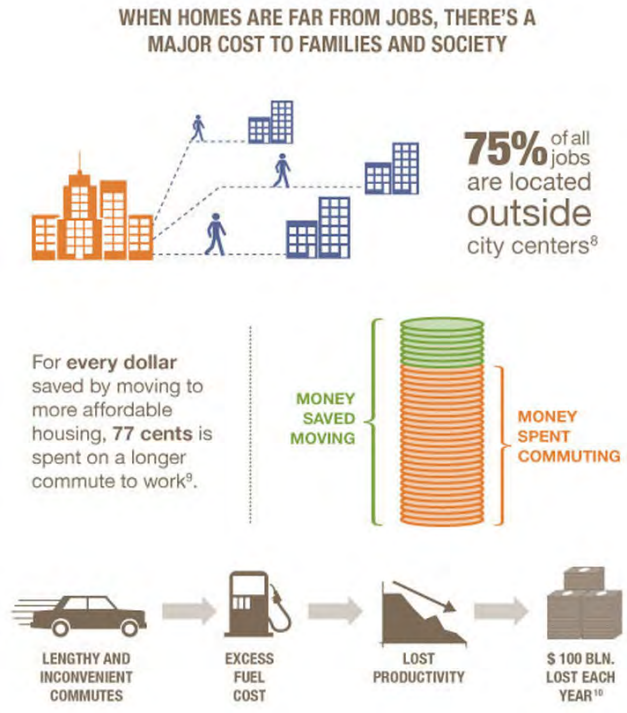


Image from the "Better Education = Healthier Lives" campaign focusing on the health of our communities, part of the NewPublicHealth National Prevention Strategy (Robert Wood Johnson Foundation). http://www.rwjf.org/en/blogs/new-public-health/2012/08/better_educationhea.html

NCDOT Complete Streets Design Guidelines

From a land use perspective,the NCDOT Complete Streets Policy and the NCDOT Complete Streets Planning and Design Guidelines focuses on context-based approach as a means to integrate adjacent land use to the functionality of street design. Understanding that not one-size-fits-all, the complete streets approach allows for flexibility in the design to suit the diverse land uses found in the state This is a good starting point for addressing the integration of land use and transportation.

NCDOT's Traditional Neighborhood Development (TND) Street Design Guidelines

These guidelines, which pre-dated the Complete Streets Design Guidelines, are available for proposed TND developments and permits localities and developers to design certain roadways according to TND guidelines rather than the conventional subdivision street standards. The guidelines recognize that in TND developments, mixed uses are encouraged and pedestrians and bicyclists are accommodated on multi-mode/shared streets. This is a good first step for TND developments, but the concept should be expanded to apply to a broader range of applications and settings.

Policy Direction

Adopt a multi-modal and efficient transportation network in coordination with new land use policies

Though not a new concept, NCDOT and its stakeholders need this policy to guide and educate their staff to eliminate inconsistencies during the planning, design and implementation of bicycle and pedestrian systems. It should also require local communities to develop smart growth codes. In turn, local communities should consider ways mixed-use and form-based development can help support bicycle and pedestrian infrastructure.

Recommendations

To ensure the discussion of land use and transportation planning are interdependent during all local and regional planning efforts, a significant investment in time and capital resources will be needed to shift the current culture of transportation planning processes. The following are recommendations that could enhance integration of these two mutually exclusive planning items.

A. Consider land use in transportation planning.
   1. Encourage local governments to develop current land use plans and development policies in advance of CTP development
   2. Develop policy to assess land use, connectivity, health, wellness, quality of life, and sustainability impacts into NCDOT project decisions about building new roads or widening/reconstructing existing roads.
      - Develop metrics that address the above-mentioned topics that go beyond assessing congestion impacts.
      - Look beyond a curb-to-curb analysis to address local impacts (e.g. back of property to back of property).
      - Involve local land use planners, health agencies, and DBPT in the scoping and project development process.
   3. Implement a sign-off or review process from local land use planners on each state project in their jurisdiction. (NCDOT; NCBOT; NC State Legislature; Local governments).
   4. Establish a venue for local land use planners to provide input into statewide transportation decisions.

B. Research best practices and case studies in the state and surrounding states for coordinated land use and transportation planning and development efforts.

C. Encourage partnerships between local land use planners, MPOs, and NCDOT to encourage understanding of land use goals such as smart growth and transportation strategies.

D. Consider tools for Municipalities, Counties, and NCDOT
   1. Incorporate context-based and transect-based approach for urban, suburban, and rural areas.
   2. Adopt the principles of Traditional Neighborhood Development. (These principles include compact development, mix of use, diverse housing options, transportation choices and environmental stewardship.)
   3. Develop small area plans for addressing local walkability/bikability.
   4. Create graphic-based urban design guidelines and zoning regulations.
   5. Encourage local governments to use the Conservation Planning Tool and Green Growth Toolbox. Using these tools will help communities to ensure they avoid transportation impacts and impacts to streams, wetlands and natural areas through local land use planning. Planning for green infrastructure can also cost

Case Study: Transportation Efficient Land Use and Design – A Guide for Local Governments

The focus of the Virginia Department of Transportation report, *Transportation Efficient Land Use and Design – A Guide for Local Governments*, is to enhance the existing toolkit by adding tested, successful strategies that better integrate land use and transportation in more cost effective and efficient ways. The report provides guidance to achieve a strong and prescriptive integration of land use and transportation.

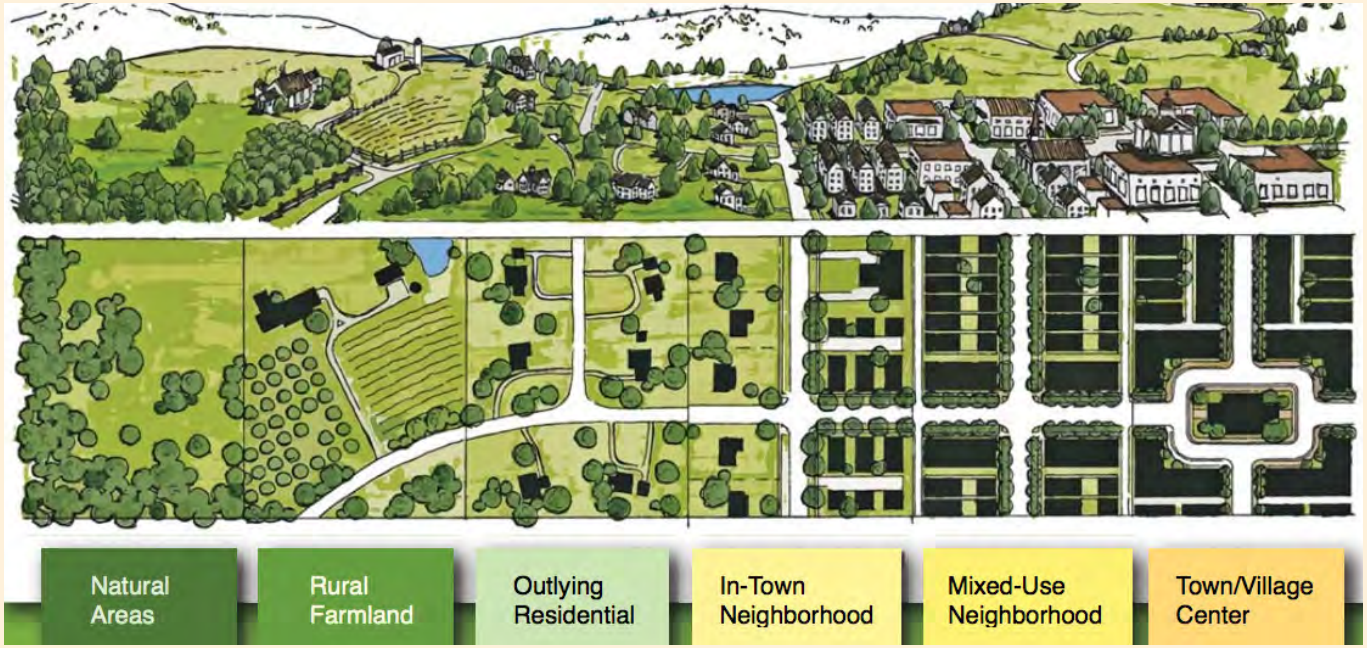
Transportation-efficient land use planning and design focuses on the principles of Traditional Neighborhood Development (TND) as a design approach that combines a range of community design elements to create a more attractive, efficient, and livable communities. TND is a human-scale, compact, and walkable development patterns, mixing of land uses, interconnected networks of streets and blocks, recognizable neighborhood centers and accessible open spaces. Though TND is not a one-size-fits-all approach to development, its guiding principles and design elements can be applied to all types of communities –urban, suburban, and rural – although with different scales and architectural styles.

The plan also addresses what to avoid (elements that are incompatible with TND) and are more geared toward conventional suburban and auto-oriented development. These include cul-de-sacs, separation of uses, lack of connected street grid, excessive curb cuts, high-speed vehicular travel, and absence of sidewalks or gaps in the sidewalk network.

Small area plans are also identified as another means identified to incorporate transportation efficiency since these plans examine key land use and transportation issues at a greater detail than a comprehensive plan. For example, pedestrian shed can be effectively analyzed. A community is considered walkable when it has a ¼-mile to ½-mile radius of walkable area from its center (called a pedestrian shed), which may be expanded if a neighborhood is served by transit and adjusted to account for topography and any barriers to pedestrian circulation.

Source: VDOT 'Transportation Efficient Land Use and Design' report. ▲

Case Study (Continued): Transportation Efficient Land Use and Design: Transect-Based Approach for Urban, Suburban, and Rural Areas



Proposed Future Land-Use Categories in the VDOT 'Transportation Efficient Land Use and Design' report, prepared by: The Cox Company, Renaissance Planning Group, and Rhodeside & Harwell.

effectively help mitigate flooding, protect streams, improve air quality, provide wildlife habitat, and improve network connectivity.

E. Consistent Terminology and Definition: Ensure consistency in the understanding of the terminology and definitions for land use and transportation by all stakeholders. For instance, the character of boulevards may have many versions among stakeholders resulting in challenges in design and implementation (NCDOT).

F. Staff Support: Continue providing Division Planning Engineer, or comparable position, as support to local transportation planning and design efforts

G. Incentives: Evaluate the impacts of communities that develop land use and corridor plans consistent with land use codes and supportive of multi-modal networks.

H. Education: More emphasis should be given to multi-modal transportation-efficient land use discussions at all levels at NCDOT, regional entities, and local communities since each partner has a different understanding of this term. A common understanding can assist in addressing issues during planning, design and funding (NCDOT; ITRE).

I. Research best practices for including bicycle and pedestrian issues and mitigation options within local Traffic Impact Studies.

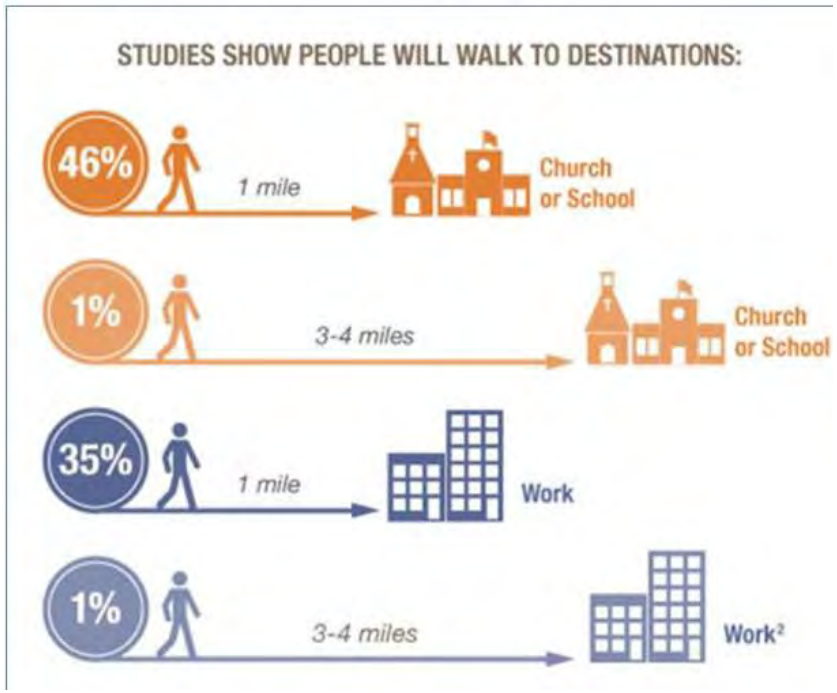
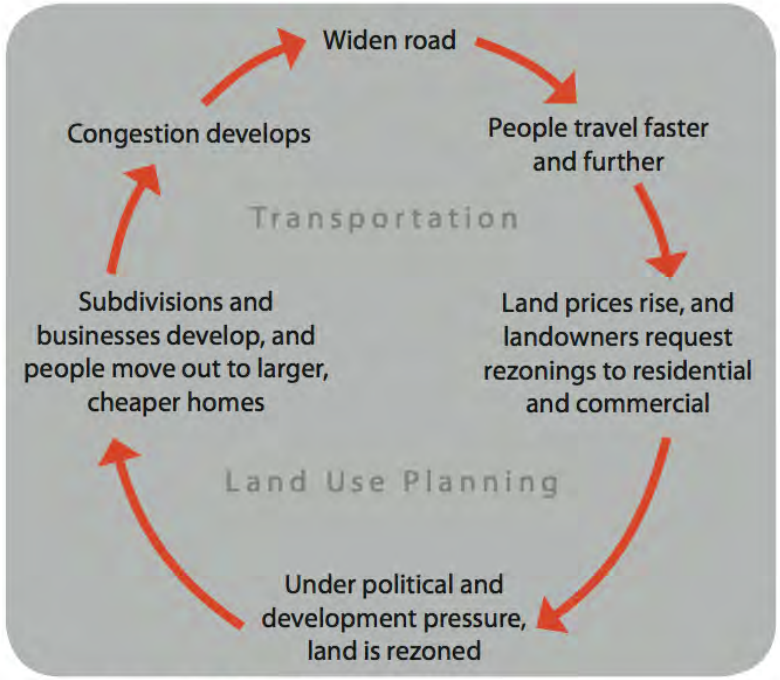


Image from the "Better Education = Healthier Lives" campaign focusing on the health of our communities, part of the NewPublicHealth National Prevention Strategy (Robert Wood Johnson Foundation). http://www.rwjf.org/en/blogs/new-public-health/2012/08/better_educationhea.html

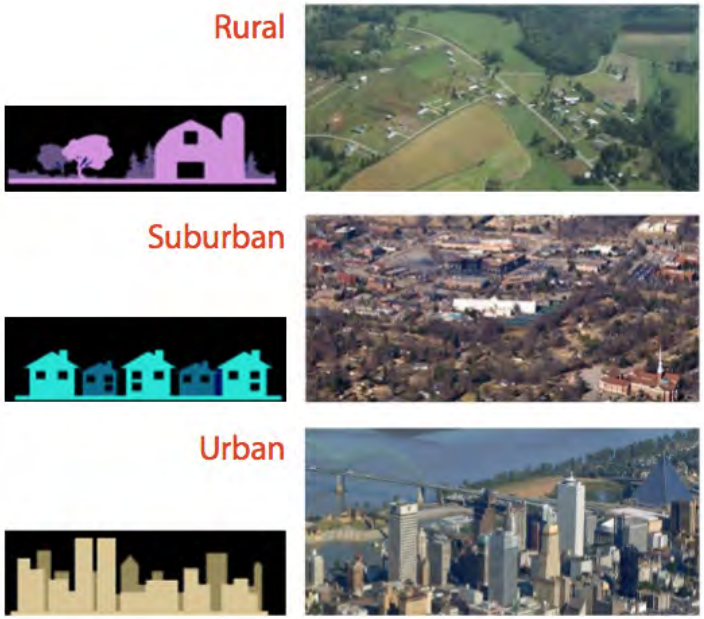
Case Study: Transportation Process Alternatives for Tennessee: Removing Barriers to Smarter Transportation Investments (2012)

The Tennessee Department of Transportation (TDOT) and Smart Growth America partnered to find ways in which TDOT can more effectively use its limited resources to create better outcomes. The working team executed a thorough, but fast-paced process that engaged Department staff and community stakeholders from across the state to help formulate a path to removing barriers to better investment. Among the major findings is a call to action regarding transportation and land-use:

"TDOT should develop joint transportation/land use corridor studies that improve projects and identify beneficiaries who can bring more project dollars to the table. While local governments are solely responsible for local land use planning, it is important for TDOT to coordinate state transportation plans and projects with local land use planning agencies. This will more effectively leverage the taxpayers' investments."



Transportation and Land Use Cycle



Tennessee's diverse development patterns require that TDOT utilize tools and process that enable the development of tailored context sensitive transportation solutions.

6 Design Toolbox

Raleigh, NC

Overview

As described in the Design Guidance section of Chapter 5, NCDOT should update its Roadway Design Manual to include prescriptive pedestrian and bicycle design treatments and develop new Bicycle and Pedestrian Facility Design Guidelines. Existing guidance, including the new Complete Streets Guidelines, are generally high-level discussions of pedestrian and bicycle design strategies. More detail is needed for designers to clearly understand how to implement these strategies.

This chapter serves as a Toolbox to identify key elements currently missing from NCDOT guidebooks. This Toolbox will be a robust resource that helps planners and designers select appropriate facilities or treatments given the project context and the issues being addressed. FHWA's PEDSAFE and BIKESAFE toolboxes are examples of best practices for this type of resource. NCDOT's Pedestrian and Bicycle Facility Toolbox will take the best information and resources that are available nationally, and apply them to the North Carolina context.

In order to be a useful resource, the Toolbox needs to facilitate a more complex planning and design decision process. The Toolbox should emphasize that it is not always desirable or possible to just apply basic standards - factors including nearby land uses, variations in traffic speed and volumes, existing as well as projected future demand will influence the design of any given facility. The Toolbox will highlight these issues and provide an understanding of trade-offs in pedestrian and bicycle facility design.

This Toolbox of resources and treatments, intended to provide guidance for Roadway Design Manual updates, will not be a static document. The field of pedestrian and bicycle facility design is rapidly evolving, and the NCDOT design manuals should be regularly updated to reflect the latest proven designs and treatments. By providing a detailed and current Pedestrian and Bicycle Facility Toolbox, NCDOT can offer designers and planners a comprehensive resource for developing and implementing pedestrian and bicycle accommodations and improvements. Incorporation of this Toolbox into the RDM will ensure that it is used to guide design decisions on a project by project basis. In addition, projects should employ low impact development design when possible.

In this Chapter

Overview

National Pedestrian Facility Design Resources

National Bicycle Facility Design Resources

NCDOT Complete Streets Compliance with National and State Standards and Guidelines

Pedestrian and Bicycle Facilities in the NCDOT Complete Streets Planning and Design Guidelines

Pedestrian Facilities Not in the NCDOT Complete Streets Guide

Bicycle Facilities Not in the NCDOT Complete Streets Guide

Context and Design Considerations

Conclusion

National Pedestrian Facility Design Resources

Numerous national resources exist for the design and development of pedestrian facilities. These resources are briefly outlined below.

FHWA PEDSAFE Pedestrian Safety Guide and Countermeasure Selection System: This interactive website allows users to select the type of problem or crash issue they are attempting to address and provides guidance on pedestrian facility types that may be appropriate. The website includes detailed descriptions of many types of facilities, including the purpose of each facility, considerations when implementing the facility, estimated costs and case studies from around the nation.

http://www.walkinginfo.org/pedsafe/

Proposed Public Rights-of-Way Accessibility Guidelines (PROWAG): Developed by the U.S. Access Board, the PROWAG provides draft accessibility guidelines for the design, construction and alteration of pedestrian facilities in the public right-of-way. The guidelines ensure that sidewalks, pedestrian street crossings, pedestrian signals and other facilities for pedestrian circulation and use constructed or altered in the public right-of-way by state and local governments are readily accessible to and usable by pedestrians with disabilities. Compliance with the accessibility guidelines will be mandatory when they are finalized and adopted.

http://www.access-board.gov/prowac/nprm.htm

How to Develop a Pedestrian Safety Action Plan: This document will help state and local officials know where to begin to address pedestrian safety issues. It is intended to assist agencies in further enhancing their existing pedestrian safety programs and activities, including identifying safety problems, analyzing information and selecting optimal solutions. The guide also contains information on how to involve stakeholders, potential sources of funding for implementing projects and how to evaluate projects. The guide is primarily a reference for improving pedestrian safety through street redesign and the use of engineering countermeasures, as well as other safety-related treatments and programs that involve the whole community.

http://safety.fhwa.dot.gov/ped_bike/ped_focus/docs/fhwasa0512.pdf

AASHTO Guide for the Planning, Design and Operation of Pedestrian Facilities: The purpose of this guide is to provide guidance on the planning, design and operation of pedestrian facilities along streets and highways. The guide focuses on identifying effective measures for accommodating pedestrians on public rights-of-way. Appropriate methods for accommodating pedestrians, which vary among roadway and facility types, are described in this guide. The guide also acknowledges the effect that land use planning and site design have on pedestrian mobility and addresses these topics in detail.

http://www.walkinginfo.org/library/details.cfm?id=2067

FHWA Designing Sidewalks and Trails for Access: The document is the Federal Highway Administration's two part report on pedestrian and trail accessibility. Part 1 of the Guide lays out the history and the practices of applying accessibility concepts to sidewalks and pedestrian trails while Part 2 provides recommendations on how to design sidewalks, street crossings, intersections, shared use paths and recreational pedestrian trails. Both parts of the Guide are out of print and are available online only. Since the Guide was last published in 2001, accessibility guidelines and practices and construction and maintenance techniques have evolved, and more current information may be available.

http://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/sidewalks/

http://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/sidewalk2/

FHWA's Proven Safety Countermeasures: This resource provides tested countermeasure treatments to crashes and their measure of effectiveness.

http://safety.fhwa.dot.gov/provencountermeasures/

NATIONAL BICYCLE FACILITY DESIGN RESOURCES

Numerous national resources exist for the design and development of bicycle facilities. These resources are briefly outlined below.

AASHTO Guide for the Development of Bicycle Facilities, 4th Edition: Published by the American Association of State Highway and Transportation Officials, this guide provides information on how to accommodate bicycle travel and operations in most riding environments. The guide is intended to present sound planning and design guidelines by referencing a recommended range of design values and describing alternative design approaches. Some flexibility is permitted to encourage designs that are sensitive to local context and incorporate the needs of bicyclists, pedestrians, and motorists.

https://bookstore.transportation.org/item_details.aspx?id=1943

NACTO Urban Bikeway Design Guide: The National Association of City Transportation Officials produced this guide of "innovative" bicycle facilities based on the experience of the best cycling cities in the world. The designs in the guide were developed specifically for urban settings, since unique urban streets require innovative solutions. Most of these treatments are not directly referenced in the current version of the AASHTO Guide, although they are virtually all permitted under the *Manual on Uniform Traffic Control Devices* (MUTCD). All of the *NACTO Urban Bikeway Design Guide* treatments are in use internationally and in many cities around the US.

http://nacto.org/cities-for-cycling/design-guide/

FHWA BIKESAFE Bicycle Countermeasure Selection System: This interactive website allows users to select the type of problem or crash issue they are attempting to address, and provides guidance on facility types that may be appropriate. BIKESAFE also includes a large number of case studies to illustrate treatments implemented in communities throughout the United States. The system allows the user to refine their selection of treatments on the basis of site characteristics, such as geometric features and operating conditions, and the type of safety problem or desired behavioral change. The purpose of the system is to provide the most applicable information for identifying safety and mobility needs and improving conditions for bicyclists within the public right-of-way.

http://www.bicyclinginfo.org/bikesafe/

Bicycle Road Safety Audit Guidelines and Prompt Lists: This FHWA guide provides information on how to conduct road safety audits and effectively assess the safety of bicyclists. The guidelines provide an overview of the Road Safety Audit process, as well as an overview of basic safety principles and potential hazards affecting cyclists. Prompt lists are provided to assist team members in considering general issues when performing a bicycle road safety audit.

http://safety.fhwa.dot.gov/ped_bike/tools_solve/fhwasa12018/fhwasa12018.pdf

Level of Service Indicators: Level of Service (LOS) refers to performance indicators that rate transportation system service quality from A (best) to F (worst). Level of Service has long been used for rating conditions for motor vehicle traffic, but relatively sophisticated LOS indicators now exist for bicycle and pedestrian conditions. Most important, the Multimodal LOS asses conditions for multiple modes on a street including walking, bicycling, and public transportation. The Multimodal LOS elements have been integrated into the 2010 Highway Capacity Manual and can help agencies determine how design changes to a street or roadway impact users of different modes.

http://www.trb.org/Main/Blurbs/164718.aspx

http://www.trb.org/Main/Blurbs/160228.aspx

Facility Design Guidelines Compliance Categories

Facility design guidelines describe the application of various facilities to roadways.

SYMBOL	CATEGORY	DESCRIPTION
✦	Included	The guidelines/standards discuss this topic and provide at least some guidance for application considerations.
✧	Experimental	The guidelines/standards discuss this treatment, and generally discourage their use outside of very specific contexts.
○	N/A	The guidelines/standards are silent to this topic. Lack of discussion is not a statement of non-compliance.

6

NCDOT COMPLETE STREETS COMPLIANCE WITH NATIONAL AND STATE STANDARDS AND GUIDELINES

FHWA Traffic Control Device/Marking Compliance Categories

The FHWA MUTCD is not a facilities manual, but rather identifies describes federally approved traffic control devices (markings, signs and signals). These devices may be in various stages of the FHWA approval process, these are identified below

SYMBOL	CATEGORY	DESCRIPTION
★★★★	Approved	The traffic control device is included or featured in the MUTCD and can be implemented at this time.
★★★	Compliant	The treatment may be implemented at this time, if MUTCD compliant signs and pavement markings are used.
★★	Interim Approval	Interim approval permits local application of new traffic control devices in accordance with prescribed guidance.
★	Included	The guidelines/standards discuss this topic and provide at least some guidance for application considerations.
☆	Experimental	The treatment may be installed with FHWA approval of a Request To Experiment (RTE), and has been done so by other jurisdictions.
○	N/A	This treatment is not considered a traffic control device and the MUTCD does not apply to this topic. Lack of inclusion should not be considered non compliance.

Summary of Complete Streets Compliance with National and State Standards and Guidelines

	FHWA MARKING COMPLIANCE	FACILITY DESIGN GUIDELINES COMPLIANCE				
	FHWA MUTCD (2009)	AASHTO GUIDE FOR THE DEVELOPMENT OF BICYCLE FACILITIES (2012)	NACTO URBAN BIKEWAY DESIGN GUIDE (2012)	ITE DESIGNING WALKABLE URBAN THOROUGHFARES: A CONTEXT SENSITIVE APPROACH (2010)	NORTH CAROLINA BICYCLE FACILITIES PLANNING AND DESIGN GUIDELINES (1994)	NORTH CAROLINA DEPARTMENT OF TRANSPORTATION COMPLETE STREETS PLANNING AND DESIGN GUIDELINES (2012)
Bicycle Focused Treatments						
Shared Roadway Facilities						
Unmarked Wide Outside Lane	★★★	✦	○	○	✦	○
Signed Bike Route	★★★★	✦	○	○	✦	✦
Shared Lane Markings	★★★★	✦	✦	○	○	✦
Bicycle Boulevard	★★★★*	✦	✦	○	○	○
"Home Zone"	★★★*	○	○	○	○	○
On-Street Facilities						
Shoulder Bikeway	★★★★	✦	○	○	✦	✦
Conventional Bike Lanes	★★★★	✦	✦	✦	✦	✦
Buffered Bike Lanes	★★★★	✦	✦	○	○	○
Contra-Flow Bike Lanes	★★★★	○	✦	○	○	○
Left-Side Bike Lanes	★★★★	✦	✦	○	○	○
Advisory Bike Lane	☆	○	○	○	○	○
Uphill Bicycle Climbing Lane	★★★	✦	✦	○	✦	○
Cycle Track Bikeways						
One-Way Protected Cycle Tracks	○	✦*	✦	○	○	○
Raised Cycle Tracks (aka Raised Bike Lanes)	○	○	✦	○	○	○
Two-Way Cycle Tracks	○	✧*	✦	○	○	○
Cycle Track Mixing Zone	★★★	○	✦	○	○	○

	FHWA MARKING COMPLIANCE	FACILITY DESIGN GUIDELINES COMPLIANCE				
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* The 2012 AASHTO Guide to the Design of Bicycle Facilities does not mention "cycle tracks" by name. The provided guidance discourages two-way operation of bicycles on one side of the street, such as on a two-way cycle track, but does aknowledge that "it may be better to place one-way sidepaths on both sides of the street.." p5-11						
Off-Street Bikeways						
Multi-Use Path	★★★★	✦	○	○	✦	✦
"Sidepath"	★★★	✧	○	○	✧	✦
Bikeway Intersection Treatments						
Advance Stop Line for adjacent motor vehicle lane	★★★★	○	○	○	○	○
Bike Boxes	☆	○	✦	✦	○	✦
Two-Stage Turn Queue Boxes	★★★	○	✦	○	○	○
Median Refuge Island for Bicycle Use	★★★	✦	✦	✦	○	○
Through Bike Lanes at Auxiliary Right Turn Only Lanes (aka "add lanes")	★★★★	✦	✦	✦	✦	✦
Combined Bike Lane/Turn Lane	★★★*	○	✦	○	○	○
Intersection Crossing Markings						
Intersection Crossing Markings (Dotted line extensions at a minimum)	★★★*	✦	✦	✦	✦	○
Crossing Markings: Color, bicycle symbols	★★					

	FHWA MARKING COMPLIANCE	FACILITY DESIGN GUIDELINES COMPLIANCE				
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Crossing Markings: Elephants Feet	○					
On-Street Bikeway Intersection Crossings						
Bicycle Signal Heads	☆	○**	✦	○	○	○
Signal Detection and Actuation	★★★★	✦	✦	✦	✦	✦
Active Warning Beacon for Bike Route crossing at Unsignalized Intersection	☆	○	✦	○	○	○
Rectangular Rapid Flash Beacon	★★*	○	✦	○	○	○
Hybrid Beacon for Bike Route Crossing of Major Street	★★★★***	○	✦	○	○	○
*[use of W11-15 (bike/ped) sign is not addressed in the IA for RRFBs ** The 2012 AASHTO Guide to the Design of Bicycle Facilities refers to the application of conventional traffic signals for bicycle-only use. *** when used with bicycle signal head, experimentation required						
Off-Street Bikeway Midblock Crossings						
Hybrid Beacon for Off-Street Path Crossing	★★★★	✦	✦	○	○	○
Active Warning Beacon	★★★★	✦	✦	○	○	○
Rectangular Rapid Flash Beacon	★★	○	✦	○	○	○
Bicycle Signal Head	☆	○**	○	○	○	○
Additional Marking and Signing						
Bike Route Wayfinding Signage	★★★*	✦	✦	○	✦	✦
Colored Bike Facilities	★★	✦	✦	✦	○	○

	FHWA MARKING COMPLIANCE	FACILITY DESIGN GUIDELINES COMPLIANCE		
	FHWA MUTCD (2009)	AASHTO GUIDE FOR THE PLANNING, DESIGN, AND OPERATION OF PEDESTRIAN FACILITIES (2004)	ITE DESIGNING WALKABLE URBAN THOROUGHFARES: A CONTEXT SENSITIVE APPROACH (2010)	NORTH CAROLINA DEPARTMENT OF TRANSPORTATION COMPLETE STREETS PLANNING AND DESIGN GUIDELINES (2012)
Pedestrian Focused Treatments				
Pedestrian Ways				
Buffered sidewalks	○	✦	✦	✦
Pedestrian Scale Lighting	○	✦	✦	✦
Street trees	○	✦	✦	✦
ADA Curb Ramps	★★★★	✦	✦	✦
Shoulders for Pedestrian Travel	★★★★	✦	○	✦
Multi-Use Paths	★★★★	✦	○	✦
"Sidepaths"	★★★	✦	○	✦
Un-signalized Crossings				
Midblock Crossings	★★★★	✦	✦	✦
Marked crosswalks	★★★★	✦	✦	✦
Pedestrian Crossing Advanced Warning Signs	★★★★	✦	✦	✦
Pedestrian bridges: overpasses and underpasses	○	✦	○	✦
In-street pedestrian crossing sign	★★★★	✦	○	○
Advance yield/stop lines at crossings	★★★★	✦	✦	○
Raised Crosswalk	★★★★	✦	✦	✦
Refuge Island	★★★★	✦	✦	✦
Two-stage Pedestrian Crossing	★★★★	✦	✦	✦
High visibility crosswalks	★★★★	✦	✦	✦

	FHWA MARKING COMPLIANCE	FACILITY DESIGN GUIDELINES COMPLIANCE		
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Crossing Beacons for use at midblock or unsignalized crosswalks				
Pedestrian hybrid beacon	★★★★	○	○	✦
Conventional Continuous Flashing Warning Beacon	★★★★	✦	✦	○
Active Warning Beacons	★★★★	○	✦	✦
Rectangual Rapid Flash Beacon	★★	○	○	✦
Signalized Intersections				
Pedestrian Countdown Signal Head	★★★★	✦	✦	✦
Pedestrian pushbutton actuators	★★★★	✦	✦	○
"No turn on red" sign	★★★★	✦	✦	○
Leading pedestrian interval	★★★*	✦	○	○
General Roadway Design				
Median island	★★★★	✦	✦	✦
Curb Extension	○	✦	✦	✦
Curb radius reductions	○	✦	✦	✦
Sight distance considerations	○	✦	✦	✦
Narrow (10') Travel Lanes	○	○	✦	✦
Road Diet Conversions	○	○	✦	✦
Single-Lane Roundabouts	★★★★	✦	✦	✦
Multi-lane roundabouts	★★★★	✦	✦	✦

	FHWA MARKING COMPLIANCE	FACILITY DESIGN GUIDELINES COMPLIANCE		
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Access Management				
Pedestrian-Friendly Driveways	○	✦	✦	○
Consolidate driveways	○	✦	✦	○
Right-in, right-out Channelization	○	✦	○	○
Transit Stop Considerations				
Best practice for transit stop placement	○	○	✦	✦
Concrete pads	○	✦	✦	✦
Benches and shelters	○	✦	✦	✦
Lighting	○	○	✦	✦
Other				
Low Impact Development/ Green Infrastructure	○	○	✦	✦
Pedestrian Wayfinding Signage	○	○	○	○
Block Length	○	○	✦	✦
Traffic Calming				
Mini traffic circles	★★★★	✦	○	○

Pedestrian and Bicycle Facilities in the NCDOT Complete Streets Planning and Design Guidelines

NCDOT adopted a Complete Streets policy in July 2009. The policy directs the North Carolina Department of Transportation (NCDOT) to consider and incorporate all modes of transportation when building new projects or making improvements to existing infrastructure. In June 2012, NCDOT published the *Complete Streets Planning and Design Guidelines* to provide guidance on how to implement the 2009 Complete Streets policy. The Guidelines include a number of pedestrian facilities and treatments that are detailed below.

Pedestrian Facilities and Treatments

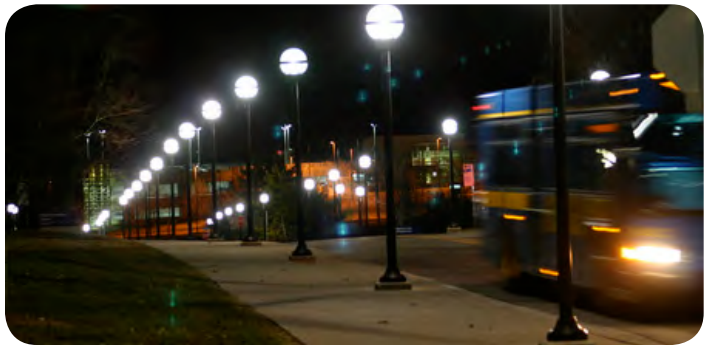
Sidewalk and Sidewalk Buffer Zones: Sidewalks are the primary mode of pedestrian travel in most non-rural areas and are a crucial element in any pedestrian network. Sidewalks should be part of a continuous network, connected with crosswalks and separated from traffic with a buffer. Sidewalks are provided on both local and state-owned roads in North Carolina, and should be regularly included as part of ongoing private development.

A buffer zone is a strip of land that separates vehicular traffic from the sidewalk or other pedestrian facility. A pedestrian's safety and comfort in the roadway environment is significantly affected by the width and quality of the buffer between the sidewalk and the roadway, especially on streets with heavy traffic volumes. A minimum buffer zone of six to eight feet is desirable, and will vary with the street type and surrounding land uses.

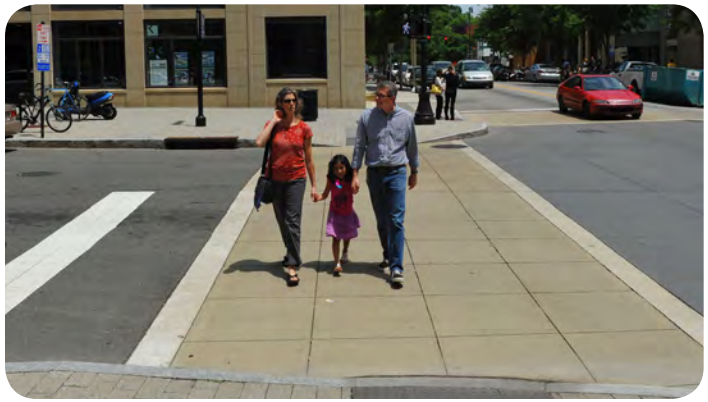
Multi-use Path: A multi-use pathway is physically separated from motor vehicle traffic, and can be either within the highway right-of-way or within an independent right-of-way. Multi-use pathways include sidepaths (in the roadway right-of-way), rail-trails (along or within existing or former railroad right-of-way), greenway trails (within natural corridors) or other paved facilities built for bicycle and pedestrian traffic.

Multi-use path projects should employ low impact development design, when possible, including being an adequate distance from streams (The NCWRC recommends that greenway trails be at least 100 feet from streams). As with every project, the benefits and trade-offs should be considered.

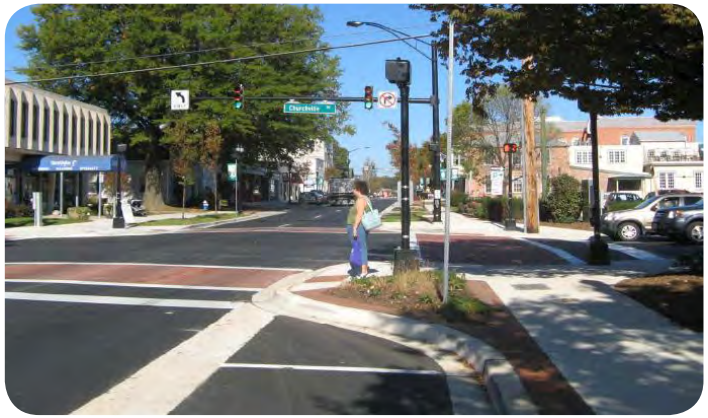
Pedestrian Lighting: Lighting should be provided near transit stops, commercial areas, or other locations where night-time pedestrian activity is likely. Pedestrian-scale lighting such as street lamps helps to illuminate a sidewalk, and improves pedestrian safety and security.



Pedestrian Crossings: Pedestrian crossings and/or crosswalks are another crucial element in any pedestrian network. Crosswalks are used to alert motorists to locations where they should expect pedestrians and to identify a designated crossing location for pedestrians. A crosswalk may be marked or unmarked since, legally, crosswalks exist at all intersections, unless specifically prohibited. Crossing treatments vary depending on a number of factors, including nearby land uses, transit stop locations, and characteristics of the street.



Curb Extensions: Curb extensions (also called bulb-outs or bump-outs) are extensions of sidewalks that narrow the street, increase pedestrian visibility, and decrease pedestrian crossing distance. They are an element of traffic calming that prioritizes pedestrian safety, reduces vehicle speeds, and serves to protect on-street parking. Curb extensions should however not intrude into a bicycle lane.



Paved Shoulders: In rural areas, shoulders may be the only pedestrian facility. Wide shoulders on rural roads allow pedestrians to travel along a gravel and sometimes paved surface in a separate space from traffic. Paved shoulders are much preferred over gravel, and offer numerous benefits to all users of the roadway including bicyclists.

Bicycle Facilities and Treatments

Signed Bike Route: Signed bike routes help bicyclists to navigate lower-volume street networks. Bicycle signage is an important element of bike routes that alerts motorists to the presence of bicycle traffic while providing information to bicyclists.

Shared-Lane Markings: Shared lane markings (also known as "sharrows") have become more popular as a pavement marking treatment to help align cyclists properly within more complex, urban landscapes that may feature on-street parking, a variety of lane widths, and other factors. Additionally, sharrows help remind motorists of the potential presence of cyclists and their right to be in the main travel lane with automobile traffic.

Paved Shoulders: In many rural areas, four-foot-wide paved shoulders are the typical treatment for accommodating bicyclists. Four-foot-wide paved shoulders allow bicyclists to travel on a paved surface adjacent to through traffic, if desired. Where speeds are 55 mph and above, five-foot-wide or wider paved shoulders are preferred. Paved shoulders are not preferred by some cyclists since the additional separation sometimes does not allow the surface to be 'swept' clear of debris by the passage of motorists.

Bicycle Lanes: Dedicated bicycle lanes are the preferred option to provide for the greatest variety of cyclists on streets, particularly those streets with higher volumes and speeds. Bicycle lanes are the backbone of a complete bicycle network, as they visually distinguish a bicycle-only travel lane in which a cyclist does not have to maneuver around motor vehicles and vice versa. Bike lanes enable bicyclists to ride at their preferred speed without interference from prevailing traffic conditions. Bike lanes are typically used in curb-and-gutter contexts where the number of driveway cuts is lower. A more recent development is the use of green pavement markings to delineate driveway openings or the full length of a bicycle lane so as to further separate

a cyclist – at least perceptually – from adjacent motorized traffic. Bicycle lanes often have similar maintenance issues as paved shoulders.

Multi-Use Paths: A multi-use pathway is physically separated from motor vehicle traffic, and can be either within the highway right-of-way or within an independent right-of-way. Multi-use pathways include sidepaths (in the roadway right-of-way), rail-trails (along or within existing or former railroad right-of-way), greenway trails (within natural corridors) or other paved facilities built for bicycle and pedestrian traffic. Multi-use paths provide the maximum protection from automobile traffic, except for where they cross roadways at-grade.

Sidepath: Sidepaths are multi-use paths that are located exclusively adjacent to a roadway, typically within the road right of way. These provide space for bicycle and pedestrian travel where on-road bicycle facilities are not feasible due to traffic volumes, speeds, or roadway configuration (such as limited access highways, for example).

Bike Box: A bike box is a designated area at the head of a traffic lane at a signalized intersection that provides bicyclists with a safe and visible way to get ahead of queuing traffic during the red signal phase. Bike boxes are typically applied at signalized intersections with high volumes of bicycles and/or motor vehicles, especially those with frequent bicyclist left-turns and/or motorist right-turns. (NACTO)

Right Turn Through Bike Lane: Right-turn-only lanes are often used where right-turning motor vehicle volumes warrant an exclusive right-turn lane to improve traffic flow. The correct placement of a bike lane is on the left of an exclusive right-turn lane. Incorporating the bike lane to the left of the right-turn-only lane enables bicyclists and right turning motorists to sort their paths by destination in advance of the intersection, avoiding last moment conflicts. (AASHTO)

Signal Detection and Actuation: Bicycle detection at traffic signals is used at actuated signals to alert the signal controller of bicycle crossing demand on a particular approach. Bicycle detection occurs either through the use of push-buttons or by automated means (e.g., in-pavement loops, video, microwave, etc). (NACTO)

Bike Route Wayfinding Signage: Bicycle signage alerts motorists to the presence of bicycle traffic while providing information to bicyclists. Both bicycle lanes and shared lane markings should include signage, but bicycle signage that identifies a designated bicycle route can be a standalone element. Offering additional wayfinding information with bike route signs as appropriate can enhance quality of service and is particularly effective in high-tourism areas.

Transit Facilities and Treatments

Transit Stop Benches and Shelters: Bus shelters provide a place protected from the elements for transit users to wait for a transit vehicle. Bus shelters should include seating, lighting, and bus information. In places where there is not enough demand or usage to justify a complete bus shelter, seating alone can improve the experience of waiting for a bus.

Transit Stop Lighting: Lighting enhances the visibility and safety of a transit stop. Lighting also improves the readability of transit features such as schedules.

Transit Signage: Signage helps transit users locate the bus stop. Signage can identify the route serving a stop and provide any additional information on the route and schedule.

Pedestrian Facilities Not in the NCDOT Complete Streets Guide

Numerous pedestrian facilities and treatments exist in addition to the pedestrian facilities cited in the Complete Streets Guidance. These facilities and treatments are briefly described below and should be included in the updated Pedestrian and Bicycle Facilities Toolbox. The facilities and treatments are divided into categories, but may be appropriate to use in settings other than the category they are included within.

Un-signalized Intersections

Advanced Pedestrian Warning Signs: Advanced warning signs warn motorists to be aware of pedestrians in the area. Advance pedestrian warning signs should be used where pedestrian crossings may not be expected by motorists, especially if there are many motorists who are unfamiliar with the area.

Marked Crosswalks: Marked crosswalks serve to emphasize the right-of-way where motorists can expect pedestrians to cross and designate a stopping or yielding location. They can also indicate optimal or preferred locations for pedestrians to cross. Marked crosswalks should often be installed in conjunction with other enhancements that physically reinforce crosswalks and reduce vehicle speeds, particularly at uncontrolled locations and on more major roads.

Pedestrian Overpasses and Underpasses: Pedestrian overpasses and underpasses allow pedestrians to cross streets without any conflicts with vehicles on the street. It is important to recognize and document conditions that warrant these facilities as they are not appropriate in all locations.

Mini Traffic Circles: Mini traffic circles are raised circular islands constructed in the center of residential street intersections (generally intended for use where streets are functionally classified as local or neighborhood streets). They reduce vehicle speeds by forcing motorists to maneuver around them.

In-Street Pedestrian Crossing Signs: In-street pedestrian crossing signs reinforce the presence of crosswalks and remind motorists of their legal obligation to yield for pedestrians in marked or unmarked crosswalks. This signage is often placed at high-volume pedestrian crossings that are not signalized.

Advanced Yield/Stop Lines at Crossings: At signalized intersections and midblock crossings, the vehicle stop line can be moved farther back from the pedestrian crosswalk for an improved factor of safety and for improved visibility of pedestrians. Advanced stop lines allow pedestrians and drivers to have a clearer view of each other and more time in which to assess each other's intentions. Advanced stop lines are also applicable for non-signalized crosswalks on multi-lane roads to ensure that drivers in all lanes have a clear view of a crossing pedestrian.

Rectangular Rapid Flashing Beacons: The RRFB is a rectangular shaped lightbar with two high intensity LED lightheads that flash in a wig-wag flickering pattern. The lights are installed below the pedestrian crosswalk sign (located on each side of the road near the crosswalk button) and are activated when a pedestrian pushes the crosswalk button. The lights flash for a set time while the pedestrian crosses the street. At all other times the lights are dark.

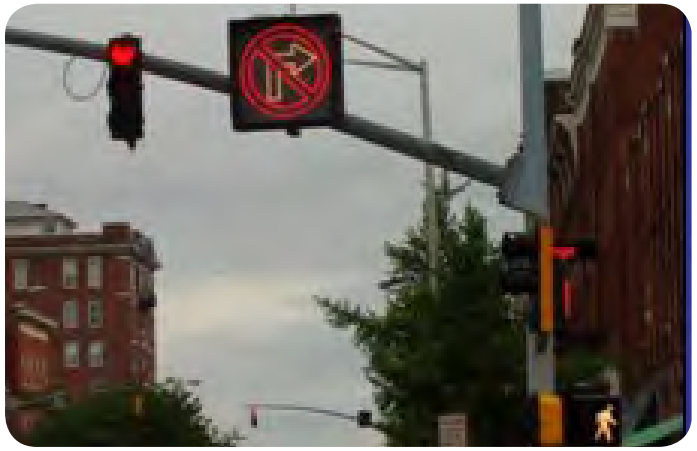
Right-in, Right-out Channelization: Right-in, right-out refers to access management for streets or driveways where the only movements allowed are right turns. Right-in, right-out designs can improve conditions for pedestrians by reducing the number of potential conflicts between motor vehicles and pedestrians. Because vehicles will only be coming from one direction, it is easier for pedestrians to watch for approaching vehicles and to be sure that the vehicle operator sees them before proceeding.

Signalized Intersections

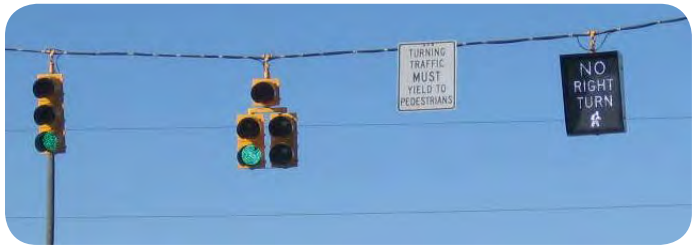
Pedestrian Signal Head: Pedestrian signal heads indicate to pedestrians when they should cross a street. Pedestrian signal indications should be used at traffic signals wherever warranted, according to the MUTCD. The use of WALK/DON'T WALK pedestrian signal indications at signal locations are important in many cases, including when vehicle signals are not visible to pedestrians, when signal timing is complex (e.g., there is a dedicated left-turn signal for motorists), at established school zone crossings, when an exclusive pedestrian interval is provided, and for wide streets where pedestrian clearance information is considered helpful. Countdown signals that indicate the amount of time pedestrians have remaining to cross the street should be installed with all new or replacement signals. Signalization may also be audible to those who are sight-impaired.

Pedestrian Pushbutton Actuators and Pedestrian Detection Systems: In locations where pedestrian signals are not automatically actuated during each signal cycle, pushbutton actuators should be provided to allow pedestrians to "call" the signal. However, since pedestrian pushbutton devices are not activated by about one-half of pedestrians, automated pedestrian sensors that detect the presence of pedestrians and trigger the pedestrian signal should also be considered. Manual pedestrian signal actuators should only be installed where pedestrian traffic is expected to be low to intermittent.

Right Turn on Red Restrictions: Prohibiting RTOR should be considered where and/or when there are high pedestrian volumes. This can be done with a simple sign posting, although there are some options that are more effective than a standard sign. For areas where a right-turn-on-red restriction is needed during certain times, time-of-day restrictions may be appropriate.



Leading Pedestrian Interval (LPI): A LPI gives pedestrians an advance walk signal before the motorists traveling adjacent to them get a green light, giving the pedestrian several seconds to start in the crosswalk where there is a concurrent signal. This makes pedestrians more visible to turning motorists and makes motorists more likely to yield to them. This advance crossing phase approach has been used successfully in several U.S. cities for decades and studies have demonstrated reduced conflicts for pedestrians.



Midblock Crossings

Pedestrian Hybrid Beacon: Installed at mid-block crosswalks, the Pedestrian Hybrid Beacons (PHB), formerly known as the HAWK, remains dark until a pedestrian presses a pushbutton to activate the system. When activated, the system flashes a sequence of amber warning beacons followed by red "stop" beacons, providing motorists with the message to stop. PHB systems include count-down pedestrian signal heads that indicate to pedestrians when they should cross.

Raised Crosswalk: Raised crosswalks are essentially speed tables with a crosswalk across them. Raised crosswalks slow traffic on the street, and can provide a more accessible crossing for disabled pedestrians depending on how the crosswalk connects to the sidewalk.

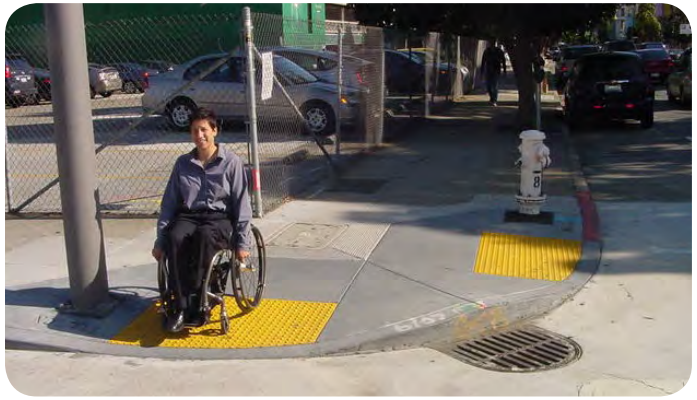
Median or Crossing Islands: Crossing islands—also known as center islands, refuge islands, pedestrian islands, or median slow points—are raised islands placed in the center of the street at intersections or midblock to help protect crossing pedestrians from motor vehicles. Center crossing islands allow pedestrians to deal with only one direction of traffic at a time, and they enable them to stop partway across the street and wait for an adequate gap in traffic before crossing the second half of the street. They are a proven crash reduction device for pedestrians. Some of them can be designed so they are staggered or angled across a median causing pedestrians to face traffic as they are approaching the crossing from the median to street side. At signalized intersections, median islands provide a waiting place for pedestrians who may not be able to cross the full intersection during one signal cycle. Islands should always be ADA compliant.

Two-Stage Crossing: Two-stage crossings utilize a refuge island to allow pedestrians to cross a street in two stages. The refuge islands may be medians islands between opposing directions of traffic or "pork chop" islands between turning and through lanes. By providing an island, pedestrians who cannot make the crossing in a single signal cycle can wait for the next signal to complete their crossing.

Pedestrian Paths / Sidewalks General

Street Trees: Street trees are planted in the buffer area between the street and the sidewalk. Street trees provide a number of benefits including providing a physical barrier between pedestrians and the street, providing shade, visually narrowing the street which may slow traffic, and improved aesthetics. A context-sensitive approach should be used when selecting street tree varieties to ensure they can survive and not damage surrounding sidewalks or streets. Wider buffer widths can allow for larger trees.

Curb Ramps: Curb ramps provide access between the sidewalk and roadway for people using wheelchairs, strollers, walkers, crutches, handcarts, bicycles, and also for pedestrians with mobility impairments who have trouble stepping up and down high curbs. Curb ramps must be installed at all intersections and midblock locations where pedestrian crossings exist, as mandated by federal legislation (1973 Rehabilitation Act and 1990 Americans with Disabilities Act). In most cases, separate curb ramps for each crosswalk at an intersection should be provided rather than having a single ramp at a corner for both crosswalks. All newly constructed and altered roadway projects must include curb ramps. In addition, all agencies should upgrade existing facilities.



Access Management

Driveway Treatments: Several driveway designs may cause safety and access problems for pedestrians, including excessively wide and/or sloped driveways, driveways with large turning radii, multiple adjacent driveways, driveways that are not well defined, and driveways where motorist attention is focused on finding a gap in congested traffic. Examples of driveway improvements include narrowing or closing driveways, tightening turning radii, converting driveways to right-in only or right-out only movements, and providing median dividers on wide driveways.

Consolidated Driveways: Driveway crossings of sidewalks often create hazards for pedestrians as motorists may not be looking for pedestrians as they pull into or out of a driveway. Where multiple driveways exist in close proximity, efforts should be made to consolidate the driveways and reduce conflict points with pedestrians.

Roadway Design

Chicanes: Chicanes are used to slow traffic. Chicanes create a horizontal diversion of traffic and can be gentler or more restrictive depending on the design. Shifting a travel lane has an effect on speeds as long as the taper is not so gradual that motorists can maintain speeds. For traffic calming, the taper lengths may be as much as half of what is suggested in traditional highway engineering.

Speed humps/tables: Speed humps and tables are raised sections of the roadway used to slow motor vehicle traffic. Speed humps are paved (usually asphalt) and approximately 75 to 100 mm (3 to 4 in) high at their center, and extend the full width of the street with height tapering near the drain gutter or roadway striping to allow unimpeded bicycle travel. A "speed table" is a term used to describe a very long and broad speed hump, or a flat-topped speed hump, where sometimes a pedestrian crossing is provided in the flat portion of the speed table.

Road Diet for decreased crossing distance: Roadway narrowing can improve conditions and safety for pedestrians by decreasing vehicle speeds and the distance pedestrians have to travel to cross the street. Roadway narrowing can be achieved by narrowing vehicle lanes, removing travel lanes, adding on-street parking, or other means.

Curb radius reductions: A wide curb radius enables high-speed turning movements by motorists which can result in increased crashes with pedestrians and more serious outcomes when crashes occur. Reconstructing the turning radius to a tighter turn will reduce turning speeds, shorten the crossing distance for pedestrians, and also improve sight distance between pedestrians and motorists.

Sight distance improvements: Improving sight distances for both pedestrians and motorists can increase pedestrian safety. Providing pedestrians with a clear view of approaching traffic at un-signalized intersections will help ensure that they have enough time to make a crossing when a gap in traffic appears. Similarly, ensuring that motorists have a clear view of pedestrians at crossings can help increase yielding behavior toward pedestrians at un-signalized crossings. Sight distance can be improved by cutting back landscaping but this can have the undesirable effect of increasing vehicular speeds.

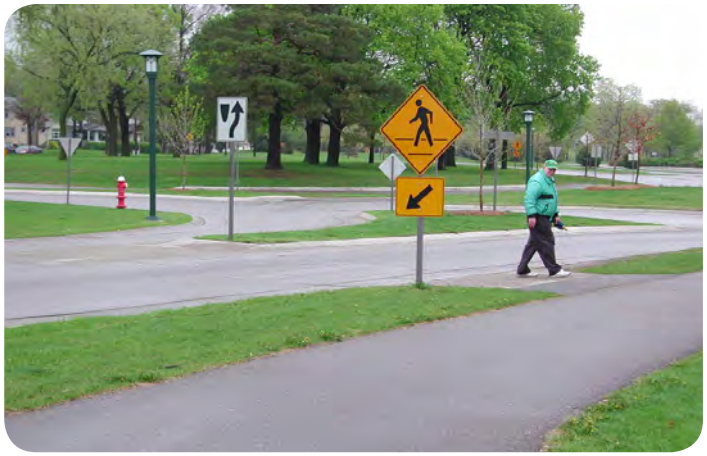
High visibility crosswalks: High visibility crosswalks use specific marking patterns to increase the visibility of the crosswalk to approaching motorists. Traditional crosswalks have two lines perpendicular to the direction of motorist travel, and are often difficult for motorists to see. High visibility crosswalks use wider lines perpendicular to traffic, but also add wide lines parallel to the direction of motorist travel, which greatly increases the visibility of the crosswalk.

Transit Stop Locations

Concrete pads: A solid surface waiting area, typically a concrete pad, should be provided at all transit stops. At very low usage stops, the pad alone may be sufficient to provide a waiting area for transit users, although all stops should be evaluated for the need for benches or shelters. Pads provide a stable boarding area for transit users with disabilities, particularly those who may be using wheelchairs or other assistive devices. It is critical that the pads are directly connected to nearby pedestrian facilities, and that they can be easily accessed by users with disabilities.

Other Treatments

Pedestrian Signage: Signage helps to improve pedestrian safety by alerting motorists that pedestrians may be present. Signage can also improve the visibility of pedestrian facilities at pedestrian crossings, such as a marked crosswalk. To maintain a high quality of service, crosswalks at mid-block locations, and under some circumstances at unsignalized intersections, should include signage at a distance that allows a motorist to react and slow down if necessary.



Block Length: Block length can impact pedestrian safety. In particular, long blocks may encourage pedestrians to attempt mid-block crossings not at crosswalks. This increases the risk of a crash with a motor vehicle, particularly on multi-lane roadways. In new developments, overly long blocks should be avoided, and where they are included, formal mid-block crossings should be provided. In existing developments, mid-block crossings should be provided where there is reasonable pedestrian traffic and where there are specific destinations on one side of the street that encourage crossings.

Bicycle Facilities Not in the NCDOT Complete Streets Guide

Numerous bicycle facilities and treatments exist in addition to the bicycle facilities cited in the *Complete Streets Design Guidelines*. These facilities and treatments are briefly described below and should be included in the Pedestrian and Bicycle Facilities Toolbox. The facilities and treatments are divided into categories, but may be appropriate to use in settings other than the category they are included in.

Shared Roadway Facilities

Unmarked Wide Outside Lane: Lane widths that are 14 ft (4.3 m) or greater allow motorists to pass bicyclists without encroaching into the adjacent lane, and also provide a recovery area for all types of vehicles. However, bike lanes or paved shoulders are the preferred facilities on major roadways when sufficient width is available to provide those facilities. (AASHTO)

Bicycle Boulevards: Bicycle boulevards are streets with low motorized traffic volumes and speeds, designated and designed to give bicycle travel priority. Bicycle Boulevards use signs, pavement markings and speed and volume management measures to discourage through trips by motor vehicles and create safe, convenient bicycle crossings of busy arterial streets. (NACTO)

"Home Zone": This concept originated in Denmark where it is known as a Woonerf, or "Street for Living." These are typically streets where vehicles are slowed by placing trees, planters, parking areas and other obstacles in the street. The street is intended for local traffic only; through traffic is discouraged. This makes a street available for public use that is essentially only intended for local businesses and/or residents. (FHWA)

On-Street Facilities

Buffered Bike Lanes: Buffered bike lanes are conventional bicycle lanes paired with a designated buffer space separating the bicycle lane from the adjacent motor vehicle travel lane and/or parking lane. The buffer allows for a safer and more comfortable ride for more types of bicyclists. A buffered bike lane is allowed as per MUTCD guidelines for buffered preferential lanes (NACTO)

Contra-Flow Bike Lane: Contra-flow bicycle lanes are bicycle lanes designed to allow bicyclists to ride in the opposite direction of motor vehicle traffic. They convert a one-way traffic street into a two-way street: one direction for motor vehicles and bikes, and the other for bikes only. Contra-flow lanes are separated with yellow center lane striping. (NACTO)

Left-Side Bike Lane: Left-side bike lanes are conventional bike lanes placed on the left side of one-way streets or two-way median divided streets. Left-side bike lanes offer advantages along streets with heavy delivery or transit use, frequent parking turnover on the right side or other potential conflicts that could be associated with right-side bicycle lanes. Additionally, the reduced frequency of right-side door openings lowers the risk of a cyclist getting "doored."

Advisory Bike Lanes: Advisory Bike Lanes are low-speed, low traffic volume streets with one narrow lane of two-way vehicular travel (no centerline) and bike lanes on either side indicated by a dashed white line. Passing vehicles are allowed to intrude on the bike lane if bicyclists are not present. Signage is necessary to instruct drivers and bicyclists on proper operation.

Uphill Climbing Lane: On streets where downhill grades are long enough to result in bicycle speeds similar to typical motor vehicle speeds, a bike lane may be provided only in the uphill direction with shared-lane markings in the downhill direction. This design can be advantageous on streets where fast downhill bicycle speeds have the potential to increase the likelihood of crashes with fixed objects, particularly in locations with on-street parking. (AASHTO)

Cycle Track Bikeways

One-Way Cycle Track: One-way protected cycle tracks are bikeways that are at street level and use a variety of methods for physical protection from passing traffic. A one-way protected cycle track may be combined with a parking lane or other barrier between the cycle track and the motor vehicle travel lane. (NACTO)

Raised Cycle Track: Raised cycle tracks are bicycle facilities that are vertically separated from motor vehicle traffic. Many are paired with a furnishing zone between the cycle track and motor vehicle travel lane and/or pedestrian area. A raised cycle track may allow for one-way or two-way travel by bicyclists. (NACTO)

Two-Way Cycle Track: Two-way cycle tracks are physically separated cycle tracks that allow bicycle movement in both directions on one side of the road. Two-way cycle tracks share some of the same design characteristics as one-way tracks, but may require additional considerations at driveway and side-street crossings. (NACTO)

Cycle Track Mixing Zone: The approach to an intersection from a cycle track should be designed to reduce turn conflicts for bicyclists and/or to provide connections to intersecting bicycle facility types. This is typically achieved by removing the protected cycle track barrier or parking lane (or lowering a raised cycle track to street level), and shifting the bicycle lane to be closer to or shared with the adjacent motor vehicle lane. At the intersection, the cycle track may transition to a conventional bike lane or a combined bike lane/turn lane. (NACTO)

Two-Stage Turn Queue Box: Two-stage turn queue boxes offer bicyclists a safe way make left turns at multi-lane signalized intersections from a right side cycle track or bike lane or right turns from a left side cycle track or bike lane. Two-stage turn queue boxes may also be used at unsignalized intersections to simplify turns from a bicycle lane or cycle track, as, for example, onto a bicycle boulevard. (NACTO)

Median Refuge Island for Bicycle Use: Median refuge islands are protected spaces placed in the center of the street to facilitate bicycle and pedestrian crossings. Crossings of two-way streets are facilitated by allowing bicyclists and pedestrians to navigate only one direction of traffic at a time. Medians configured to protect cycle tracks can both facilitate crossings and also function as two-stage turn queue boxes. (NACTO)

Combined Bike Lane/Turn Lane: A combined bike lane/turn lane places a suggested bike lane within the inside portion of a dedicated motor vehicle turn lane. Shared lane markings or conventional bicycle stencils with a dashed line can delineate the space for bicyclists and motorists within the shared lane or indicate the intended path for through bicyclists. (NACTO)

Intersection Crossing Markings: Intersection crossing markings indicate the intended path of bicyclists and alert drivers to potential bicycles in the roadway. They guide bicyclists on a safe and direct path through intersections, including driveways and ramps. They provide a clear boundary between the paths of through bicyclists and either through or crossing motor vehicles in the adjacent lane. Many different crossing treatment combinations exist: dotted lines or "elephant feet" can be augmented with pavement color, bicycle symbols and/or chevron symbols. (NACTO)

On-Street Bikeway Intersection Crossings

Bicycle Signals: A bicycle signal is an electrically powered traffic control device that should only be used in combination with an existing conventional traffic signal or hybrid beacon. Bicycle signals are typically used to improve identified safety or operational problems involving bicycle facilities or to provide guidance for bicyclists at intersections where they may have different needs from other road users (e.g., bicycle-only movements, leading bicycle intervals). (NACTO)

Active Warning Beacon for Bike Route Crossing at Unsignalized Intersection: Active warning beacons are user-actuated amber flashing lights that supplement warning signs at unsignalized intersections or mid-block crosswalks. Beacons can be actuated either manually by a push-button or passively through detection. Active warning beacons should be used to alert drivers to yield where bicyclists have the right-of-way crossing a road. (NACTO)

Rectangular Rapid Flash Beacons (RRFBs): RRFBs are a type of active warning beacon that use an irregular flash pattern similar to emergency flashers on police vehicles. RRFBs can be installed on either two-lane or multi-lane roadways. (NACTO)

Hybrid Beacon for Bike Route Crossing of Major Street: A hybrid beacon, also known as a High-Intensity Activated Crosswalk (HAWK), consists of a signal-head with two red lenses over a single yellow lens on the major street and pedestrian and/or bicycle signal heads for the minor street. There are no signal indications for motor vehicles on the minor street approaches. Hybrid beacons were developed specifically to enhance pedestrian crossings of major streets. However, several cities have installed modified hybrid beacons that explicitly incorporate bicycle movements. (NACTO)

Off-Street Bikeway Midblock Crossings

Hybrid Beacon for Off-Street Path Crossings, Active Warning Beacons, and Rectangular Rapid Flash Beacons: These beacons can be applied at an off-road, multi-use path crossing where no nearby signalized intersections are present. (NACTO)

Additional Marking and Signing

Colored Bike Facilities: Colored pavement within a bicycle lane increases the visibility of the facility, identifies potential areas of conflict and reinforces priority to bicyclists in conflict areas and in areas with pressure for illegal parking. Colored pavement can be utilized either as a corridor treatment along the length of a bike lane or cycle track or as a spot treatment, such as a bike box, conflict area or intersection crossing marking. (NACTO)

Context and Design Considerations

The purpose of this Toolbox is not simply to provide a comprehensive listing of treatments and facilities, but to provide planners and designers with a decision matrix so they can easily select the most appropriate treatments for a given situation. A detailed discussion of the context in which it is appropriate to use each treatment and specific design elements will help guide the selection of the best treatments for each situation. Providing the following information with each item in the Toolbox will allow planners and designers to select the appropriate treatment for the specific project they are working on.

Crash Modification Factors

Crash modification factors (CMFs) are multiplicative factors used to compute the expected number of crashes after implementing a given countermeasure at a specific site. The CMF is multiplied by the expected crash frequency without treatment. A CMF greater than 1.0 indicates an expected increase in crashes, while a value less than 1.0 indicates an expected reduction in crashes after implementation of a given countermeasure. For example, a CMF of 0.8 indicates an expected safety benefit; specifically, a 20 percent expected reduction in crashes. A CMF of 1.2 indicates an expected degradation in safety; specifically, a 20 percent expected increase in crashes.

Many of the facilities and design treatments listed in this chapter have known crash modification factors that demonstrate a reduction in crashes when the facility is implemented. Toolbox items that have positive crash modification factors associated with them (indicating a reduction in crashes) should be highlighted as priority facilities to implement when the context and need is appropriate.

Design Considerations

Location and context needs to be carefully examined when selecting the type of pedestrian or bicycle facilities that should be implemented in a given location. Even when considering a single street corridor, significant differences can exist from one end of the corridor to the other end, or even from block to block, that may require adjustments to the facilities being implemented. Factors such as the abutting land use, current and projected pedestrian and motor vehicle levels, the presence of schools, civic spaces, retail and other pedestrian and bicyclist attractors are some of the things that should be considered.

In addition to the design considerations cited above, the age and abilities of both pedestrians and bicyclists should be a primary consideration when selecting treatments. At a minimum, pedestrian facilities should meet all ADA requirements. Close attention should be paid to ensuring that the selected treatments meet the needs of youth, elderly and disabled pedestrians. These groups may require additional crossing time at intersections, among other design considerations.

It is important to recognize the types of bicyclists that will be served by specific facilities and ensure that facilities and treatments are provided to serve the full-spectrum of bicyclists. Bicyclists range from confident cyclists who are comfortable riding with motor vehicle traffic to more cautious cyclists who may be uncomfortable riding with much traffic to youths who may not have fully developed spatial and cognitive skills. While not every bicycle facility can serve all user types, it is important that the overall bicycle network meet the needs of all bicyclists and potential bicyclists in a community. For example, this may be accomplished by providing bicycle lanes on the main thoroughfare through a village while also providing a nearby parallel route that is comfortable and accessible for families or less confident cyclists. This parallel route may consist of a shared use path, a bicycle boulevard or another low-stress treatment. Chapters 3 and 4 of the 2012 *AASHTO Guide for the Development of Bicycle Facilities* provide significant information and context about bicycle operation and safety and the selection and design of on-road bicycle facilities.

Once specific facility types have been selected, they should be tailored for each specific location. The Toolbox should provide the basic starting point for each facility type, with minimum specifications for design, but the Toolbox should also emphasize that the minimum/standard design may not

Additional Considerations

Access to Transit: Nearly all transit users are also pedestrians at some point in their trip. Sidewalk connectivity in the proximity of bus stops provides safer access for transit users, and is especially important to older residents and those with disabilities.

Access to Trails: North Carolina has an extensive trail network, but often these trails are not connected to destinations and neighborhoods. A network of sidewalks and on-street bicycle facilities is needed to provide better access to multi-use trail entrances.

Access Through Construction Zones: Construction zones can range from complete sidewalk closure to fully protected access. In May 2008, NCDOT published a Guide for Temporary Pedestrian Accommodations, which addresses issues such as American's with Disabilities Act (ADA) accessibility, safety, and the identification of temporary detour routes.

Access Across Bridges: Bridges can serve as either connections or barriers in pedestrian and bicycle networks. NCDOT's Bridge Policy establishes controlling design elements for new and reconstructed bridges on the state road system. It includes information to address sidewalks and bicycle facilities on bridges, including minimum handrail heights and sidewalk widths.

Access Near Major Highways: Freeway on-off ramp intersections present special challenges for pedestrians and bicyclists due to the often free-flow intent to accommodate turning motor vehicles. Countermeasures may include channelization islands, median island "refuges," embedded lighting at crosswalks, and tighter corner radii to slow down turning speeds. The ultimate crossing solution is a separated grade facility, either a bridge over or a tunnel/culvert structure under the crossing mainline roadway. In 1994 the NCDOT adopted administrative guidelines to consider greenways and greenway crossings during the highway planning process, so that critical corridors for future greenways will not be severed by highway construction.

be appropriate in all situations. The discussion presented for each potential facility type should be sufficient to aid an engineer's judgment as to whether a location is appropriate for the facility and considerations for its siting.

North Carolina Case Studies and Examples

Case studies and examples from North Carolina communities should be provided with as many Toolbox items as possible. Where examples or case studies from North Carolina are not available, examples from nearby states with a similar geographic and urban/rural mix as North Carolina should be provided. Efforts should be made to include examples from a mix of urban, suburban and rural communities, and urban examples should include large cities as well as smaller villages and towns. Examples from other locations in the United States may be appropriate if they offer particularly strong examples of specific facilities.

Urban, Suburban and Rural Considerations

The same facility may be implemented differently depending on the surrounding land use. NCDOT's road network passes through urban, suburban and rural areas, and a pedestrian or bicycle facility that is appropriate in one area may not be appropriate in another. The Pedestrian and Bicycle Facility Toolbox should note the appropriateness of each facility type for urban, suburban and rural areas as well as any special design considerations for each area type. This guidance should not be binding as there may be instances where a specific facility type is appropriate for an area it is not generally recommended for, but should allow planners and engineers to quickly ascertain which treatments and facilities are appropriate for the project area they are working on.

Design Resources

The Pedestrian and Bicycle Facility Toolbox should identify specific design resources for each treatment or facility. The resources should primarily include national and North Carolina guidance, including the resources noted at the beginning of this document.

Relevant Research

Details on relevant research for each item in the Pedestrian and Bicycle Facility Toolbox should be provided. This may include links to best practices for implementing specific facility types or research regarding safety improvements from specific facilities. Links to relevant research should be brief, but should note the primary conclusion of the research, and why it is important.

Conclusion

A detailed Pedestrian and Bicycle Facility Toolbox will serve as a resource for planners and designers who are seeking to implement the recommendations provided in the Complete Streets Design Guidelines. The Toolbox will be incorporated within the Roadway Design Manual and will build upon national-level pedestrian and bicycle facility design resources. The Toolbox will expand upon the facilities described in the existing Complete Streets Guidelines, while also introducing emerging treatments that are being used throughout the United States.

Most importantly, the new Pedestrian and Bicycle Facility Toolbox will present context-based design considerations so that project designers are well aware of considerations such as Crash Modification Factors, relevant research and examples of communities in North Carolina that have implemented specific facilities or design treatments.

7 Programming for Health, Safety, & Active Living

Adult cyclists learn proper signaling techniques

Overview

Charles Dickens got it right: "Walk to be healthy, walk to be happy." Creating a safe and inviting bicycle and pedestrian transportation system requires attention to more than physical infrastructure; it requires a diverse toolkit of complementary programmatic recommendations that will enable people to walk and bicycle more, and lead healthier lives. Recent studies show that programming and promotion aspects are crticially important for the success of bicycle and pedestrian projects.[1] Targeted education, encouragement, enforcement, and evaluation strategies that improve North Carolina residents' health, safety, and their ability to incorporate walking and bicycling into everyday life are important as strategies that support the development and success of physical infrastructure. Successful programs must reach users and motorists in all different sectors of the population in North Carolina. A program may be presented as a campaign, effort, on-going initiative or one-time event, depending on its purpose. Every initiative should have a well-defined purpose or focus, a clearly identified goal (or goals), a lead agency/organization, and a logical timeline or schedule. In essence, these different efforts market walking and bicycling to the general public and ensure the maximum "return on investment" in the form of increased mode shift to walking and bicycling. As John Fitzgerald Kennedy once said, "Nothing compares to the simple pleasure of a bicycle ride."

This Statewide Pedestrian and Bicycle Plan establishes the following vision for the future of pedestrian and bicycle transportation in North Carolina:

North Carolina is a place that incorporates walking and bicycling into daily life, promoting safe access to destinations, physical activity opportunities for improved health, increased mobility for better efficiency, retention and attraction of economic development, and resource conservation for better environmental stewardship of our state.

In this Chapter

Overview

The Role of Advocacy Organizations

Bicycle- and Walk-Friendly Communities

Education Programs, Initiatives, Strategies

Encouragement Programs, Initiatives, Strategies

Enforcement Programs, Initiatives, Strategies

Programmatic Recommendation Review Table

The Role of Advocacy Organizations

State and local advocacy groups have the opportunity to support bicycle and pedestrian safety, education, and outreach programs and initiatives. These efforts work in parallel to the efforts of NCDOT and can help further the reach and impact of NCDOT's programmatic strategies. North Carolina Active Transportation Alliance (NCATA) seeks to promote non-motorized transportation choices in North Carolina. Through partnerships with shop owners, bicycling clubs, transportation professionals, local advocacy organizations, and elected officials, NCATA promotes infrastructure, planning and education programs that improve conditions for people-powered transportation. Their vision for North Carolina is a state "where anyone can choose to bicycle, skate, run, and walk as normal, practical, healthy, safe and active transportation."

NCATA and local advocacy organizations should promote policies at the state level that will fairly and equitably accommodate bicyclists, skaters, wheelchair users, pedestrians, and others using human-powered active transportation. These organizations should also take a lead role in advocating for statewide support of Complete Streets concepts and other laws that improve safety and establish dedicated funding sources for pedestrian and bicycle infrastructure in the state budget.

The first inaugural Bike Summit was held in 2012 in Raleigh and was well attended by public and private sector planners, cyclists, policy and decision makers and other related representatives in the transportation field. The NCATA, with the support of bicycle advocate volunteers and local government volunteers, should should continue to host statewide bicycle summits each year. Statewide bicycle summits are well-attended and can include focus areas such as "Bike to the Legislature" events. Additionally, the NCATA should seek partnerships with health organizations and volunteer advocates to host a companion Walk Summit on an annual basis. The Walk Summit could begin as a one-day workshop and expand into a multi-day summit as attendance and awareness increases.

Example responsibilities of NCATA and local advocacy organizations:

- Generate awareness and support through champions, volunteers and community members at the local level to stimulate a grassroots movement.
- Start with Governor and State Assembly and recruit elected officials to champion the Active Transportation Cause.
- Avoid turning Active Transportation issues into a partisan issue.
- Find legislative support from all political parties.
- Build diverse coalitions consisting of health groups, chambers of commerce, safety, environment, older adults, recreation, realtors and other appropriate partners.
- Build constructive relationships with NCDOT and set up recurring meetings with staff.
- Be a resource - volunteer on committees, review policies and documents, consult on bike/walk projects, run publicly funded bicycle and pedestrian education classes.
- Offer public recognition to decision makers who institutionalize best practices.

The support of NCATA and local advocacy organizations such as Bicycling in Greensboro, Charlotte Area Bicycle Alliance, Carrboro Bicycle Coalition, Durham Bicycle Coalition, Asheville on Bikes, Bicycle HaywoodNC, Connect

Walking school buses are educational and build confidence in children to safely walk to school.

Gaston, and Walkable Hillsborough Coalition will contribute to the successful implementation of the programmatic recommendations presented in this chapter. Specific opportunities for these partnerships are identified throughout this chapter; however, advocacy organization support should not be limited to these specific partnerships. NCATA and local advocacy groups are identified as potential partners for the implementation of several programmatic recommendations presented in this chapter.

Bicycle- and Walk-Friendly Communities

Recognizing the importance of targeted programmatic strategies, the national Bicycle Friendly Community program (administered by the League of American Bicyclists), and the Walk Friendly Communities program (administered by the Highway Safety Research Center's (HSRC) Pedestrian and Bicycle Information Center (PBIC)), recommend a multi-faceted approach based on five different "E" categories: Engineering, Education, Encouragement, Enforcement, and Evaluation. This Plan has been developed using the "5 Es" approach with an intent to provide action steps in each category that the state can take towards becoming more bicycle and pedestrian-friendly. In addition to the action steps recommended in this chapter, NCDOT can support North Carolina municipalities who wish to achieve a Bicycle and/or Walk Friendly designation by encouraging communities and providing guidance during the development of a Bicycle Friendly or Walk Friendly application.

This chapter organizes the efforts the state of North Carolina has taken to promote bicycling and walking into three primary categories, Education, Encouragement and Enforcement. The additional efforts that would be included in the Evaluation and Engineering categories are included and reported on in other sections of this Plan. Recommendations presented in the following pages align with the vision and goals of this Plan and are approached in two ways: A) as recommendations to improve on existing efforts, and B) as recommendations for new targeted strategies. Partnership and facilitation support guidance is included with each recommendation. NCDOT should enlist the support and assistance from these partners and actively engage them throughout the development and implementation of each initiative.

Education Programs, Initiatives, Strategies

Providing bicycle and pedestrian educational opportunities is critical for bicycle and pedestrian safety. Education should span all age groups, cultures, abilities, and include motorists as well as current and potential cyclists and pedestrians. The focus of an educational campaign can range from information about the rights and responsibilities of road users, to tips for safe behavior; from awareness of the community-wide benefits of bicycling and walking, to technical trainings for agency staff.

Purpose

One of the goals of this Plan is to develop and implement educational programs for all road users to increase safety, awareness, and understanding of pedestrian and bicycle rights, responsibilities, and benefits. Every year, on average, 168 pedestrians and 24 bicyclists are killed on North Carolina roadways. Through improvements to existing and past educational programs and development of new statewide education programs, NCDOT will increase safety and reduce the number of fatal pedestrian and bicycle crashes each year. Attention should be given to prioritizing educational campaigns in underserved communities, children, and among populations who are more likely to walk and bicycle for necessity.

Another goal of this Plan is to "coordinate transportation and land use planning to provide safe walking and bicycling connections between neighborhoods, employment centers, commercial centers, schools, parks, and other popular destinations and places that serve the community." By providing educational programs for decision-makers, engineering and planning staff representatives, NCDOT is cultivating the expertise and skill sets needed to develop state of the art bikeways, walkways, and greenways for the short- and long-term future of North Carolina's bicycling and pedestrian environment.

Existing and Past Efforts

Bicycle Helmet Initiative

Introduction: Since its inception in 1974, NCDOT's Division of Bicycle and Pedestrian Transportation has been committed to encouraging the use of bicycle helmets as an essential means of reducing bicyclist injuries and fatalities. Over the last twenty years, the DBPT has undertaken a series of helmet promotions in collaboration with other organizations and agencies across North Carolina. The Bicycle Helmet Initiative is designed to reduce bicycle related injuries and fatalities of children, as well as encourage behaviors that will lead to bicycle helmet usage as an adult.

Today, communities conducting bicycle safety events for underprivileged children can request helmets through the DBPT's Bicycle Helmet Initiative. The program is funded through proceeds from "Share the Road" license plates. While the DBPT does not actively promote the initiative, most agencies and schools are aware of the program and regularly request helmets. A maximum of 24 helmets is available per year to each agency that requests helmets. Helmet availability is determined on a "first come first serve" basis.

Type: Ongoing

Action Item/Recommendation: Increase funding of the Bicycle Helmet Initiative program to increase the number of helmets available per agency each year and to broaden the number of agencies served each year. The increased funding can come from a diversified funding stream. In addition to using "Share the Road" license plate revenues, pursue public health funders in the private and public sectors.

Lead Facilitator(s): North Carolina Department of Transportation, in partnership with the Department of Public Instruction (DPI); the Department of Health and Human Services (DHHS); the Department of Insurance's NC Safe Kids; local health departments; hospitals; and advocacy groups

Let's Go NC - Bicycle and Pedestrian Curriculum

Introduction: Let's Go NC is a bicycle and pedestrian safety skills program for children in North Carolina. The bicycle component of the curriculum is based on the 1990's Basics of Bicycling Curriculum, developed for fourth and fifth graders. The pedestrian component is based on the NTSHA pedestrian curriculum. Both components are modified for North Carolina and for use to instruct children in grades k-5. The program encourages children to be healthy and active by teaching the skills necessary for safely participating in bicycling and walking activities. The curriculum is available online and includes Safe Routes to School components, classroom curriculum materials, and videos and exercises. Let's Go NC is based on an earlier NCDOT program called "The Basics of Bicycling."

Type: Ongoing

Action Item/Recommendation: Establish a formal partnership with the Department of Public Instruction to implement Let's Go NC. The partnership agreement should include specific goals and a target timeline for increasing funding for the program, assigning one staff at each agency to serve as a point person for program implementation, and engaging North Carolina schools in the process. The partnership should establish a goal of every elementary school in North Carolina adopting the Let's Go NC curriculum. The curriculum includes encouragement for educators who are responsible for educating students on the program's curriculum. With the assistance and support of NCATA or local advocacy organizations, information should be available to schools and non-profits. These materials would be used to educate students on fun and safe ways to walk and bike to school.

Lead Facilitator(s): North Carolina Department of Transportation, in partnership with the DPI; NC Safe Kids; NCATA; and local advocacy organizations

Safety Education Materials

Introduction: NCDOT's Division of Bicycle and Pedestrian Transportation offers safety and education materials on the agency website. The materials target specific age groups and are organized by the targeted age level. The program offers an assortment of pamphlets, handouts, tests, curricula, information sheets, posters and other items for each age level. This program is not actively marketed and is primarily distributed based on direct requests from schools. The program teaches children to become conscientious road users.

Parents gather with their kids to help children learn about riding bicycles safely to school in Southern Pines, NC

Type: Ongoing

Action Item/Recommendation: The development of Safety Education Materials is an important statewide education program, but need not be repeated as a unique effort. This Plan recommends focusing on furthering the development and statewide implementation of the Watch for Me NC program, including the development of appropriate digital materials for different age levels, all abilities, and cultures. Watch for Me NC is described later in this chapter, and is a safety awareness and education program that launched in 2012.

Lead Facilitator(s): N/A

Share the Road Posters

Introduction: NCDOT continually reinforces the message that motorists and bicyclists must "Share the Road" responsibly. To promote this effort, three "Share the Road" posters are available online for order or download. The three posters reflect three distinct messages: "Be Responsible," "Bicycle Safety Month," and "Be Predictable." The poster messages were designed to appeal to different audience ages and were last updated in 2009.

Type: Ongoing

Action Item/Recommendation: Update the existing "Share the Road" posters and incorporate them into a broader "Share the Road" campaign for the state. The broader program should include a video PSA distributed widely online (such as through YouTube and/or Vimeo), to local network TV stations, and to local government access cable channels. The statewide effort may also include print materials (such as a brochure or postcard-size handout) and printed versions of the posters. If printed materials are developed, a marketing plan for distributing the materials in a targeted and timely manner is necessary. The plan would identify partner agencies and institutions that could actively distribute the materials to a target demographic group and at major events where NCDOT staff or partner groups are available to distribute materials to a broad audience of North Carolina bicyclists and motorists.

Lead Facilitator(s): North Carolina Department of Transportation in partnership with NCATA; and local advocacy groups

Safe Routes to School Community Workshop

Introduction: NCDOT's Safe Routes to School (SRTS) Program offers a customized version of the "Safe Routes to School National Course," developed by the National Center for Safe Routes to School and the Pedestrian and Bicycle Information Center. Designed to help communities develop sound SRTS programs based on their unique local context, this one-day event provides information on best practices, useful strategies, and available resources. When offered, over 100 individuals participated.

Type: Episodic

Action Item/Recommendation: Establish a formal partnership with the Department of Public Instruction to host a SRTS Workshop in all communities of North Carolina within a specific timeframe (such as five years) and create a strategy for achieving that goal. Collaborate with the Department of Public Instruction to promote the workshop to schools and to schedule workshops for multiple communities within a region at the same time. This could come in the form of a "SRTS Workshop Week," which would offer five workshops over five days in five communities of a

specific region, or a similar implementation strategy. Increase funding for the SRTS Community Workshop program to a level that provides sufficient staffing and resources to achieve the goal.

Lead Facilitator(s): North Carolina Department of Transportation in partnership with the DPI

Bicycle Planning and Design / Pedestrian Planning and Design Workshops

Introduction: NCDOT's Division of Bicycle and Pedestrian Transportation hosts a one-day Bicycle Planning and Design Workshop providing comprehensive information on the latest in bicycle planning, design standards, and research. The workshop offers guidance on integrating bicycle transportation needs into roadways and shared-use paths to enhance the "bike-friendliness" of a community. The DBPT has offered the course multiple times since 2006 and has over 100 participants.

NCDOT's Division of Bicycle and Pedestrian Transportation hosts a one-day Pedestrian Planning and Design Workshop providing comprehensive information on the latest in pedestrian planning, design standards, and research. Instructors present best practices for enhancing pedestrian access, innovative pedestrian treatments, sidewalk design, signalization and signing, ADA considerations, street crossings, transit interface, and NCDOT policies, standards and guidelines. The DBPT last offered the course in 2005 and had over 100 participants.

Type: Episodic

Action Item/Recommendation: Bicycle Planning and Design Workshops are an important program, and should be continued as "Complete Streets Workshops". NCDOT recently launched its Complete Streets training program and "Complete Streets Workshops" that combine bicycle and pedestrian planning and design concepts should be offered. They should be held after the initial round of training seminars to offer regional and local staff opportunities for continued education and training, especially as Complete Streets concepts continue to evolve.

Lead Facilitator(s): North Carolina Department of Transportation in partnership with regional planning organizations (MPOs, RPOs, COGs); and local municipalities

Designing Pedestrian Facilities for Accessibility

Introduction: NCDOT's Division of Bicycle and Pedestrian Transportation hosts a day-and-a-half workshop, developed by the Federal Highway Administration and the Association of Pedestrian and Bicycle Professionals (APBP). The program provides an overview of the Americans with Disabilities Act (ADA) and provides detailed information on policies and design guidance related to accessibility. The Division last offered the course in 2006.

Type: Episodic

Action Item/Recommendation: Training related to designing pedestrian facilities for accessibility is an important programmatic element, but need not be repeated in this format. This Plan recommends that NCDOT focus on providing pedestrian accessibility planning and design training as part of the Complete Streets training program offered throughout 2013.

Lead Facilitator(s): N/A

Streetwise Cycling - Guide to Safe Bicycling in North Carolina

Introduction: The purpose of NCDOT's Streetwise Cycling Guide is to explain the rights and duties of bicyclists as vehicle operators on North Carolina's roads. The guide also includes information on riding with traffic, handling skills, and equipment. The material is not actively marketed by NCDOT, but is available online.

Type: Ongoing

Action Item/Recommendation: Update the Streetwise Cycling – Guide to Safe Bicycling North Carolina. The guide is targeted to adult bicyclists and provides an important complement to the age-specific educational materials provided for children and youth. The material should be updated bi-annually, in conjunction with updates to the Guide to NC Bicycle and Pedestrian Laws (description on page 7-24) and should be made available online, along with other materials. NCDOT should assign the role of updating the manual to a specific staff person within the agency to ensure the information is updated every two years. That staff person should also establish opportunities for promoting the manual and any associated online resources within existing NCDOT programs, such as the Complete Streets training program and the Planning Grant Initiative.

Lead Facilitator(s): North Carolina Department of Transportation in partnership with NC Safe Kids

Pedestrian Safety Roadshow

Introduction: In 1998, NCDOT's Division of Bicycle and Pedestrian Transportation trained facilitators to lead Pedestrian Safety Roadshows across the state. The objectives of the program were to increase awareness of pedestrian safety and walkability concerns, provide participants with information about the elements that make a community safe and walkable, and channel community concerns into a plan of action for addressing pedestrian issues. The trainings focused on ways to get communities involved in developing and promoting bicycle and pedestrian safety and improving the walking and biking environments in their neighborhoods. Training was setup as a "train the trainer" program to train planning, transportation, health, architecture, community development, and other interested professionals on how to conduct a Pedestrian Safety Roadshow in their community. 15 trainers participated in two 3-day course sessions, held in 4 locations each time. Training included two days of training for a Roadshow, with visuals, handouts and field observations at several locations to demonstrate design concepts. On the third day of training, trainees conducted mini Roadshows under observation and evaluation. The Pedestrian Safety Roadshow, was developed by the Federal Highway Administration (FHWA) in conjunction with the National Highway Traffic Safety Administration (NHTSA).

Type: Episodic (Discontinued)

Action Item/Recommendation: The Pedestrian Safety Roadshow training and events were a success, but need not be repeated. This Plan recommends focusing on other tools (such as the Complete Streets Workshops previously described in this chapter) for educating community leadership about strategies for creating bicycle and walk friendly environments.

Lead Facilitator(s): N/A

Bicycle skills for the road are learned through training and riding in groups, as seen here. ▲

Walkable Communities Conferences

Introduction: In 1997, NCDOT's Division of Bicycle and Pedestrian Transportation sponsored a series of regional Walkable Communities Conferences. The conferences explored the concept that walking is part of every trip and is the most accessible form of transportation for people of all ages. Well-known national speakers shared their experiences and ideas with more than 1,000 people across the state and developed strategies for applying the concepts in their communities.

Type: Episodic (Discontinued)

Recommendation: The Walkable Communities Conferences were a success, but need not be repeated. This Plan recommends focusing on other tools (such as merging efforts with the NC Bicycle Summit and the Complete Streets Workshops previously described in this chapter) for educating community leadership about benefits and strategies for creating bicycle and walk friendly environments.

Lead Facilitator(s): N/A

Workshops and Webinars

Introduction: The Institute for Transportation Research and Education (ITRE) at North Carolina State University provides training specifically for employees of NCDOT. The two training programs currently available are: Fundamental Engineering Principles (FEP) and Highway Engineering Concepts (HEC). In the past, NCDOT contracted with ITRE to provide up to seven day-long workshops on topics including bicycle facility design, liability in design, traffic calming, planning and design for pedestrians, and designing pedestrian facilities for accessibility (compliance with American with Disabilities Act). When offered, over 100 NCDOT staff members participated in the program. Through a contract with the Highway Safety Research Center, these workshops will be held as part of the Complete Streets training program.

Type: Episodic

Action Item/Recommendation: Partner with the Office of State Personnel to ensure that all relevant agency staff are included

in the Complete Streets training program. Beyond NCDOT, relevant agencies may include the Department of Crime Control and Public Safety, the Department of Environment and Natural Resources, the Department of Health and Human Services, and the Department of Public Instruction.

Lead Facilitator(s): North Carolina Department of Transportation in partnership with the Office of State Personnel

Bicycle Rodeo Kit

Introduction: Bicycle rodeos are a hands-on educational tool for training youth in on-bike skills and safety through a fun and interactive event. Most rodeos are conducted by police officers or others not trained for best-practice bicycle handling in traffic. Similar to the community guide for bicycle events, NCDOT created the Bicycle Rodeo Kit to provide guidance and encouragement for communities seeking to host youth bicycle safety events. The kit includes a bicycle rodeo manual and is based on materials developed for a similar program in Colorado. The Kit is available online only and has not been updated.

Type: Ongoing

Action Item/Recommendation: Allocate funding to revamp the existing Bicycle Rodeo Kit with the specific goal of updating the entire document to: 1) be specific to North Carolina; 2) reflect current trends and attitudes among North Carolina youth; 3) reflect current best practices in bicycle safety curriculum; and 4) shift focus from balance/control skills to in-traffic knowledge at age-appropriate levels. This Plan recommends that NCDOT promote the updated Bicycle Rodeo Kit as part of its statewide Safe Routes to School efforts and through the Planning Grant Initiative (specifically incorporating the kit into bicycle plans developed with Planning Grant Initiative funds). Revamped Kits could be shared between NCDOT Division Offices until each office has their own Kit. Additional, mini-grants could be available to each Division Office to purchase the materials needed to update or revamp their original Kit.

Lead Facilitator(s): North Carolina Department of Transportation

New Program Recommendations

Bicycle Law Enforcement Education for Police

Introduction: Most law enforcement professionals do not receive training specific to bicycle laws, handling, or safety. Police education courses or training can help officers improve public safety and enforce existing laws more effectively by providing them with the training they need.

Action Item/Recommendation: Comprehensive trainings should be offered to municipal police department, county sheriff departments and the State Highway Patrol. These trainings should include comprehensive information about laws and statutes pertaining to bicycling; information about common crash types and causes, and how to prevent and enforce against the most serious offenses; knowing options for enforcement and education (e.g. when a citation vs. warning should be issued, diversion class options, and safety materials that can be handed out during a traffic stop or public event). The program will also be useful to police departments who wish to do educational outreach to the bicycle community and relevant organizations. Incorporating skills training and certification to officers who wish to patrol on bicycle could also be included in these courses. The presence of police officers on bicycles will discourage bike lane incursions by motor vehicles, and will assist the officers with enforcing traffic violations by bicyclists. More information on the Chicago Bikes program for police education can be found online at: http://www.chicagobikes.org/video/index.php?loadVideo=police_training_2009.

Type: Ongoing

Lead Facilitator(s): North Carolina State Highway Patrol in partnership with municipal and county police departments

Statewide Bicycle Skills Training for Adults

Action Item/Recommendation: Bicycle Skills Training Courses should be developed and offered to adult cyclists of all levels who wish to learn bicycling technique, how to navigate busy roads and complex junctions, and how to teach their children the proper and safe way to ride a bicycle. Courses that are taught as a regional series of 3-hour, on-bike classes on the weekends would most likely be convenient for the majority of adults. The League of American Bicyclists (LAB) offer excellent resources on proper bicycling practices and have League Cycling Instructors (LCIs) that teach courses to suit the needs of any cyclist. There are 52 LCIs in North Carolina, More information can be found online: http://findit.bikeleague.org/search/.

Type: Ongoing

Lead Facilitator(s): North Carolina Department of Transportation in partnership with the LAB; and local municipalities

"Train the Trainers" - Bicycle Skills Training for Child Care Personnel

Action Item/Recommendation: Bicycle Skills Training Courses to "train the trainers" should be developed and offered to program managers and other personnel who will be incorporating bicycle skill training elements into child care program curriculums such as after school programs and summer camps. The 2012 Bicycle and Pedestrian Curriculum includes care giver instruction and should be accepted as the state standard for child care agencies. Curriculums should include training for safe bicycling technique, and how to navigate busy roads and complex junctions for all experience levels. These could range from one-time, three-hour intensive trainings, to a week-long series of daily two-hour trainings as part of child care programs, to full-week bike adventure camps. The skills training could also be incorporated into the physical education curriculum in elementary schools and middle schools.

Type: Ongoing

Lead Facilitator(s): North Carolina Department of Transportation in partnership with DHHS, Department of Public Instruction, local municipalities and school districts

Drivers Education Training

Action Item/Recommendation: Driver's education directed toward all motorists, whether as part of a driver's education course in school or a driving safety course for adults, and including applicable laws, roadway positioning of cyclists, traffic and hand signals, principles of right-of-way and left and right turn problems should be taught to increase the safety of the motorist as well as cyclists and pedestrians. The training should cover rules of the road for motorists, cyclists and pedestrians. All Drivers Education tests should include at least three questions related to bicycles. NCATA should assist the efforts of NCDOT and lobby to improve the state driver's license test to include testing driver's knowledge of motorist responsibilities to cyclists.

Type: Ongoing

Lead Facilitator(s): North Carolina Department of Transportation in partnership with the DPI; local municipalities; school districts; NCATA; and local advocacy organizations

Bicycle and Pedestrian Facility Design Seminars

Action Item/Recommendation: The state should continue to provide training to NCDOT Design staff, NCDOT Engineering staff and NCDOT Maintenance staff for state-of-the-art bicycle facility design and engineering techniques. The seminars should be facilitated in collaboration with the University of North Carolina and other educational institutions. Seminars should include discussion of different available design manuals (AASHTO, NACTO, Complete Streets, etc.) and seminar agendas should be continually updated based on current adopted/accepted design standards.

Type: Ongoing

Lead Facilitator(s): North Carolina Department of Transportation in partnership with the University of North Carolina campuses

7

Encouragement Programs, Initiatives, Strategies

Encouragement programs are critical for promoting and increasing walking and bicycling. These programs should address all ages, abilities, and user groups from school children, to working adults, to the elderly and also address recreation and transportation users. The goal of encouragement programs is to increase the amount of bicycling and walking that occurs in a community. Through history, all levels of leadership from neighborhood leaders to Presidents of the United States of America have encouraged Americans to increase their physical activity, and walking more or bicycling more is a simple way to do so. President Kennedy's 50-mile hike is an example of national level encouragement directed first at US Marine Corps soldiers, but ultimately inspired the Nation. Encouragement programs can range from national challenges like the 50-mile hike, to work-place commuter incentives, to a "walking school bus" at an elementary school; and from bicycle- and walk-friendly route maps, to the creation of a bicycle co-op.

Purpose

According to a 2008 survey by The National Highway Traffic Safety Administration, "71% of Americans said they would like to bicycle more than they do now." As bicycle and pedestrian infrastructure improvements are made, NCDOT must simultaneously develop targeted strategies for encouraging North Carolinians to engage in bicycling and walking activities and communicate information about safe and inviting places for bicycling and walking. Improving upon existing encouragement programs and developing new encouragement programs that promote transportation and recreation choices and healthy, active lifestyles are important steps toward meeting the goal to "integrate pedestrian and bicycle facilities with all other travel modes (personal vehicle, bus, train, airplane, etc.) to form an interconnected transportation network with efficient and convenient connections between modes."

Existing & Past Efforts

Bicycle/Pedestrian Commuter Incentive Programs

Introduction: The SmartCommute Challenge is an annual campaign coordinated by GoTriangle and SmartCommute@rtp. From September 1 to October 15, Triangle commuters are encouraged to try an alternative commute (not driving alone) to work or campus such as riding the bus, carpooling, vanpooling, teleworking, biking, or walking. These free ride-matching services are provided by the "GoTriangle" agencies and participating statewide agencies. Participation in any of the offered services is voluntary. Every Monday starts a new work week and a new challenge. Winners of the weekly challenge are announced on the website the following week. Private sponsorships provide funding for the prizes and Transportation Demand Management staff in the Triangle region dedicate time to administering the program annually.

In the past, pledge cards were used and a follow up survey was sent out to gather information to report on the success of the program and total Vehicle Miles Traveled (VMT) and emissions reductions. The program has been a great success for many years, however, recently there has been a decline in participation. This program is no longer new and exciting so the program is being reinvented as an ongoing tracking and incentive program called GoPoints to attract new commuters and get them to form the habit of sustainable commuting. A loyalty program called GoPerks for existing SmartCommuters is also under development. Short-term challenges will be released throughout the year to continue to grow excitement and get people to join the program.

▲ The NC State Cycling Team

Type: Ongoing

Action Item/Recommendation: NCDOT should follow the model provided by Triangle Transit's Smart Commute Challenge. Using a local or regional pilot program as a basis for building a statewide program is a cost-effective means of capitalizing on the state's existing resources. Allocate funding to work with Triangle Transit to customize Smart Commute Challenge materials for other regions of the state. Promote the program as a new strategy that local and regional transit agencies can employ to encourage multimodal travel. NCDOT should act as a program promoter, provide seed funding for agencies beginning a program, and provide technical assistance for communities interested in replicating the Triangle Transit Smart Commute Challenge model. Local or regional transit agencies would act as program administrators.

▲ *Bicycle parking provides encouragement and convenience for bicyclists.*

Lead Facilitator(s): Local/regional transit agencies in partnership with the North Carolina Department of Transportation; and Triangle Transit

Safe Routes to School Program

Introduction: North Carolina's Safe Routes to School (SRTS) programming is a statewide infrastructure tool that can be used to transform communities and develop inter-agency cooperation for mutually reinforcing investments, such as in the case of school siting, comprehensive planning, etc. Since 2007, NCDOT has awarded 95 SRTS projects impacting 154 school areas across the state. These projects improve infrastructure within two miles of select schools through building sidewalk, marking crosswalks, installing pedestrian signal heads, constructing shared-use paths, striping bike lanes and more. Other communities have pursued non-infrastructure projects enabling them to offer bicycle and pedestrian safety skills trainings; launch walking school bus or bicycle train programs; establish safety patrol or crossing guard programs; or other similar education, enforcement, and encouragement activities. A key outcome of the SRTS program is making is safe for kids to walk and bike to school in their communities. Another is the 2013 partnership with DHHS to create ten SRTS regional coordinator positions.

Type: Ongoing

Action Item/Recommendation: Establish a North Carolina Safe Routes to School program "learning network", with a website and online digital materials to communicate current and future initiatives, provide direct access to educational materials and technical assistance, and encourage community participation in Safe Routes to School efforts. Mentorship opportunities between communities that have successfully implemented SRTS initiatives and communities who wish to implement SRTS initiatives should be encouraged and nurtured by NCDOT and/or NCATA. NCDOT should secure a unique URL for the website that will be marketable and memorable for North Carolina citizens (the website could exist as a webpage of www.ncdot.gov while seamlessly redirecting visitors by way of the chosen URL). Increase funding and personnel for the Safe Routes to School program so that sufficient staff time is available to promote the program statewide, maintain the website content and SRTS materials, and handle administrative duties related to processing and evaluating SRTS grants. The added personnel could come in the form of allocating a set amount of time of an existing staff member towards SRTS and continue to support the regional Active Routes to School coordinator positions.

Lead Facilitator(s): North Carolina Department of Transportation in partnership with NCATA; and local advocacy groups

Bicycle Events - A Community Guide

Introduction: NCDOT offers a community guide to hosting bicycle events. The 32-page booklet outlines suggested bicycle events and promotions. It includes information on how to mobilize community resources and how to work with the media. The guide is available online only and has not been updated.

Type: Ongoing

Action Item/Recommendation: Local bicycling events are an important component of creating or supporting a bicycle friendly environment, however NCDOT's community guide has had a limited role in increasing the number of events or improving the quality of events hosted in the state. This Plan recommends allocating funding to enhance and re-release the community guide with updated guidance and fresh ideas to inspire communities who are planning bicycle events and promotions.

Lead Facilitator(s): North Carolina Department of Transportation in partnership with existing established Bicycle and Pedestrian Advisory Commissions (BPACs)

New Program Recommendations

Bicycle Parking Installation

Action Item/Recommendation: The state should encourage local municipalities to update local zoning, licensing, and permit processes that designate the types and numbers of bicycle parking required at private employment and retail facilities. These facilities should offer bicycle parking in safe, well illuminated areas, and near entrances. Providing secure bicycle parking is a key ingredient in efforts to encourage bicycling as a form of transportation. Placing long-term bicycle parking at transit stations provides opportunities for multi-modal travel and supports alternative transportation choices. The state should offer training for local municipalities to understand the benefits of offering bicycle parking, and provide sample/template municipal and/or zoning code language that could be used to implement this program at the local level.

Type: Ongoing

Lead Facilitator(s): North Carolina Department of Transportation in partnership with municipalities; and regional planning organizations (MPOs/RPOs/COGs)

Safe Routes to School (Regional Plans)

Safe Routes to School Programs are bolstered by the development of a collaborative approach to the program, rather than separate efforts led by individual schools. Encouraging the development of regional Safe Routes to School Plans allows communities to set a benchmark that all elementary schools in the area take part in the program over a specified period of time. The state's Safe Routes to School

Coordinator should work with different regions to leverage resources as they develop plans for implementation of this program. This program expands on the state's existing, successful SRTS program.

Type: Ongoing

Lead Facilitator(s): North Carolina Department of Transportation's SRTS Project Manager and the SRTS Regional Coordinators

Walking Programs

Action Item/Recommendation: Walking programs such as a "Weekend Walkabout" are regularly occurring events that promote walking while also bringing attention to pedestrian infrastructure. "Weekend Walkabouts" could be scheduled and held in each region of the state in conjunction with the statewide Walk to School Day that takes place each fall. The events' walking routes should highlight safe and inviting places to walk in the public realm (rather than private or enclosed facilities such as walking tracks) and should be three miles or less in length. These events are ideal for families and seniors.

National Walk to School Day is a positive way to encourage walking. Here in Holly Springs, NC.

Different walking programs may be organized based on themes for each event, such as an architectural tour, a "Steeple Chase" tour (visiting historic churches), a tour of parks, neighborhood strolls, etc. To generate added marketing potential, the state should engage local celebrities to lead a walk and help raise awareness for the event.

The state should partner and coordinate with municipalities who have adopted pedestrian plans that were developed as part of the NCDOT Bicycle and Pedestrian Planning Grant initiative to host and showcase local walking programs. The state should support the community by providing ideas, materials, and helping the community communicate with local contacts who could assist with the event.

Type: Ongoing

Lead Facilitator(s): North Carolina Department of Transportation in partnership with local municipalities

Open Street Events

Introduction: Open (or "Car-free") Streets events have many names: Sunday Parkways, Ciclovias, Summer Streets, and Sunday Streets. The events are periodic street "openings" (i.e., "open" to users besides just cars; usually on Sundays) that create a temporary park open to the public for walking, bicycling, dancing, hula hooping, roller-skating, etc. They have been very successful internationally and are rapidly becoming popular in the United States. Open street events promote health by creating a safe and attractive space for physical activity and social contact, and are cost-effective compared to the cost of building new parks for the same purpose. Events can be weekly events or one-time occasions, and are generally very popular and well attended.

Action Item/Recommendation: Open street events attract a local audience and should be hosted by a municipality, with the support of NCDOT.

For future expansion of the program, organizers should consider lessons learned and best practices from other communities. Some recommendations include:

- Make sure that there are programmed, family-friendly activities along the route; an "open street" alone is not sufficient to draw participants (and especially not on a repeat basis).
- These events lend themselves to innovative partnerships and public/private funding. Health care providers whose mission includes facilitating physical activity are often major sponsors. Businesses may also support the event if it brings customers to their location.
- The cost of organizing the event can be mitigated through volunteer participation, as this type of event lends itself to enthusiastic volunteer support. However, this will require a high level and quality of volunteer recruitment and management to be sustainable in the long run.
- Police costs to manage the road closure will be one of the largest costs. Work with the police to develop a long-term traffic closure management strategy that uses police resources where needed but also allows well-trained volunteers to participate in managing road closures.
- The greatest value to the community comes when an event happens on a regular basis (e.g. monthly during pleasant weather months). For this to be successful, different routes and/or different activities should be considered.

Program Resources:

- Open Streets Guide (includes networking opportunities and organizers guide): http://openstreetsproject.org/
- Videos of Open Streets events: http://www.streetfilms.

org/tag/ciclovias/

Sample Programs:

- Atlanta Streets Alive (GA): http://www.atlantabike.org/atlantastreetsalive
- Bull City Open Streets (NC): http://bullcityopenstreets.com/
- 2nd Sunday on King Street (SC): http://susanlucas.typepad.com/secondsundayonkingstreet/

Type: Ongoing

Lead Facilitator(s): North Carolina Department of Transportation in partnership with the Department of Commerce; Department of Crime Control and Public Safety; North Carolina State Highway Patrol; municipal and county police departments; local political jurisdictions; and local municipalities

Campus Commuter Program

Introduction: College and university students, faculty, and staff are a sector of the population with commute patterns to and from and around campuses that are conducive to active transportation. Many institutions of higher education are realizing the benefits that active transportation programs offer towards campus-wide transportation demand management and parking services. By encouraging students and faculty to commute to school by an alternative to an automobile, there will be a reduction in automobile emissions, a reduction in Average Daily Traffic (ADT) on roadways that connect to campuses, and there will be a reduction in the need for additional on-campus parking spaces.

There are colleges and universities in North Carolina that are either already designated Bicycle Friendly Universities, or are working toward designation. There are opportunities to build upon existing momentum and support for travel by bicycle.

A campus commuter program should provide resources and information for commuting to campus by biking, walking, or transit and offers incentives to students, faculty and staff that commute by means other than a car.

Action Item/Recommendation: The University of North Carolina should implement campus commuter programs and lead the way for other institutions in North Carolina. The NCATA should support this program to raise awareness about motor vehicle, pedestrian and bicyclist fatalities. The NCATA should develop and provide presentations and materials for distribution to incoming college students during Fall orientation.

Example "starter" programs that could lead to the development of a campus commuter program:

- University of South Carolina's "Travel Lightly Day" http://www.dailygamecock.com/index.php/multimedia-11/item/4217-usc-community-travels-lightly-to-promote-health-sustainability
- Ripon College Freshmen Receive Free Bicycle in Exchange for a "No-Car Pledge" http://www.jsonline.com/news/education/32585109.html
- Yay Bikes! / Ohio DOT "This is How We Roll" http://howwerollosu.com/about-hwr.htm

Other example bicycle commuter programs:

- http://transportation.stanford.edu/alt_transportation/Commute_Club.shtml
- http://www.washington.edu/facilities/transportation/commuterservices/about
- http://www.activateomaha.org/igsbase/igstemplate.cfm?SRC=DB&SRCN&GnavID=11&SnavID=27

More information on the Bicycle-Friendly University Program by the League of American Bicyclists:

The Bicycle Friendly University (BFU) program recognizes institutions of higher education for promoting and providing a more bicycle-friendly campus for students, staff and visitors. The BFU program provides the roadmap and technical assistance to create great campuses for cycling.

College and university campuses are unique environments for their high density, stimulating atmosphere and defined boundaries. These factors make them ideal environments to incorporate bikes. Many colleges and universities have built upon these good conditions and embraced the enthusiasm for more bicycle-friendly campuses by incorporating bike share programs, bike co-ops, clubs, bicycling education classes and policies to promote bicycling as a preferred means of transportation. With the goal to build on this momentum and inspire more action to build healthy, sustainable and livable institutions of higher education, the League created the Bicycle Friendly University program.

▼ *Bicycle enforcement provides encouragement and enforcement.*

The Bicycle Friendly University program evaluates applicants' efforts to promote bicycling in five primary areas: engineering, encouragement, education, enforcement and evaluation/planning. Applications must be submitted online. (http://www.bikeleague.org/programs/bicyclefriendlyamerica/bicyclefriendlyuniversity/bfu_about.php)

Type: Ongoing

Lead Facilitator(s): North Carolina Department of Transportation in partnership with University of North Carolina campuses; NCATA; League of American Bicyclists; and local advocacy organizations

National Bike Month and Walk to School Day Support/Participation

Introduction: National Bike Month is an opportunity to celebrate the unique power of the bicycle and the many reasons people choose bicycles as their mode of transportation or for recreation. National Walk to School Day is an opportunity to make walking to school a fun event, encouraging walking for both parents and children.

Action Item/Recommendation: All state departments and agencies should support and encourage staff to participate in National Bike Month and Walk to School Day activities that are hosted by local groups across the state. In addition to attending and participating in local events, the NCDOT should develop an interactive website for participants to share their

experiences as they shift their mode of transportation. This would be similar to the WalkBikeNC Challenge that took place during the development of this Plan.

The state should encourage employers and school systems to offer incentives to employees and students who participate in National Bike Month activities and Walk to School Day events to promote initiative and reward their participation. For example, the state should encourage school districts to partner with parents to organize bicycling trains and walking school buses for the children who will participate. Each group of students should be led safely to school by a parent or teacher volunteer. Additionally, the state should also encourage employers to allow flexible work days to employees participating in National Bike Month.

Type: Ongoing

Lead Facilitator(s): North Carolina Department of Transportation in partnership with the DPI; local municipalities; school districts; and private employers

Bicycle Commuter Services

Introduction: This program is modeled on Bicycle Colorado's Bicycle Commuter Services (BCS) webpage. Bicycle Colorado offers a "program designed to educate entire workplaces about bicycling to work. BCS is aimed at employers who want to demonstrate good corporate citizenship while simultaneously maximizing cost savings and productivity in supporting healthier, happier and more productive employees. Through our program, employees will learn everything they need to know in order to commute to work comfortably, safely and efficiently. This is done through a combination of classroom and on-bike training. We have found that combining education sessions with on-the-road skills demonstrations is most effective at turning employees into confident bicycle commuters."

Action Item/Recommendation: The state of North Carolina should partner with local bicycling advocacy groups to develop a program similar to Bicycle Colorado's Bicycle Commuter Services and offer the program to state departments and agencies, regional and local government agencies, private employers and retailers.

Type: Ongoing

Lead Facilitator(s): North Carolina Department of Transportation in partnership with the Department of Commerce; and DHHS

Walking or Bicycling Youth Engagement Contest

Introduction: Fun and interactive statewide competitions educate and engage students about the benefits of bicycling and walking. Each year the state should coordinate with the school districts to schedule a poster, Photovoice, YouTube, and other audio/visual media contest and develop the "scoring" criteria for the audio/visual media. Students in grade four, five, or six would be the best age group for this contest, and the state and school districts should determine which grade (or grades) should participate. Once the details of the contest have been clearly defined, the students should be tasked with creating media that highlights the benefits and value of walking and/or bicycling. Students could be asked to include their favorite place to bicycle or walk to in their town, or where they have enjoyed bicycling or walking in another town in North Carolina. A selection panel made up of representatives from NCDOT, other state departments,

▲ In Jacksonville, NC, crossing guard training provides guidance to communities interested in employing crossing guards at schools.

and the participating school districts will choose the winner of the contest. The Engagement Contest could be launched during a "Take A Child Outside" week, or as part of the Walk to School Day event. Each of these initiatives helps educate and encourage children to learn about environmental stewardship while connecting with nature during a walk or outdoor activity.

Type: Ongoing

Lead Facilitator(s): North Carolina Department of Transportation in partnership with the DPI

Bike-Repair Programs

Introduction: By providing well-maintained bicycles to members of the program, bicycle-repair programs encourage use and empower people to make more trips by bicycle. Many programs have also served to teach bike safety, maintenance, and on-road skills and have encouraged more people to bicycle for exercise, transportation, and leisure. In addition, these programs have increased the visibility of bicycling in communities. Community bike-repair programs take different forms, but typically are run by local community groups. These groups acquire and are donated used bicycles that are then repaired by and for lower-income residents, who are offered training for the repairs and an option to volunteer for earn-a-bike programs. Example programs such as "bicycle recyclery", or "earn a bike" already exist as potential models that extend bike ridership and ownership to lower income populations.

Action Item/Recommendation: The state should develop a tool-kit of model programs for different size municipalities and offer training workshops to local municipal officials and staff who wish to use the state's model to develop a local program. One successful example of a bike-repair program is the Carrboro Recyclery.

Type: Ongoing

Lead Facilitator(s): North Carolina Department of Transportation in partnership with local municipalities; and Bicycle and Pedestrian Advisory Committees (BPACs)

Communicate Maintenance Schedules

Action Item/Recommendation: NCDOT Division Offices should provide early notification to regional planning organizations (MPOs, RPOs, COGs) and municipalities of maintenance/restriping schedules. Annual meetings should be held when updated maintenance/restriping schedules are released to allow for face to face conversation between local staff and NCDOT Division staff. This information would allow the local governments an opportunity to provide input regarding their needs and support for accommodation measures such as restriping to include bicycle lanes and other relevant markings.

Type: Ongoing

Lead Facilitator(s): North Carolina Department of Transportation Division Offices in partnership with regional planning organizations (MPOs/RPOs/COGs); and local municipalities

Enforcement Programs, Initiatives, Strategies

Enforcement is critical to ensure that motorists, bicyclists, and pedestrians are obeying common laws. It serves as a means to educate and protect all users. The goal of enforcement is for bicyclists, pedestrians, and motorists to recognize and respect each other's rights on the roadway. In many cases, officers and citizens do not fully understand state and local laws for motorists, bicyclists, and pedestrians, making targeted education an important component of every enforcement effort.

Purpose

According to the Alliance for Biking and Walking, North Carolina ranks 41st out of the U.S.'s 50 states for pedestrian safety and 44th for bicycling safety. Enforcement programs are a key tool in improving bicyclist and pedestrian safety, as well as improving perceptions of safety. As one of its goals, this Plan seeks to "create and maintain safe, efficient, and accessible pedestrian and bicycle accommodations as fundamental elements of North Carolina's transportation network to provide mobility, recreation, and physical activity opportunities to all North Carolinians." Meeting that goal requires a commitment to inter-agency cooperation in enforcing the state's laws as they relate to bicyclists and pedestrians, educating all road users about state and local laws, and monitoring trends in roadway safety for bicyclists and pedestrians.

Existing & Past Efforts

Crash Data Tool

Introduction: Through a contractual partnership with NCDOT, the Highway Safety Research Center (HSRC) administers the NC Crash Data Tool. This involves yearly updating, geocoding, analyzing, and maintaining roughly 900 bicycle collision reports and 2,600 pedestrian collision reports. Agencies around the state are routinely using the crash data tool for information.

Type: Ongoing

Action Item/Recommendation: This Plan recommends continuing the Crash Data Tool program and expanding promotion of the tool as a resource for agencies and organizations around the state. Expanded promotion will add to the value of the program and also reduce any redundancy created by local agencies establishing their own means of crash data analysis. NCDOT should ensure that an explanation of the tool and its uses and availability is included in all Safe Routes to School activities, Complete Streets Workshops (or other design workshops), safety related manuals and guidebooks, and is incorporated into planning efforts funded by the Planning Grant Initiative.

Lead Facilitator(s): North Carolina Department of Transportation; Highway Safety Research Center

Bicycle and Pedestrian Law Manuals and Guidebooks

Introduction: In addition encouragement and education focused manuals (discussed previously in this Chapter); NCDOT's Division of Bicycle and Pedestrian Transportation has developed two informative guidebooks focused on legal matters related to bicyclists and pedestrians:

- *Guide to NC Bicycle & Pedestrian Laws*
- *NC Bicycle Helmet Campaign Guide*

The guides have not been updated in recent years. The materials are not actively marketed, but are available online. When first published, NCDOT provided copies of the Guide to NC Bicycle and Pedestrian Laws to law enforcement agencies around the state.

Type: Ongoing

▼ *With safe pedestrian and bicycle facilities in place, children and parents can feel confident about walking and biking more often.*

Action Item/Recommendation: The *Guide to NC Bicycle and Pedestrian Laws* is a particularly important and popular item and should receive an update bi-annually to ensure consistency with current laws. NCDOT should assign the role of updating the manual to a specific staff person within the agency to ensure the information is updated every two years. The designated staff person should also establish opportunities for promoting the manual within existing NCDOT programs, such as Safe Routes to School and the Planning Grant Initiative.

Recognizing the passage of the mandatory helmet law for youth in NC (2001), this Plan recommends that NCDOT discontinue the NC Bicycle Helmet Campaign Guide.

Lead Facilitator(s): North Carolina Department of Transportation

School Crossing Guard Training Manual

Introduction: The School Crossing Guard Training Manual is a tool for crossing guard trainers to lead instruction workshops for crossing guards. Elements covered in this manual include crossing procedures, characteristics of children in traffic, responsibilities of the crossing guard, emergency procedures, signalization and traffic signs, professional guidelines, and legal issues. The manual has not received an update since 2001, with the exception of adding changes to the MUTCD component of the manual.

Type: Ongoing

Action Item/Recommendation: The *School Crossing Guard Training Manual* serves an important role for law enforcement agencies responsible for training crossing guards. The Manual will be updated by NCDOT. Before updating the training manual, this Plan recommends that NCDOT conduct a brief survey of agencies responsible for crossing guard training and identify preferred training methods and current needs related to crossing guard training. The surveying process can include targeted interviews, as well. Currently in North Carolina, local communities choose what agency is responsible for training the guards. Conducting the survey will allow NCDOT to better respond to the differences in approaches to training throughout the state. Based on the survey's results, NCDOT will update the manual and establish bi-annual targeted workshops to "train the trainers" of crossing guards.

Lead Facilitator(s): North Carolina Department of Transportation; Local law enforcement

"Watch For Me NC" Pedestrian Campaign

Introduction: The "Watch For Me NC" campaign is intended to improve pedestrian safety by influencing the behaviors of drivers and pedestrians through safety messaging and enforcement. The program is currently targeted to the Triangle region of North Carolina. The effort was launched in 2012 through Transportation Enhancement funding provided by NCDOT and federal funds provided by the National Highway Traffic Safety Administration. The four municipalities of the Triangle region have provided

substantial support for and participation in the campaign. The four major universities and their campus police departments have also been very supportive of this effort. Funding and expansion for the bicycle component will be launched in 2013.

Fall 2012 Update: The Bike30 Unit along with the Traffic Unit conducted a Pedestrian Operation at the intersection of Gregson St and Lamond Ave. They conducted the operation at the same place and same time as they conducted the informational checkpoint the day before. They cited 13 drivers with "Failure to Yield to Pedestrian in a crosswalk", 1 driver was charged with Driving with license revoked, 1 driver was charged with Driving with no license, and 1 driver was arrested and charged with two FTA's (Failure to Appears). The unit was approached and thanked by several pedestrians, and citizens of the area. (Sergeant B. M. Massengill, Durham Police Department)

Type: Ongoing

Action Item/Recommendation: The Triangle region "Watch for Me NC" pedestrian campaign has been well-supported and successful. This Plan recommends that NCDOT fund the Triangle region "Watch For Me NC" campaign for the 2013 year and establish a strategic plan for expanding the program to all regions of the state. Based on the Triangle region's successful program model, create a "toolkit" for implementing the program in other regions and use localized versions of the materials created for the Triangle region. When expanding the program to other regions, provide one year of funding for program development and provide guidance on utilizing local staff and resources to bolster the program, as was done in the Triangle region. Pedestrian and bicyclist safety, rights and etiquette, along with street crossing rules, traffic signal messages and meanings, and how to follow and obey pavement markings should be taught to children and adolescents to increase their safety and reduce automobile-pedestrian crashes in North Carolina. Courses should be developed and incorporated into the physical education curriculum in elementary schools and middle schools.

As part of the strategic expansion plan the state should consider increasing funding for this program and expand its reach in three distinct ways:

1) Develop a communications strategy with specific goals for increasing the number of children exposed to the program through active promotion to schools and teachers;

2) Expand the program to include bicycle-related information and materials; and

3) Create an online interactive version of the bicycle and pedestrian safety materials that will be attractive to each of the targeted age groups.

Example: Existing program in Oregon

Bicycle Transportation Alliance's Pedestrian Safety Enforcement Mini-Grants program:

ODOT funds enable enforcement agencies throughout the state to stage crosswalk enforcement actions educating motorists, cyclists, and pedestrians on crosswalk laws. In these operations, a decoy police officer attempts to cross a street at an intersection or marked crosswalk. (Crosswalk laws apply to unmarked crosswalks as well.) If passing motorists fail to stop and yield for the pedestrian they are issued either a warning or a citation. The operations include a media outreach component, with the purpose of raising awareness around motorist, cyclist, and pedestrian responsibilities.

Lead Facilitator(s): North Carolina Department of Transportation in partnership with DHHS; the DPI; Department of Crime Control and Public Safety; North Carolina State Highway Patrol; municipal and county police departments; local political jurisdictions; local municipalities; and school districts

New Program Recommendations

Installation of Cameras

Action Item/Recommendation: Local law enforcement units should play a key role in vehicle/driver controls and enforcement such as cameras. Cameras should be installed at high traffic volume intersections and at historically unsafe intersections where vehicular-pedestrian and vehicular-bicyclist crashes have occurred. A camera may be connected to the traffic signal and to sensors at the intersection stop line that monitor traffic flow. The camera is triggered by any vehicle entering the intersection above a preset minimum speed and following a "grace period" of time after the signal has turned red. The state should determine the appropriate "grace period" for cars to pass through the intersection after the light has turned red. Violations are mailed to the person listed on the vehicle registration.

NCDOT should install cameras on state routes and highways and should encourage local municipalities to consider the installation of cameras on priority local roads. Camera violation fees are utilized in many different ways in different states. For example, violation fees in Florida are used to fund research to cure paralysis. NCDOT should consider collecting violation fees in a designated multi-modal traffic safety fund and the funds should be used to create safer corridors for all roadway users.

Type: Ongoing

Lead Facilitator(s): North Carolina Department of Transportation in partnership with the State Highway Patrol

Automated Speed Enforcement Devices & Systems

Introduction: Automated speed enforcement devices and systems can be an effective tool for managing speed and reducing speed related crashes. Some devices record and visibly display vehicle speed, and other devices capture a real-time photo of traffic as well as devices record and visibly display vehicle speed. Most devices use radar and motorists with a radar detector in their vehicle will be alerted of the presence of the radar. This program would change motorists behavior and encourage safe driving, responsible driving, staying alert, and obeying the posted speed limit.

Action Item/Recommendation: NCDOT should install permanent, fixed photo speed enforcement devices. If permanent, fixed photo speed enforcement devices are too expensive to consider at the statewide level, mobile photo speed units may be a more affordable option for North Carolina.

Type: Ongoing

Lead Facilitator(s): North Carolina Department of Transportation in partnership with the State Highway Patrol

Bicycle and Pedestrian Needs Checklist

Action Item/Recommendation: The state should create a Bicycle and Pedestrian Needs Checklist as an additional phase in the project design process. A Bicycle and Pedestrian Needs Checklist would ensure the full participation and timely review of the NCDOT Bicycle and Pedestrian Transportation staff in the development of new projects which have the potential to benefit cyclists and pedestrians. One component of the checklist would be to increase bicycle and pedestrian related amenities at intermodal facilities and any existing or future Park & Ride facilities. Adding amenities such as bicycle parking racks can make multimodal travel easier and more seamless. There are many examples of Checklists available online in the form of Complete Streets checklists. Elements from the example Checklists below should be considered for inclusion by the NCDOT. Below are a few example resources:

- http://www.seattle.gov/transportation/compSt_how.htm
- http://www.mtc.ca.gov/planning/bicyclespedestrians/routine_accommodations.htm
- www.state.nj.us/transportation/capital/pd/documents/CompleteStreetsChecklist.doc

Type: Ongoing

Lead Facilitator(s): North Carolina Department of Transportation Division Offices in partnership with regional planning organizations (MPOs, RPOs, COGs), county planning departments; and municipal planning departments

Facility Inspection and Maintenance

Action Item/Recommendation: The state should set minimum standards for acceptable sidewalk and bicycle facility conditions. Setting and maintaining minimum condition standards will enable all users to use facilities safely. Establish standards for maintenance of bikeways including replacement of worn pavement markings and damaged signs, sweeping away debris, repaving streets and repairing potholes. The state should encourage municipalities to require sidewalk inspection when properties are sold to reduce liability for property owners, who can be held liable if someone is injured on the sidewalk in front of their property. The state should set-up a hotline to effectively and efficiently collect information regarding problematic facilities.

Type: Ongoing

Lead Facilitator(s): North Carolina Department of Transportation in partnership with municipalities

Programmatic Recommendation Review Table

The table that begins on page 7-29 illustrates how each recommendation in this Chapter serves a specific function or role in the diverse toolkit of programmatic efforts that NCDOT should pursue to enable people to walk and bicycle more, and lead healthier lives. Each of the five pillars (Mobility, Safety, Health, Economics, Environment) that guide this Plan are shown in the table, along with the programmatic recommendations associated with it.

		Program Name	Mobility	Safety	Health	Economics*	Environment*
EDUCATION	ONGOING	Bicycle Helmet Initiative		Sa	He		
		Let's Go NC - Bicycle and Pedestrian Curriculum	Mo	Sa			
		Safety Education Materials		Sa			
		Share the Road Posters		Sa			
		Safe Routes to School Community Workshop	Mo	Sa			
		Bicycle Planning and Design / Pedestrian Planning and Design Workshops	Mo	Sa			
		Designing Pedestrian Facilities for Accessibility	Mo	Sa			
		Streetwise Cycling - Guide to Safe Bicycling in North Carolina	Mo	Sa			
		Pedestrian Safety Roadshow	Mo	Sa			
		Walkable Communities Conferences	Mo	Sa	He		
		Workshops and Webinars	Mo	Sa	He	Ec	En
	NEW	Bicycle Law Enforcement Education for Police		Sa			
		Statewide Bicycle Skills Training for Adults	Mo		He		
		"Train the Trainers" - Bicycle Skills Training for Child Care Personnel	Mo		He		
		Bicycle Rodeo Kit	Mo	Sa			
		Drivers Education Training	Mo	Sa			
		Bicycle and Pedestrian Facility Design Seminars	Mo	Sa			

		Program Name	Mobility	Safety	Health	Economics*	Environment*
ENCOURAGEMENT	ONGOING	Bicycle/Pedestrian Commuter Incentive Programs	Mo		He	Ec	En
		Safe Routes to School Program	Mo	Sa			
		Bicycle Events - A Community Guide	Mo			Ec	En
	NEW	Bicycle Parking Installation	Mo			Ec	En
		Safe Routes to School (Regional Plans)	Mo	Sa	He		
		Weekend Walkabouts	Mo		He		
		Campus Commuter Program	Mo		He	Ec	
		National Bike Month and Walk to School Day Support/Participation	Mo		He	Ec	
		Bicycle Commuter Services	Mo		He	Ec	
		Walking or Bicycling Poster Contest	Mo	Sa	He		
		Bike-Repair Programs	Mo		He	Ec	
		Communicate Maintenance Schedules	Mo				

*Traditionally, bicycle and pedestrian programs do not directly impact economic and environmental initiatives, although the indirect impact can still be significant. See appendices on Environmental Stewardship and Economy for more information about programs specifically related to these pillar topics.

		Program Name	Mobility	Safety	Health	Economics*	Environment*
ENFORCEMENT	ONGOING	Bicycle Helmet Initiative		Sa	He		
		Let's Go NC - Bicycle and Pedestrian Curriculum		Sa			
		Safety Education Materials		Sa			
		Share the Road Posters	Mo	Sa			
	NEW	Safe Routes to School Community Workshop	Mo	Sa			
		Bicycle Planning and Design / Pedestrian Planning and Design Workshops	Mo				
		Designing Pedestrian Facilities for Accessibility	Mo	Sa			
		Streetwise Cycling - Guide to Safe Bicycling in North Carolina	Mo	Sa			

Endnotes

1. Pucher, J., Dill, J., & Handy, S. (2010). Infrastructure, programs, and policies to increase bicycling: An international review. Prev Med, 50, S106-S125.

8 Implementation & Funding

Little Sugar Creek Greenway, Charlotte, NC (construction)

Overview

In order to make North Carolina a premier state for walking and bicycling that improves health, safety, mobility, economics, and environmental stewardship, a concerted, connected, coordinated and collaborative effort is required. The action steps table in this chapter provides guidance on how NCDOT and partners across the state can turn this vision into reality. The strategy for doing so involves some physical changes to the roadway environment and other landscapes, as well as new government policies and programs. Successful implementation will also require partnerships and support from local governments, regional planning entities, stakeholders, and local pedestrian and bicycle advocates. This chapter will serve as a simple guide, tying all the components of the Plan together, addressing the actions that must be undertaken by NCDOT and its partners.

NCDOT Division of Bicycle and Pedestrian Transportation (DBPT)

The NCDOT Division of Bicycle and Pedestrian Transportation (DBPT) will be the lead agency responsible for implementing the recommendations of this Plan. Other divisions within NCDOT, other state agencies, and non-state agencies including MPOs, RPOs, counties, municipalities, and private sector groups will have complementary and significant roles in implementing the recommendations provided within this Plan.

DBPT staff will be charged with identifying and securing non-traditional sources of funding, broadening the work of the planning program, expanding upon federal and state design standards for facility development including revised guidelines for MUTCD, AASHTO, ADA, access to transit, Complete Streets, and supporting Health Impact Assessments. DBPT will work to achieve the goals of this Plan to improve mobility, safety, economic development, health, and environmental stewardship. As defined with the NCDOT *2040 Transportation Plan*, DBPT will perform its work program utilizing a larger share of the overall NCDOT budget dedicated for pedestrian and bicycle projects and programs.

In this Chapter

Overview

NCDOT Division of Bicycle and Pedestrian Transportation (DBPT)

Partnerships and Strategies

- *Mobility*
- *Safety*
- *Health*
- *Economy*
- *Environment*

Project Delivery

Funding

Staffing

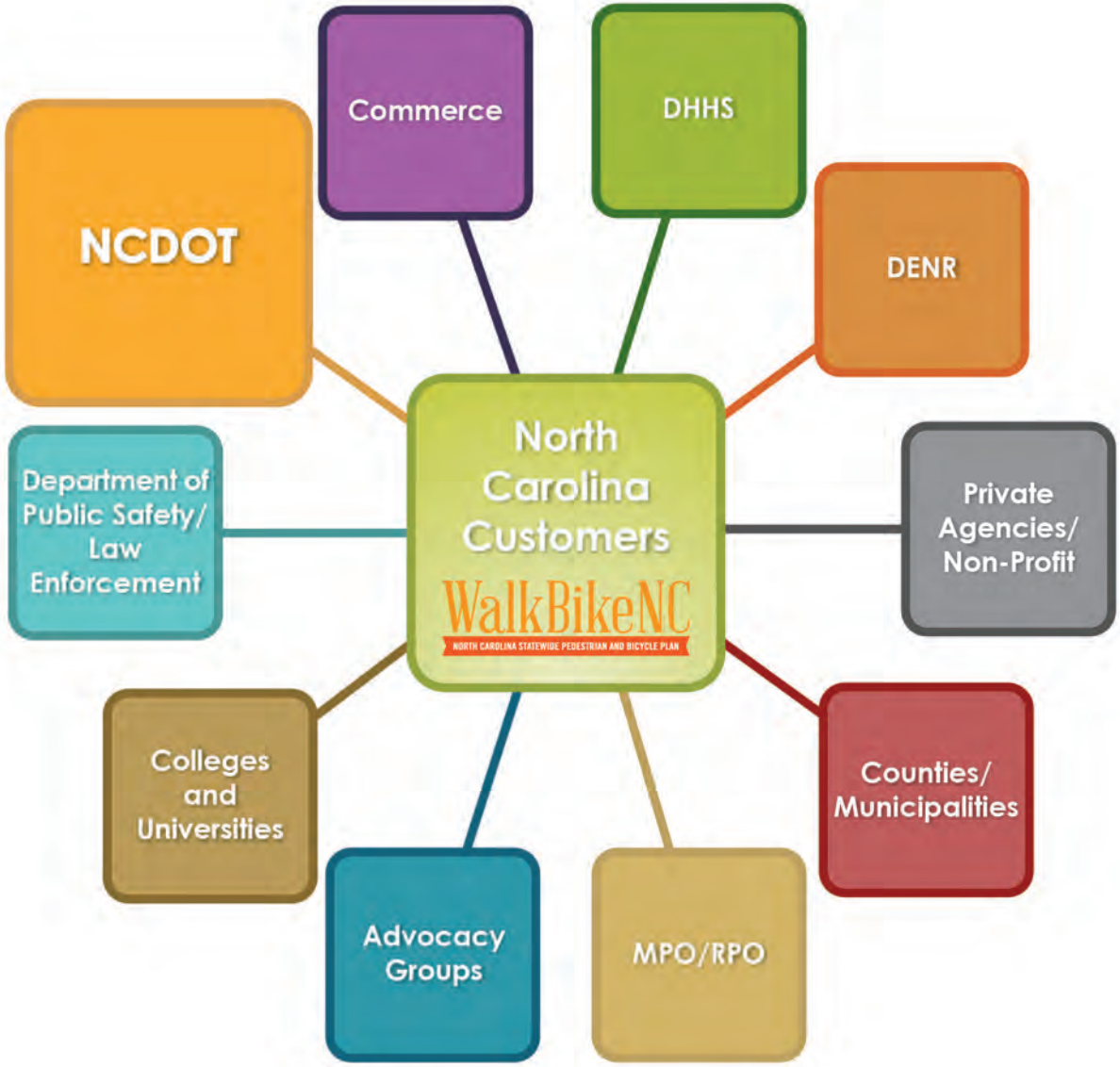
Accomplishing the recommendations and action steps of this Plan will require the dedication of current and possibly additional resources for the DBPT in the future. DBPT needs to bolster its ability to be present geographically across the state to participate closely in project scoping and design. DBPT also should expand its ability to address the five pillars of this Plan, including liasons to DHHS, DENR, and the Department of Commerce. It will be critical for new grant administers to leverage new and additional pedestrian and bicycle funding.

Partnerships and Strategies

Accomplishing the vision and goals of this Plan will require support and collaboration between multiple public and private agencies. The WalkBikeNC Plan's funding partners and stakeholders represent mobility, safety, health, environment, and economic concerns. Ultimately, the goal of making North Carolina a premier state for walking and bicycling accomplishes the goals of all partners and stakeholders. NCDOT will be the lead implementing agency but cannot achieve success on its own.

The chart on the following page represents a broad collaboration and partnership between key agencies and stakeholders and how they fit into the overall team to address North Carolina customers. The detailed objectives, strategies, and performance measures, organized by plan principle/pillar, are featured next and provide substantially more prescriptive guidance and lead agency task assignments.

The broad partnership is shown in this graphic illustration. The following pages highlight key roles of each contributor. NCDOT will be the lead implementation agency.



Mobility

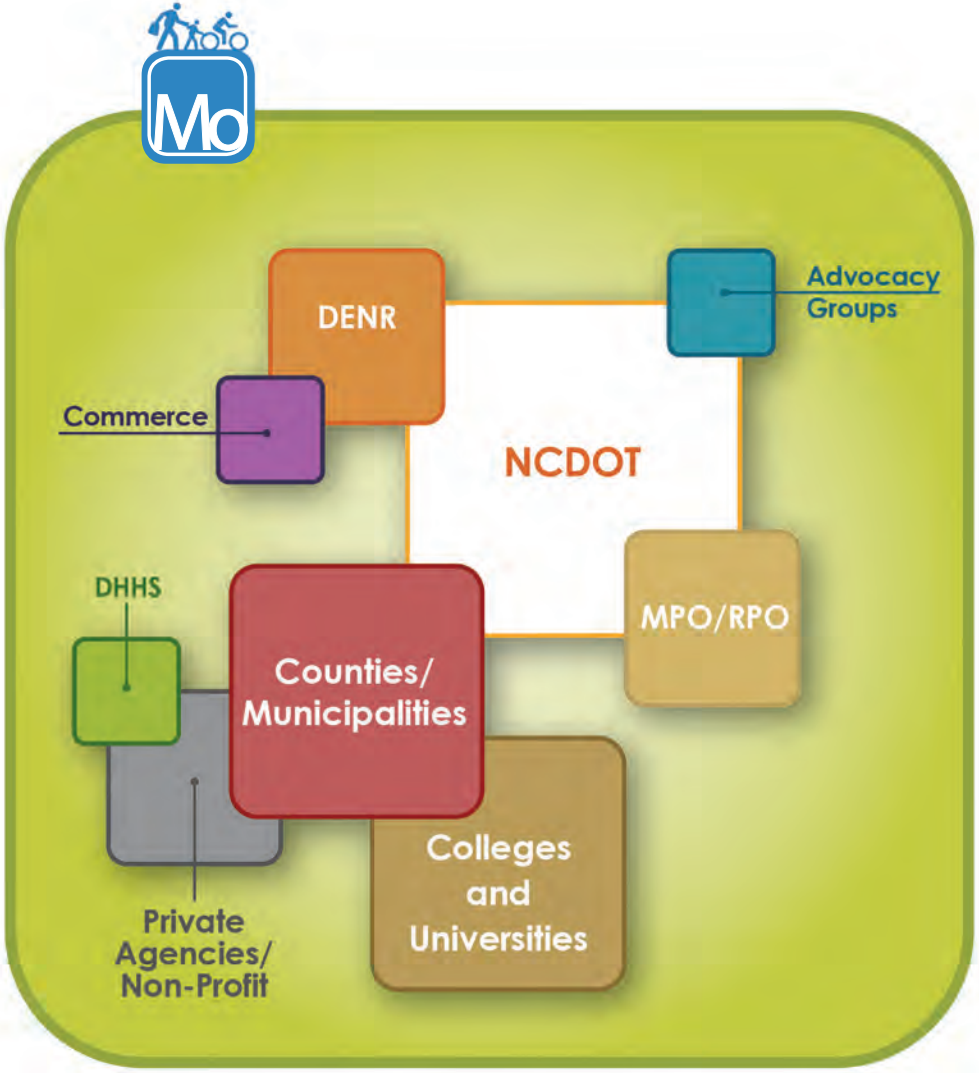
Principle One: Expand Walking and Bicycling Network

NCDOT will work with public and private sector partners to improve the quality of transportation choice for pedestrian and bicycle travel throughout North Carolina by expanding and connecting the local, regional and intrastate network of bicycle facilities, supporting the expansion of community-oriented pedestrian facilities, providing better access to transit, and meeting the needs of the disabled in all project work. NCDOT, in partnership with local governments and the private sector, will work collaboratively to streamline pedestrian and bicycle project delivery through a multi-prong approach that focuses on identifying available funding, reducing encumbrances, and implementing the NCDOT Complete Streets Policy.

NCDOT will update the Division of Bicycle and Pedestrian Transportation planning grant program to modernize its function and purpose, create a new category of funding that supports ADA, and focus on corridor and small area grant awards.

NCDOT will work with colleges and universities to improve data, technology, and web applications that make planning and customer communication more efficient.

Finally, NCDOT and local partners will focus on land use and transportation integration. Cities will improve best practices and consider incentives for infill development and walkable/bikable development.



This diagram represents the partnerships and lead agencies necessary to address this principle.

Mobility: *Equity, choice, connectivity among transportation modes*

Objectives (The WHAT)	Performance Measures (The EVALUATION)	Example Strategies (The HOW)
• Expand and connect the local, regional and intrastate network of bicycle facilities • Expand community-oriented pedestrian facilities • Improve transportation equity (fairness in transportation choice and facilities across communities) • Provide pedestrian and bicycle access to transit • Reduce traffic congestion • Improve performance-based program delivery • Improve efficiency of technology and planning	• Pedestrian and bicyclist mode share • Percentage of trips made by bicycling and walking • Percentage of non-controlled roadway mileage that has sidewalks • Percentage of non-controlled roadway mileage that has designated and/or separated bicycle facilities • Percentage of signalized intersections with pedestrian crosswalks and crossing signals • Regions/MPOs/RPOs/Counties/Municipalities with bicycle/pedestrian/greenway plans • Regions/MPOs/RPOs/Counties/Municipalities implementing local bike/ped policies • Percentage of eligible roadway projects built as Complete Streets • Percentage of transit, rail and ferry hubs with complete access amenities for bike/ped • Percentage of state bike routes with paved shoulders • Customer pedestrian and bicycle counts	• Increase investment in walking and biking infrastructure • Streamline project planning and delivery • Complete Streets implementation » Update Roadway Design Manual and Bicycle/Pedestrian Facility Design Guidelines » Pass Complete Streets as law • Coordinate land use and transportation planning • Enhance transit access policies and design to make transit accessible, attractive, and safe for pedestrians and bicyclists • Update NCDOT's Bicycle and Pedestrian Transportation planning grant program » modernize its function and purpose » create a new category of funding that supports ADA » focus on corridor and small area grant awards • Partner with the League of American Bicyclists to improve the Bicycle Friendly State Program ranking » Annual evaluations and response to successful and unsuccessful programs appropriately to ensure sustainable future investments • Establish an evaluation/benchmarking program • Partner with colleges, universities, and others to improve data development and technology

▲ This plan's strategies were developed from many partners, agencies and advocacy groups across the state. Above: one of many workshops and focus groups that provided input reflected in the strategies and action step idea table (found in Appendix 9.10).

National recognitions such as Walk Friendly Communities and Bicycle Friendly Communities/Businesses/Universities are clear signs that pedestrian and bicycle mobility needs are being addressed. These programs serve as an effective means for evaluating progress.

Diagram of strategy from Principle #1. The implementation of Complete Streets is essential to reach the goals of the WalkBike NC Plan.

Implement NCDOT Complete Streets Planning and Design Guidelines

Conduct Complete Streets training

Update Related NCDOT Guidelines

Pass Complete Streets Policy as law

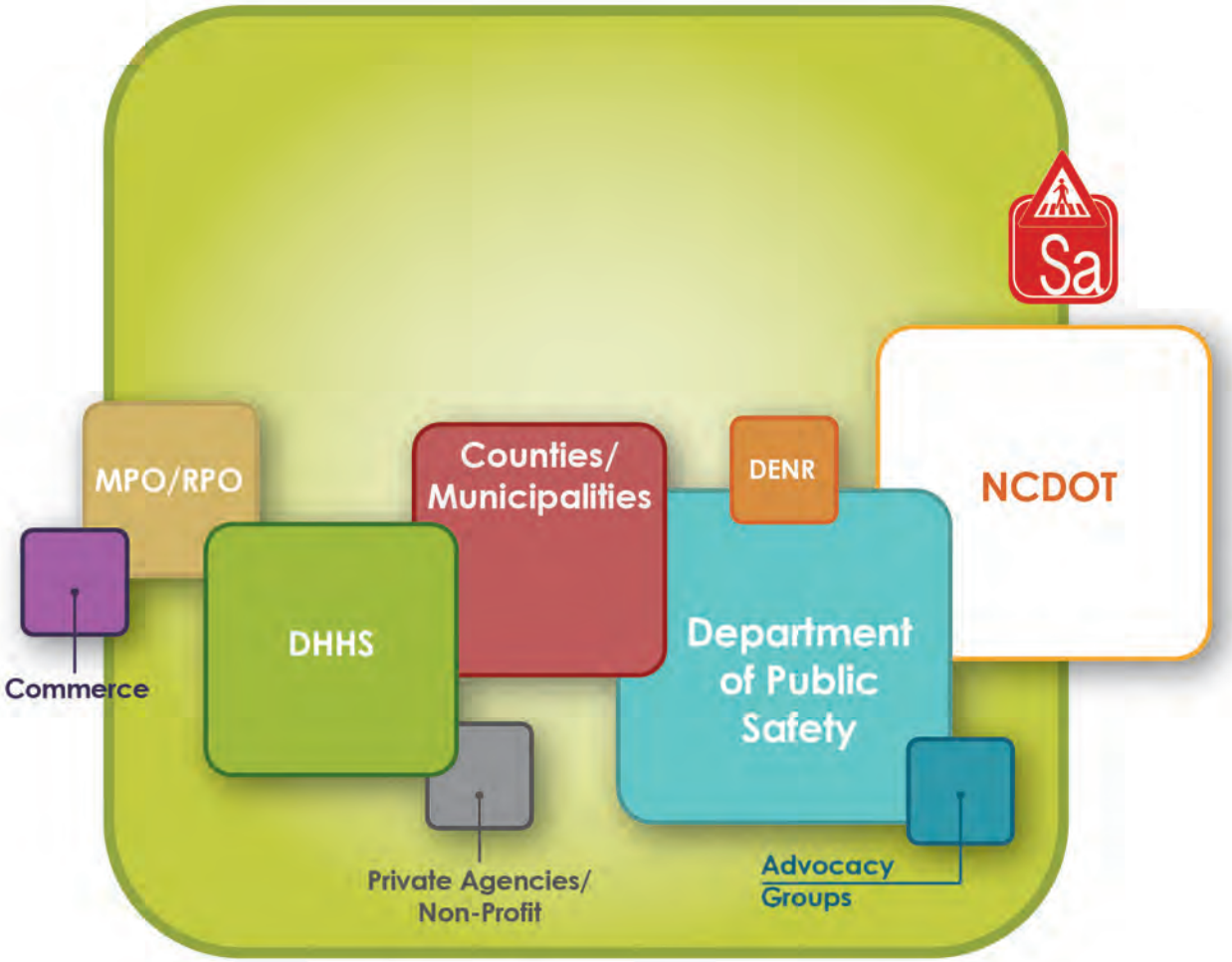
Develop Complete Streets Guidelines v2.0 (more facility types/greater detail)

Incorporate bicycling and walking accommodations in all roadway projects & conduct follow-up audits

Safety

Principle Two: Improve Public Safety for Walking and Bicycling

A primary goal of this Plan is to improve safety for all roadway users through strategic, consistent and interconnected pedestrian and bicycle facility improvements, along with appropriate policies and strategies for accident prevention, education and enforcement. NCDOT and public safety agencies will work cooperatively to implement the recommendations defined within this Plan.



This diagram represents the partnerships and lead agencies necessary to address this principle.

8

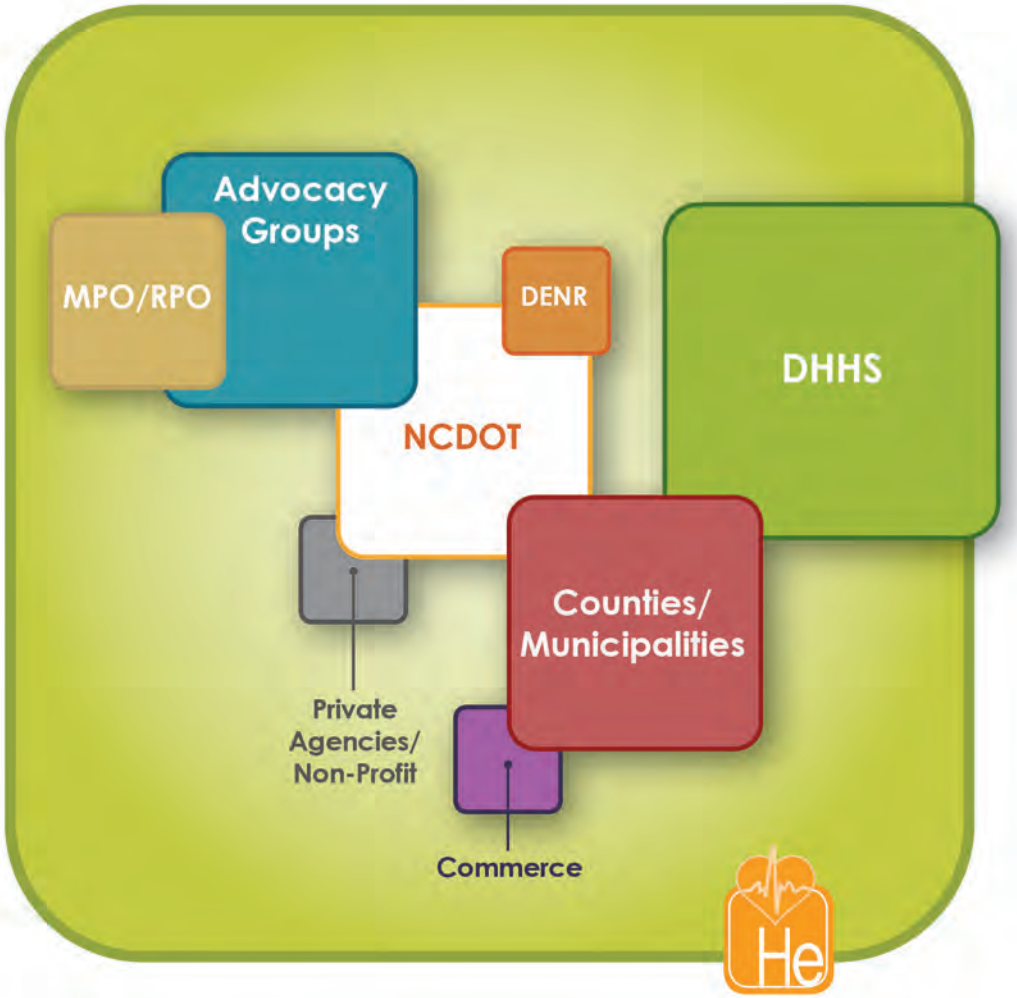
Safety: *Public safety for pedestrians and bicyclists*

Objectives (The WHAT)	Performance Measures (The EVALUATION)	Example Strategies (The HOW)
• Create a strategic, consistent, and connected pedestrian and bicycle network • Improve safety of pedestrians and bicyclists • Increase and improve enforcement of motorist/bicyclist/ pedestrian laws to ensure law abidance • Improve crash data reporting and mapping and preventative/ pro-active safety strategies	• Pedestrian and bicyclist crash and fatality rates (per capita) • Pedestrian and bicyclist crash and fatality rates (per capita) relative to other states • Number of schools, universities, and colleges participating in pedestrian and bicycle safety education/ encouragement programs • Cities, businesses, and universities designated as Bicycle and Walk Friendly by the League of American Bicyclists and the Highway Safety Research Center • Improvements at bicycle and pedestrian crash hotspots and the subsequent impact on crash reduction	• Make strategic facility improvements • Evaluate the factors considered as part of bicycle and pedestrian HSIP projects • Improve enforcement efforts • Continue education programs (including rights of the road) • Develop policies and strategies for accident prevention • Sustain Safe Routes to School program • Use FHWA Crash Modification Factors to support decision-making • Build partnerships between transportation and public safety agencies • Establish evaluation/benchmarking program

Health

Principle Three: Embrace Health and Wellness as a Significant Factor in Transportation Decisions

North Carolina must embrace a diversified statewide transportation program that contributes significantly to improved public health and wellness by providing and supporting the development of active living environments with safe, connected and accessible transportation facilities. The Department of Health and Human Services and NCDOT will work cooperatively with local health organizations, insurance companies and health care providers to implement the recommendations in this Plan to ensure that North Carolina's transportation system becomes part of successful intervention solutions.



This diagram represents the partnerships and lead agencies necessary to address this principle.

8

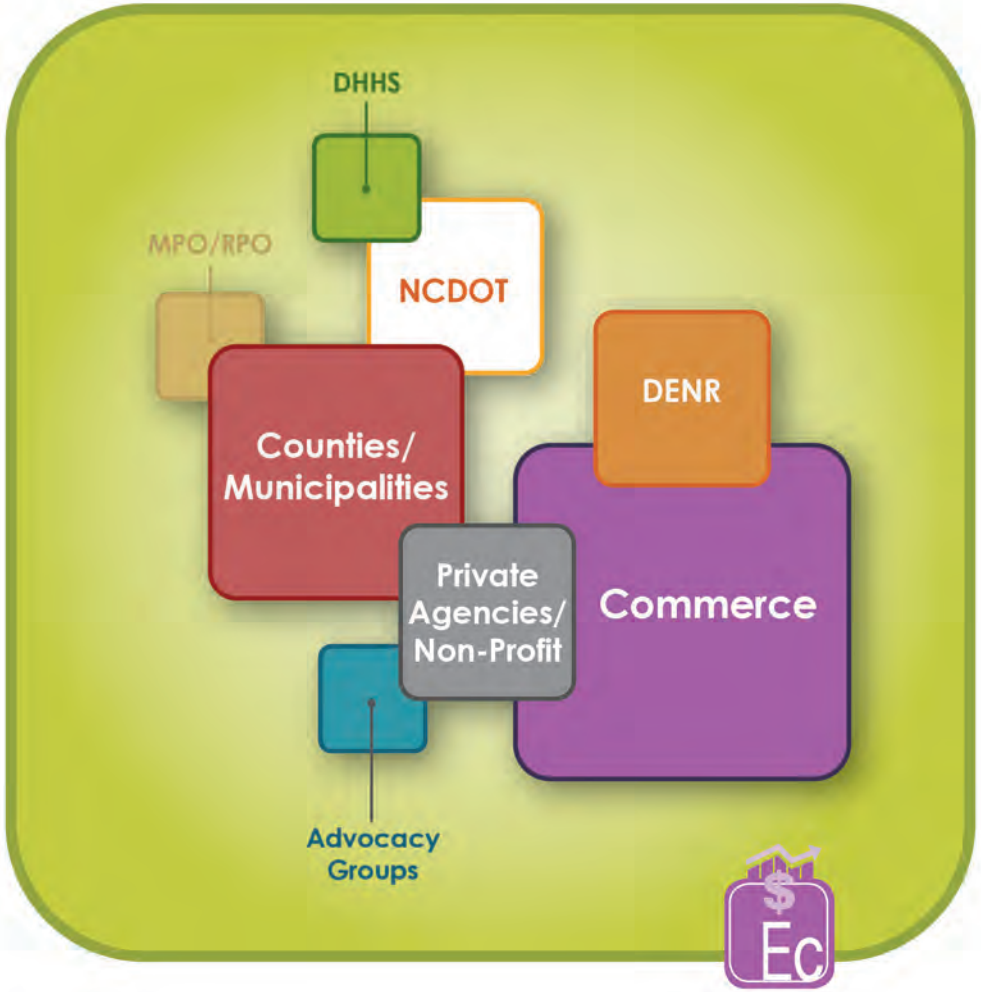
***Public Health**: Public health and wellness*

Objectives (The WHAT)	Performance Measures (The EVALUATION)	Example Strategies (The HOW)
• *Increase active living environments* • *Increase the safety, connectivity and accessibility of the bicycle and pedestrian network* • *Improve public health outcomes* • *Increase ADA compliance*	• *Physical inactivity rates* • *Obesity rates* • *Pedestrian and bicyclist crash and fatality rates (per capita) relative to other states* • *Health care costs (attributable to inactivity and sedentary lifestyle)* • *Percent of existing facilities brought into compliance with Americans with Disabilities Act (ADA) requirements* • *Inclusion of transportation planning questions as part of existing surveillance questionnaries used by the NC Depatment of Health (tracking health and wellness principle)*	• *Implement programs that encourage walking and bicycling* • *Involve health policy practitioners in comprehensive transportation planning, project scoping, and development* • *Continue DHHS and NCDOT Active Routes to School (ARTS) partnership* • *Incorporate Health Impact Assessments (HIAs) into transportation decision-making* • *Expand education, encouragement, and enforcement programs* • *Build and maintain partnerships between transportation and health professionals* • *Incorporate Public Right of Way Accessibility Guidelines into transportation development practices, strategies, and implementation* • *Establish evaluation/benchmarking program*

Economy

Principle Four: Foster Robust Economic Development by Promoting Walking and Bicycling

North Carolina can maximize economic competitiveness, and return on transportation investment, by creating more accessible, attractive, walkable and bikeable communities. Walking and bicycle facilities and programs have been shown to stimulate job growth across North Carolina. The Department of Commerce will work with NCDOT, North Carolina visitors and convention bureaus, chambers of commerce, local governments and private sector interests to build on the broad partnership that was created to prepare this WalkBike NC Plan and explore ways in which we transform our state to become a national and international destination for bicycle and pedestrian tourism.



This diagram represents the partnerships and lead agencies necessary to address this principle.

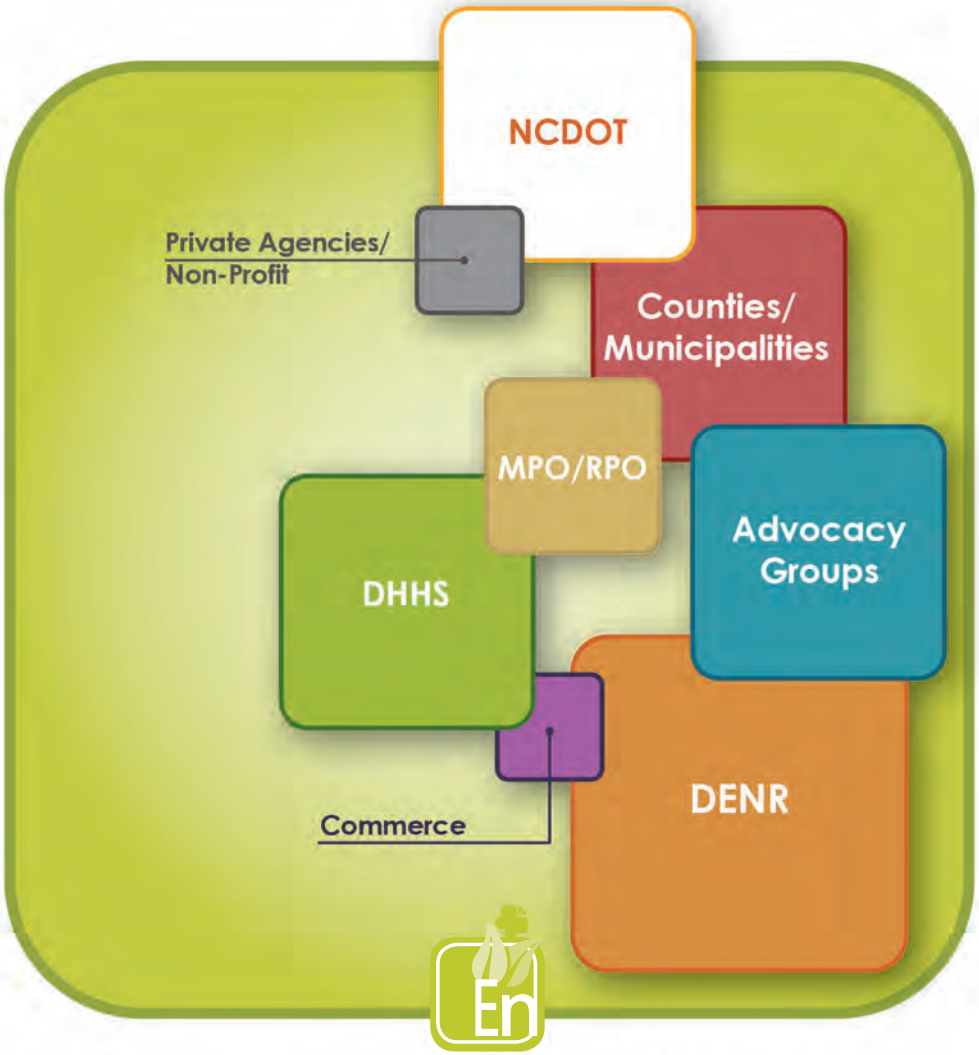
Economic Competitiveness: *A Robust Economy*

Objectives (The WHAT)	Performance Measures (The EVALUATION)	Example Strategies (The HOW)
• Use transportation investment to support economic development and job creation • Increase attractiveness and quality-of-life through walkable and bikable communities • Increase return on investment for bike/ped facilities • Increase active transportation investment to meet long term needs • Become a national and international destination for bicycle and pedestrian tourism	• Return-on-investment measures » Tourism » Property Values » Job Creation » Small business development » Individual quality-of-life measures • Percentage of active transportation project costs supported by local funding, public-private partnerships, and/or other cost recovery mechanisms • New business start-ups due to walkability and bikability of community	• Promote walking and bicycling • Enhance web presence at www.visitnc.com and www.accessnc.com • Expand Main Street Program to include Complete Streets design elements • Build partnerships between NCDOT, Department of Commerce, visitors and convention bureaus, chambers of commerce, local governments, and private sector • Initiate North Carolina-based return on investment analyses and post-construction assessment for active transportation infrastructure to inform decision-making • Diversify the funding stream that supports investment in bicycle and pedestrian facility and program development • Use return on investment analyses to inform transportation decision-making • Leverage effective funding strategies for active transportation investment to meet long-term needs • Establish evaluation/benchmarking program

Environment

Principle Five: Encourage Stewardship of North Carolina's Natural & Cultural Resources

North Carolina's land, air and water resources are the foundation of quality living, economic prosperity and community identity. NCDENR will utilize the Conservation Planning Tool (CPT). North Carolina should continue its national leadership in local, regional and statewide greenway development by completing a Green Infrastructure Plan for North Carolina. North Carolina should continue to plan and construct a statewide pedestrian and bicycle network that incorporates green infrastructure where possible and maximizes its environmental co-benefits, such as providing wildlife habitat corridors, mitigating flooding, and protecting air and water quality.



This diagram represents the partnerships and lead agencies necessary to address this principle.

Stewardship of our Environment: *Conserve and protect North Carolina's natural and cultural heritage*

Objectives (The WHAT)	Performance Measures (The EVALUATION)	Example Strategies (The HOW)
• Reduce automobile dependence • Increase the active transportation linkages between the state's natural and cultural resources • Conserve and protect North Carolina's natural resources • Expand statewide greenway network	• Percentage of planning and design efforts that utilize Conservation Planning Tool • Reduction in transportation-related emissions due to increase in walking/bicycling trips • Miles of greenways/shared-use paths • Measure of connectivity between park assets	• Complete a Green Infrastructure Plan (blueprint for improving ecological footprint and targeting areas that need protection) for North Carolina • Expand the statewide network of greenways that links key natural and cultural resources • Build partnerships between NCDOT, NCDENR, land trusts and non-profits to promote collaboration • Utilize the Conservation Planning Tool (CPT) and Green Growth Toolbox (GGT) for transportation planning and design • Update and coordinate trail design guidelines (NCDOT, DENR) • Establish evaluation/benchmarking program

Project Delivery

Building upon Strategy One described previously, NCDOT will need to focus on improved, efficient, and customer-service driven project delivery. The following strategies below provide additional detail to what was described as part of Strategy One.

Sub-Strategy One: Institutional Awareness and Responsibilities

It is essential for NCDOT to embrace the Complete Streets policy and philosophy in all future work. States that are known for successful pedestrian and bicycle programs view pedestrian and bicycle elements as essential to the success of a roadway project. NCDOT staff have operated for many years with pedestrian-bicycle facilities considered ancillary and readily dropped to accommodate concerns about ROW acquisition/expense, environmental permitting, or other issues. Key action steps include:

1. Update Roadway Design Manual to include prescriptive guidance on comprehensive slate of pedestrian and bicycle design treatments.

2. Update NCDOT Bicycle Facility Design Guidelines and develop Pedestrian Facility Design Guidelines.

3. Require pedestrian and bicycle training, with support of ITRE, and require education credits to be met every two years.

Sub-Strategy Two: New Programs to Get Facilities On-the-Ground

1. Modify projects that are currently included in the State Transportation Improvement Program (STIP) to improve pedestrian and bicycle outcomes. In keeping with the principles of complete streets (and previous efforts such as "inclusion", "incorporation", and "mainstreaming") standard features of streets and roadways should accommodate bicyclists and pedestrians as incidental parts of larger highway and street projects. All projects that are not past the "design public hearing" stage should be reviewed and upgraded as needed using regular project funds in order for them to, at a minimum, meet NCDOT's complete streets policy.

The additional budget described above should not be used to accomplish this task. However, the additional funding could be used to improve projects in the STIP under two specific scenarios. The first involves projects that are past the design public hearing stage. These projects should be assessed on an ongoing basis to determine if additional pedestrian and bicycle features could be added without interrupting the project schedule and timeline. Using the additional funds for this purpose would create near term "on the ground" improvements while not undermining each District's responsibility to design complete streets projects moving forward. It could also provide valuable lessons learned as District's go through the process of upgrading the design of projects in the STIP.

The second scenario, where using additional funds to improve projects in the STIP, identifies and funds projects

that are considered "over and above" treatments based on the scope of the project. An example might be adding a short path segment on a street reconstruction project to connect to a library even though the project already includes bicycle lanes and sidewalks. In this case, additional funds may be needed to acquire additional right-of-way and they will increase project costs. Another example is a bicycle and pedestrian underpass that could be added to a project even though at-grade crossings of the street are also planned.

2. Develop a Sidewalk Retrofit Program

A sidewalk retrofit program would install sidewalks as stand-alone projects not connected to an adjoining road project. Such a program would allow NCDOT to add sidewalks along state highways where there are existing gaps in the sidewalk network or where there is a demonstrated need for sidewalks. This program would be done in addition to the existing prioritization process. The program would likely be outside of the STIP, to proactively add sidewalks where need is greatest. A set of parameters would need to be developed to determine those priorities. A number of details are important for ensuring that a sidewalk retrofit program functions well:

- The program should be run as a competitive grant program. Projects should be nominated by local municipalities or the Division offices. Local municipalities and the regional offices will be the most familiar with areas where sidewalks are needed to complete a pedestrian network, provide connections to transit, or meet an observed need.
- The program should be targeted to roads that have been resurfaced/reconstructed within the last 5 years. Projects along roads that are older than that should have sidewalks added with the next major project performed on the road as part of the Department's Complete Streets effort. These sidewalk projects should be funded as part of the road project, and not through the retrofit program. Exceptions may be made to the project age requirement if there is a strong demonstrated need or safety benefit from providing sidewalks before the next road project.
- A local cost-share may be required as part of the program, but, if used, it should be minimal to encourage participation from local municipalities. A sliding scale could also be considered, for example to ensure that rural areas have access to the program.
- Given the logistical difficulties of managing many small-scale sidewalk programs, grant applications should have to meet a minimum standard for the amount of sidewalk to be constructed in a given area. Alternatively, the program could focus on specific MPOs/RPOs or Regions each year to guarantee that all projects are in the same area.

3. Develop a Shoulder Retrofit Program

A paved shoulder retrofit program would function similarly to the Sidewalk Retrofit Program described above. For this program, projects would be selected to add paved shoulders to a roadway outside of any other work being performed. Paved shoulders provide considerable benefit to bicyclists and pedestrians, but also reduce the amount of maintenance needed on roads, increase safety by providing additional recovery area for motorists, and provide additional space for maintenance crews and emergency responders to operate.

The program should only be used to fund paved shoulders as stand-alone projects. NCDOT Divisions, MPOs/RPOs, and municipalities should have input into the process. State bike routes could also garner a higher priority. New resurfacing and reconstruction projects should typically include paved shoulders as a matter of course.

4. Expand the budget for the existing Highway Safety Improvement Program.

NCDOT's existing Highway Safety Improvement Program (HSIP) provides a venue for the continuous and systematic review and identification of traffic safety concerns throughout the state. Through this process, potentially hazardous (PH) locations are identified. In the most recent analysis, completed in May 2012, 99 potentially hazardous bicycle/pedestrian intersection locations were identified. Each of these locations has a targeted pattern of crashes that can be identified, investigated, and appropriate countermeasures can be developed where applicable. The ultimate goal of the HSIP process is to reduce the number of traffic crashes, injuries, and fatalities by reducing the potential for these incidents on public roadways.

NCDOT could use additional funds to evaluate these locations, identify appropriate countermeasures based on the types of crashes that are occurring, and then implement countermeasures. Depending on resources available, the agency could attempt to evaluate and improve all of the locations, or it could simply increase the quantity of projects that are implemented each year through this program.

Sub-Strategy Three: Improve efficiency through NCDOT internal process/structure

Roadway reconstruction and resurfacing present cost-effective opportunities to incorporate pedestrian and bicycle facilities. For example, resurfacing projects present opportunities for the addition of bike lanes and marked crosswalks. NCDOT and municipalities must communicate better and more regularly to ensure that pedestrian and bicycle plans, designs, and facilities are incorporated into the design of the roadway improvement.

In addition, NCDOT should consider adding and distributing pedestrian and bicycle positions geographically across North Carolina. This would allow for a more effective and efficient means to incorporate meaningful, context-sensitive pedestrian and bicycle project input. Also, input from the DBPT would become less "external" and a regular, local component of all project processes. This arrangement would be more similar to other State DOTs.

Sub-Strategy Four: Define "shovel-ready" and create process

NCDOT and municipalities deal with pedestrian and bicycle implementation difficulties of ROW acquisition/expense, environmental permitting, or other issues. These issues often provide an obstacle or excuse to not incorporate pedestrian and bicycle facilities. NCDOT should seek to do the following:

- Educate municipalities about what "shovel-ready" means so as to more efficiently receive project requests and get projects built.
- Municipalities should step forward to move projects towards "shovel ready."
- NCDOT should develop implementation/construction process guideline and manual similar to other State DOTs to create a process and describe lessons learned.

Main Street, Durham, NC
This section of Main Street was converted from a four-lane cross section to a three-lane cross section with bicycle lanes.

Case Study:

Durham Road Diets (NCDOT Resurfacing Projects)*

The City of Durham, with cooperation from NCDOT, has successfully implemented several road diets with accompanying bicycle and pedestrian improvements in recent years. Road diets are typically identified collaboratively by City staff and the Durham Bicycle and Pedestrian Advisory Committee. The City utilizes its Bicycle and Pedestrian Plans and compares network recommendations with NCDOT's reconstruction and resurfacing lists to align needs with established funding sources. The City evaluates candidate corridors for transportation operations, mobility, and safety. Fieldwork measurements and intersection analyses are a critical element of this work. Also important is the successful designa nd construction that will increase the likelihood of future collaborative Road Diet installations.

As an example, Main Street was slated for a waterline replacement and a previously scheduled NCDOT resurfacing effort. The City conducted public outreach concerning the proposed road diet with citizen advisory boards, HOAs, Water Management, and NCDOT.

**Information and photos provided by the City of Durham.*

Sub-Strategy Five: Allow for more design flexibility in context-senstive way

Rigid guidelines often prevent pedestrian and bicycle projects from happening. Two examples that often threaten a project include greenway bridge construction and sidewalk installation along state-maintained roads. Design flexibility and a context-senstive would help these issues.

Emergency Access Requirement Impacts of Project Cost

The NCDOT Structures Unit has traditionally required that an emergency vehicle equivalent to a full size ambulance be able to drive across all pedestrian bridges. This requirement impacts both the design of the bridge from a vehicle loading perspective but more importantly from the area needed to achieve proper turn radii. This policy impacts bridge loading requirements, right of way acquisition needs, and can greatly inhibit the ability to achieve a no-rise certification when the bridge is

over water. This policy has been required irrespective of the proximity of adjacent roads that would provide adequate access. Also municipalities have attempted to get relief from this requirement by stating that 1) their emergency vehicles are smaller, 2) emergency access procedures do not require vehicles on the bridge or 3) access would be from adjacent roadways. This has met with limited success.

One possible solution is to allow a municpality to provide alternate access plans for emergency situations. Another solution is to approach each project with a context-sensitive approach involving multiple practitioners, planners, emergency responders, and engineers.

Design Flexibility for Sidewalk Installation

When installing sidewalk along a state-maintained road, municipalities are required to install curb and gutter which increases project cost significantly. Installing curb and gutter requires a cut into the asphalt roadway in which NCDOT requires the municipality to resurface.

A specific project example is a 0.25 mile sidewalk project in Charlotte, NC. The project cost is approximately $50,000. However, with the NCDOT requirement of adding curb and gutter along with resurfacing, the cost soars to $400,000.

Design flexibility should be considered in these situations to reduce local costs. Again, a team of State and local practitioners should examine each project individually. Curb and gutter are not always necessary for the purposes of drainage and other solutions may exist such as placing the sidewalk on the opposite side of the drainage.

Sidewalk without curb and gutter in Durham, NC.

Existing conditions on a state road in Burgaw, NC, where the drainage ditch was piped and covered to create a shallow grass swale. The elimination of the steeper and wider areas used for the ditches tends to free up some right-of-way for pathway construction. Also, eliminating the curb and gutter and some of the associated grading and elevation issues tends to significantly reduce the cost.

Funding

The development of an integrated, safe and convenient bicycle and pedestrian system is dependent on several key steps, as described in this plan. The first step is to articulate a local, regional or statewide vision into a long-range plan with short-term goals. Bicycle and pedestrian plans can be stand-alone or integrated within other planning functions or comprehensive transportation plans. The planning process is critical to engaging stakeholders to help define the future of their community, organizing public support for future bicycle and pedestrian improvements, and focusing efforts on a list of priority projects and programs.

The planning process should be led by experts in the field, and can be a costly step. Local and/or regional governments seeking assistance for a bicycle or pedestrian planning process should consult with the NCDOT Division of Bicycle and Pedestrian Transportation. DBPT manages a pedestrian and bicycle pedestrian grant program, described elsewhere in this plan. In some cases, a project will stand a much greater chance of being funded by NCDOT if first included in a locally adopted plan. It is important that communities re-evaluate their local plans in light of changing laws, policies, funding conditions, and unforeseen opportunities.

The best way to capitalize on a local bicycle or pedestrian plan is to begin developing engineering documents for priority projects, in order to have good information for future land acquisition, cost estimates for fund-raising, and preparedness in the event of immediate funding opportunities. The term "shovel ready" (coined in the mid-2000s as part of federal stimulus legislation) has been institutionalized into transportation investment planning. NCDOT now uses terms like "constructability" and "schedule-ready" to identify projects eligible for quick funding- a more frequent than not occurrence given today's economic climate.

FMST
friends of the MOUNTAINS to SEA TRAIL

Partnerships like those between the NC State Parks System, FMST, and hundreds of volunteers have led to the successful development of Mountains-to-Sea State Trail segments. Above: Trail near Clingmans' Dome in the Great Smoky Mountains.

The next step is to consider changes to policies affecting the inclusion, funding and preparation for planned bicycle and pedestrian facilities. At the statewide level, the NCDOT Complete Streets Policy adopted in 2009 will make the construction of bicycle and pedestrian projects much more affordable in the long-run where incorporated into the design of a roadway project. Local governments should also look to policies governing the dedication of rights-of-way or easements for future bicycle and pedestrian improvements and connections as a key means of funding projects. Local funding policies, such as Capital Improvement Programs, can set aside dollars for match funds to leverage federal and other funding sources for bicycle and pedestrian projects.

Local governments can use look to policies such as financing bonds, voluntary sidewalk assessments from property owners, general funds, assessment and tax increment districts, and developer exactions to raise money for bicycle and pedestrian improvements. Local funding can be used to make needed improvements along city-owned streets, build local trails, and develop comprehensive signage and wayfinding systems to help increase user trip quality. Local funding should also be strategically set-aside as a match for future federal and state funding awards for more regionally significant projects.

The third step for securing funding will be to compete for state, federal and other sources through open calls and formal prioritization methodologies (NCDOT process described below). Having preliminary engineering work complete, land acquired, and local match secure will be critical paths to success. In order to compete well for statewide or federal funding, projects should serve a strong local transportation purpose but may also benefit the community or region as a whole by drawing future economic development and user health benefits. Bicycle and pedestrian planners, advocates, and local leaders must become educated and keep abreast of the timing for project applications in order to capitalize on opportunities.

Much less attention has been paid to programming built bicycle and pedestrian systems, but these function are no less important than focus on funding. City, town and county governments should consider how to fund ongoing education and encouragement activities, such as running races and community events. Bicycle and pedestrian facilities, especially those which draw families and users of all abilities, must be managed and evaluated per use. Local governments must also consider the importance of training police officers and providing them with time and resources to patrol well-used bicycle and pedestrian facilities. A successful enforcement campaign engages the community, educates residents, and uses patrol styles unique to off-road transportation corridors and pedestrian areas.

Lastly, local governments must count the cost of maintaining their bicycle and pedestrian network. Setting expectations for routing trail clearing, volunteer clean-up programs, and significant upgrades or replacement are key to maintaining community support for bicycling and walking. Well planned maintenance also maximizes the original investment, lessening the time for replacement. Changes in commuter travel patterns, environmental conditions, land use changes, and technology improvements are all factors to consider when planning funding for maintenance of a variety of bicycle and pedestrian facilities.

When considering the financial need for planning,

project construction, programming and maintenance, communities need to understand the investment for bicycle and pedestrian projects is similar to that for any transportation project. Funding opportunity come by setting strategic local and state policies and competing well for federal funding or other grant sources. The need is much greater than the funding availability, so communities will have to use multiple strategies and set specific priorities in order to see change.

Federal and State Funding History

Perhaps, the most important strategy to building a more efficient bicycle and pedestrian transportation system is leveraging and maximizing funding to construct priority projects to fill gaps within that planned system. Traditional funding sources, such as federal transportation appropriations, are shrinking. Meanwhile, the need for bicycle and pedestrian improvements in North Carolina is increasing based on population changes. The following will describe the changing dynamics of federal, state, local and non-traditional funding sources, and will identify ways these funding sources can be coordinated and leveraged to meet the most immediate needs for bicycle and pedestrian travel in North Carolina.

Between the early 1990s and 2013, federal transportation laws established programs frequently used to fund bicycle and pedestrian projects within states. Starting with ISTEA in 1992 and TEA-21 in 1998, the federal Transportation Enhancements (TE) program was established within the STP as an eligible funding source for bicycle and pedestrian projects. There was no federal mandate to set-aside a certain portion of TE funding for bicycle and pedestrian projects, so individual states crafted policies for obligating those funds between eligible activities. In 2005, SAFETEA-LU legislation added the Safe Routes to School program as an additional federal funding source for eligible bicycle and pedestrian activities.

Historically, NCDOT received $12-23 million each year from the TE program between 1991 and 2012. The apportionment of STP was calculated as 10% of the sum of STP funds (after adjustments) plus a minimum or equity funds apportioned through the STP. This does not include any apportionments made to the separately funded Safe Routes to School program or Recreational Trails Program. Collectively between 1992 and 2012, North Carolina received about $ 335,395,000 in apportionments of TE funds after necessary rescissions. The state averaged about an 89% obligation rate over the 11 years.

Eligible activities under the TE program included the following:

1. Provision of facilities for pedestrians and bicycles.

2. Provision of safety and educational activities for pedestrians and bicyclists.

3. Acquisition of scenic easements and scenic or historic sites (including historic battlefields).

4. Scenic or historic highway programs (including the provision of tourist and welcome center facilities).

5. Landscaping and other scenic beautification.

Historic preservation.

6. Rehabilitation and operation of historic transportation buildings, structures, or facilities (including historic railroad facilities and canals).

7. Preservation of abandoned railway corridors

(including the conversion and use of the corridors for pedestrian or bicycle trails).

8. Inventory, control, and removal of outdoor advertising.

9. Archaeological planning and research.

10. Environmental mitigation-- i.to address water pollution due to highway runoff; or,

reduce vehicle-caused wildlife mortality while maintaining habitat connectivity.

11. Establishment of transportation museums.

Previously, the NCDOT Transportation Enhancements unit was responsible for administering a portion of the TE funds, distributed through calls for grant proposals on a regular basis. Now, the Local Programs office continues to administer projects which had been awarded TE funds through the grant cycle, but does not actively engage in any new activities. The Local Programs office does support the Bicycle and Pedestrian Division, and other units, where municipal agreements are warranted for the award of TE or other federal funds. Per the FHWA website, Jimmy Travis (manager of the Local Programs Units) is listed as NCDOT's main contact for the Enhancement program.

North Carolina historically spent TE funds in all categories, and approximately $142,455,207 in pedestrian and bicycle facilities (the largest amount of any category.

These appropriations were divided between eligible activities managed by the 14 highway divisions, the Roadside Environmental Unit, the Bicycle and Pedestrian Division, and a former Enhancement Unit. Each unit or division received a set-aside amount of TE funding, and NCDOT provided the federally-required minimum match in most cases. The Transportation Enhancements program has been replaced with a similar Transportation Alternatives Program (TAP) as described in the 2013 federal transportation authorization called MAP-21. That program will be described in more detail later. This funding was largely obligated through grant-programs, and some TE funding still remains for future obligation.

With the passage of the 2005 SAFETEA-LU act, US Congress appropriated additional Safe Routes to School (SRTS) funding to the states based on per capita growth. The first annual appropriation started nearer to $1 million dollars, and the annual appropriation grew to over $5 million dollars by 2012. SRTS funding did not require a local match, so the program was entirely federally funded. MAP-21 does not provide any new funding for the SRTS program, but these activities are still eligible under the new Transportation Alternatives Program. Many states, including North Carolina, still have unobligated SRTS funding from former authorizations. This funding will be obligated first before using TAP or other federal funding sources will be reviewed for use on SRTS program activities.

Additionally, federal legislation in the 1990s increased the flexibility of other transportation and non-transportation funding sources for expanded use bicycle and pedestrian projects. For example, federal Surface Transportation Program funding was directly apportioned to the most densely population regions of the state, referred to as the STP-DA program. MPOs are given discretion to use this funding on a variety of eligible transportation activities, including bicycle and pedestrian projects. Some MPOs

in North Carolina chose to program the majority of their STP-DA dollars on highway projects; and some MPOs in the state have policies directing minimum spending on bicycle and pedestrian projects in their region. Local project sponsors must provide a 20% match.

Another example of a federal funding source which can be used to fund bicycle and pedestrian projects is the CMAQ program. This program is administered by the NCDOT Transportation Planning Branch for regions of the state eligible to receive the funding based on air quality standard attainment. The CMAQ program was historically divided into statewide, regional and local tiers of funding. New federal and state legislation changes the funding tiers. The process for securing CMAQ funding is a competitive, data-driven process. Similar to the STP-DA program this funding requires a 20% local match.

Highway safety funding has some flexibility to fund safety-related bicycle and pedestrian projects. This funding source is also applied to projects through a competitive and data-driven process, and the funds are administered by the Transportation Mobility and Safety Unit. As bicycle and pedestrian safety data availability improves, bicycle and pedestrian projects should become more competitive for federal safety dollars. Analysis of available data sets and more in-field audits will be critical to the application of safety dollars on bicycle and pedestrian improvements.

Federal and State Funding Future

Effective as of federal fiscal year 2013, new transportation legislation called the Moving Ahead for Progress in the 21st Century Act (MAP-21) contains a new funding program called the Transportation Alternatives Program (TAP). The TAP program is very similar to the Transportation Enhancements program in previous transportation authorizations, but there are some differences of significance to North Carolina DOT and local government partners. FHWA has released guidance and Q&A documentation on TAP – this information can be found at http://www.fhwa.dot.gov/environment/transportation_alternatives/

Per MAP-21, North Carolina communities and NCDOT continue to have several options for funding bicycle and pedestrian projects. The new federal legislation produced few changes affecting bicycle and pedestrian project eligibility within the CMAQ, STP, and highway safety federal funding programs. The biggest changes were to the administration of the newer version of the Transportation Enhancement (TE) program, now called Transportation Alternatives (TA). TA funds can be used on a number of eligible project types, but bicycle and pedestrian improvements are most often mentioned by policy makers and programmers.

North Carolina received a total apportionment of a little over $23 million dollars in FY 13. The RTP set-aside equaled $1.6 million dollars, and the remaining apportionment equals $21.4 million dollars. This compares to an allocation of $23.7 million of TE funding in FY 12.

	TA/TE Apportionment	RTP Set-Aside	TA Remaining
2013	$23,014,898	$1,613,560	$21,401,338
2012	$23,667,416	n/a	

The TA program is set up similarly to the STP-DA program. Unless the receiving state's governor elects to transfer all or part of the TA funding to another program early in the federal fiscal year, the program dollars are divided accordingly:

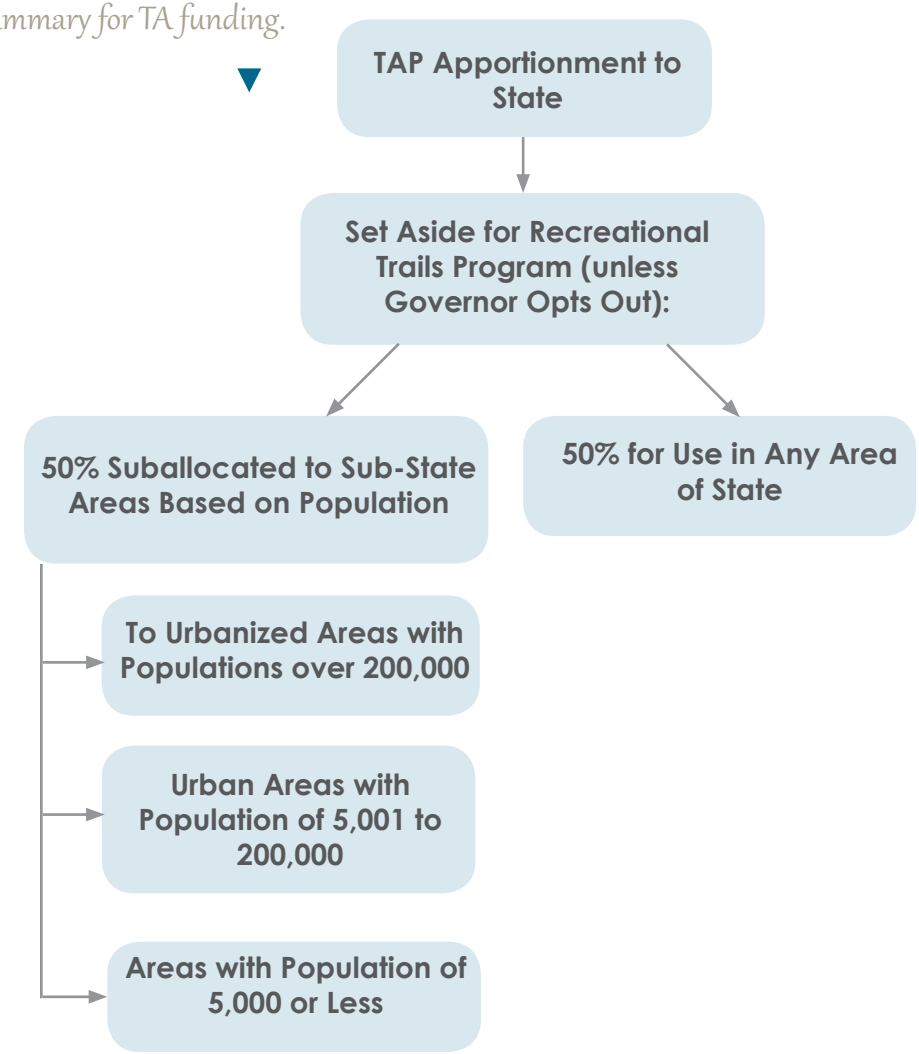
- A certain amount is taken from the top of the apportionment and directed to the state's Recreational Trails Program. In North Carolina, the RTP is managed by DENR's NC Parks Division. This annual amount usually ranges between $1-2 million dollars per state.

- Roughly half the remaining apportionment is a flexible funding source for use anywhere within the state on eligible activities. Up to the full amount of this statewide flexible funding can be transferred to one of several other transportation funding programs, such as the Surface Transportation Program.

- The remaining half of the apportionment is suballocated to population tiers. A portion is suballocated and directly administered by the nine TMAs, managed by the respective MPO, in the state because they have urbanized populations over 200,000. A second suballocation is directed toward communities of population between 5,000 and 200,000. A third suballocation is directed toward communities with population less than 5,000. See the diagram to the right as a summary of the allocation for TA funding.

The range of eligible activities is very similar to that of the former TE program, but a few changes were made. Bicycle and pedestrian projects, including Safe Routes to School activities and rail-trail conversions, are the most often cited eligible activity. It is important to note, however, that many other eligible activities are also included under the TA program, such as scenic overlooks, historic transportation

Diagram of allocation summary for TA funding.



facility restoration, stormwater mitigation, and boulevard construction. The legislation does not require that the department provide equal funding or opportunity for all eligible activities, but it should have a clearly defined selection process explaining which activities can receive funding.

1. Construction, planning, and design of on-road and off-road trail facilities for pedestrians, bicyclists, and other nonmotorized forms of transportation

2. Construction, planning, and design of infrastructure-related projects and systems that will provide safe routes for non-drivers

3. Conversion and use of abandoned railroad corridors for trails for pedestrians, bicyclists, or other nonmotorized transportation users.

4. Construction of turnouts, overlooks, and viewing areas.

5. Community improvement activities

6. Any environmental mitigation activity

7. The recreational trails program under section 206 of title 23.

8. The safe routes to school program eligible projects and activities listed at section 1404(f) of the SAFETEA-LU

9. Planning, designing, or constructing boulevards and other roadways largely in the right-of-way of former Interstate System routes or other divided highways.

A couple procedural parameters described by the law also change the way TAP-eligible activities will be submitted and selected. The first requirement is for the body making final selection of projects do so through a clearly defined competitive selection process. There is no definition of an acceptable or ideal competitive selection process in the legislation. MPOs making those final decisions for TMA-suballocated TAP funds, and NCDOT making decisions about all other TAP-funded projects will have to submit their processes to FHWA in advance of project selection. Another parameter is the recommendation that project selection include public participation. This is not a well-defined parameter in the legislation, but several transportation organizations already have strong public involvement plans in place that should be sufficient to meet this recommendation.

The most notable changes are to sponsor eligibility. The state DOT cannot be a project sponsor under the TAP. This means the state cannot identify the scope of a project or directly compete for funding. MPO and RPOs in the state are the best transportation organizations for submitting projects for funding by the TAP, either through an MPO's selection process or the NCDOT-designed process. Once projects have been selected and vetted through a public involvement process, the legislation does allow for the local project sponsor and NCDOT to partner to implement the project. This can be understood to mean the NCDOT may choose to partner with a local government to manage the project's construction.

Several other conditions and requirements are described for the TAP in MAP-21. TAP funding can only be placed on an eligible project where the required 20% local match has been secured. There are several caveats to what may serve as local match, where the percent-share may be reduced, and what other funding sources may be used to serve as the local match. Funding must be obligated to projects within 4 years after the funding has

been allocated to the MPO or state, and may otherwise be removed. The funding can be used to fund the state's Safe Routes to School coordinator position, but cannot go toward any other direct administrative activities at the state or MPO –level. Several other caveats exist, provided that it is federal transportation funding. Interested parties should review documents produced by the FHWA.

There are several connections between how TAP funding will be administered in North Carolina and the new state law directing all capital transportation investments. The Strategic Transportation Investments (STI) formula (H 817) was signed into law in June 2013. The new law will realign state funding or state-administered, federal funds toward projects selected through a data-driven process. A new slate of projects will be selected, starting in early 2014, using a prioritization process for programming in FY 16 and beyond. This new formula prescribes the process for selecting bicycle and pedestrian projects, and indicates where TAP funding will be used to fund projects.

STI divides funding into three categories: Statewide, Regional Impact, and Division Need. Each category allows for different project eligibility and provides exemptions from the prescribed selection process for certain funding sources in each category. For more information about the comprehensive law, go to NCDOT's website. Transportation planners and others are still involved in crafting the prioritization's scoring methodology.

STI provides several specific conditions for bicycle and pedestrian project funding in the future:

- Bicycle and pedestrian projects, independent of a separately-funded roadway improvement or construction project, will be funded within the Division Needs funding category.
- Bicycle and pedestrian projects will not be eligible to receive state funding match from NCDOT. Local match can be provided by local governments through traditional means (new flexibility provides the use of Powell Bill funding for local match).
- Bicycle and pedestrian projects will receive 50% of their score from quantitative points, and the other 50% from local input points.
- The quantitative points will be calculated for up to 20 bicycle and pedestrian projects submitted by each MPOs and RPO. The online scoring model will use local and statewide data points to calculate quantitative project scores on the fly.
- Local input points will be the product of collaboration between MPO/RPO members and Division Engineers.
- TAP funding allocated to a division for an eligible activity, such as a bicycle or pedestrian project, will count toward the Division Needs budget for the local division.
- TAP-funded projects may use a different selection process from the one used to prioritize bicycle and pedestrian projects.
- Several other federal funding sources, such as CMAQ and STP-DA, have separately run selection methodologies and may or may not count against the Division Needs budget.

The quantitative methodology is half of the project score in the Division Needs category, but is very important to the process and demonstrating the measurable strength of a bicycle or pedestrian project. The scoring methodology was still in draft form as of when this plan was being drafted, so readers should consult the www.ncdot.gov website for the most recent information on the Strategic Transportation Investments process. Additional materials documenting the scoring process are also included in the Technical Appendix (as developed on July 30, 2013). A summary of criteria used in the scoring methodology are as follows:

- Safety: This criterion uses crash data and speed limit information along project corridors to determine the existing safety need. The higher crash reports and/or speed limits within a distance of a proposed project, the higher the project's safety score will be.

- Access: This criterion measures community benefit as a result of constructing the proposed project. Access benefit is measured by the quantity and significance of destinations associated with the proposed project. Access benefit is also measured by the distance the proposed project is from the most important end destination. The more direct destination connections and the closer the project is to the primary destination, the more points the project will receive.

- Demand/Density: This criterion measures user benefit as a result of constructing the proposed project. It calculates the density of population and employment within a walkable or bike-able distance of the proposed project. The higher the density of population and employment, the more points a project will receive.

- Constructability: This criterion measures the readiness of a project to be constructed in the near term. Factors such as secured right-of-way, environmental impact, and preliminary engineering are used to calculate this score.

- Benefit-Cost: This criterion adds the Access and Demand scores together to create a combined benefit score, and then the benefit is divided into the cost of the project to NCDOT. The higher the benefit to cost, the higher the score for the project.

These criteria collectively measure the immediate importance of a project to potential users. Given the tremendous need for bicycle and pedestrian projects, it is important to identify those projects which would deliver immediate benefit to a community, and the most user opportunity for those seeking safer choices for travel.

The exact amount per division available for independent bicycle and pedestrian projects will be in part decided by the outcomes of the quantitative scoring model, distribution of local input points, and any additional parameters guiding "normalization" of transportation funding across the various modes. Other important factors will be the volume of projects submitted by MPOs and RPOs and availability of federal funding for bicycle and pedestrian projects, given allocation requirements set forth in TAP.

In summary, there is no way to calculate the funding available to communities for bicycle and pedestrian projects in North Carolina. Flexibility within federal legislation may or may not yield an increased share of federal funding eligible for bicycle and pedestrian projects in the state. This flexibility can be directed to a degree by policies yet to be created by NCDOT and MPOs. Flexibility afforded by the STI competitive

selection process through also leaves uncertainty for how much funding may be available for bicycle and pedestrian projects. The level of interest by MPOs/RPOs within a division for bicycle and pedestrian projects, the competitive strength of bicycle and pedestrian projects submitted by local sponsors, ability of local project sponsors to secure the necessary match for federal funding, and limits posed by caps per mode or within the Division Needs allocation will all contribute to the total funding future of bicycle and pedestrian projects in North Carolina.

Aligning Need with Funding

From the smallest of gaps in a sidewalk along neighborhood streets, to the longest recreational hike-and-bike trails spanning multiple regions, likely billions of dollars will need to be spent developing the state's bicycle and pedestrian system over the next 50 years. It will be increasingly important for locals, state officials, private sector investors, and policy makers to work together, connecting funding to the projects needed most at all scales.

At the most local level, neighborhoods and small towns, sidewalks, bike lanes, neighborhood streets, foot trails, and signage all play an integral role in enabling cyclists and pedestrians of all ages and abilities to safely walk and bike to schools, parks, work, shopping and other neighbors. Local governments will be largely responsible for funding and constructing these facilities, using locally-derived funding resources. This is the most significant area of influence for capturing vehicle trips for new bicycle and pedestrian trips, provided that the majority of our trips are made within 2-3 miles of our home. The main emphasis in the design of these projects should be to improve the safety of all road users and provide direct connections to local destinations.

Local and regional transportation partners will need to collaborate on the next generation of regionally-significant bicycle and pedestrian projects. These signature projects serve as the spine to local networks, connecting people to places beyond their neighborhood or village. These projects stimulate tourism, land development, environmental conservation, and personal health. Given the tremendous need for investment, we must prioritize where to building bicycle and pedestrian projects connecting towns and counties. Projects should firstly meet the standard of a locally-significant project, improving user safety and mobility. If they serve a transportation purpose, regional bicycle and pedestrian projects should be scaled and designed according to logical project limits, project users, and available financing. On-road bicycle routes and off-road multi-use paths will continue to transform travel patterns, public health, and recreational tourism. These projects are the best fit for state or federal funding sources, provided the effort required to administer these funds and create lasting multi-jurisdictional partnerships to foster support and growth of the network.