Healthy Living Assessment:

Coats, North Carolina

Communities Transforming
For a healthier North Carolina

Adopted:
November 2014

HOLLAND CONSULTING PLANNERS

Acknowledgements

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- Mayor: Walter Weeks
- Commissioner: John Raynor
- Mayor Pro Tem: Dr. Linda Robinson
- Ed Lauder: Planning Board
- Donna Pope: Planning Board
- Debbie Greider: Planning Board
- Town Manager: Kenny Cole

Special thanks are also given to the Coats Board of Commissioners for initiating this process:

Board of Commissioners

- Walter Weeks, Mayor
- Dr. Linda Robinson, Commissioner/Mayor Pro Tem
- J.C. Allen
- Jerry Beasley
- John Raynor
- Allen Mosby

The project was completed with the assistance of Holland Consulting Planners, Inc.:

- Wes MacLeod, ASLA – Urban Designer & Planner

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Section 1: Introduction

Purpose

This assessment was initiated through the North Carolina Region 6 Community Transformation Collaborative and funded through a grant received by Coats, NC. The town is tasked with creating a plan to encourage healthy lifestyles throughout the area. The Town of Coats is located in North Carolina's Piedmont region (See Map 1), just south of the growing Raleigh Metropolitan Area.

The "Healthy Living Assessment" for the Town of Coats is a health component to be added to the Town's Comprehensive Land Use Plan. Across the country, the design of residential developments, roadways, and settlement patterns all contribute to the relative health and wellness of citizens. Land use and transportation planning provides the foundation for our built environment. Land use plans guide development and direct future change for a community. The plans provide the basis and direction for a community's land use policies and zoning regulations. The course of action a community chooses, in turn, affects air and water quality, the level of motor vehicle use, and the ease of access to open space amenities (physical activity opportunities) that residents experience.

Over the past ten years, community officials have seen an increasing need to address health disparities through changes to the built environment. This assessment is a result of such an evolving thought process and will be unlike most traditional planning documents—its focus is primarily on health-related issues, examining the interrelationships among land use, transportation, utilities, the local economy, food resources, recreation, and community character. The diagram on the next page details the impact of land use and transportation systems on our built environment.

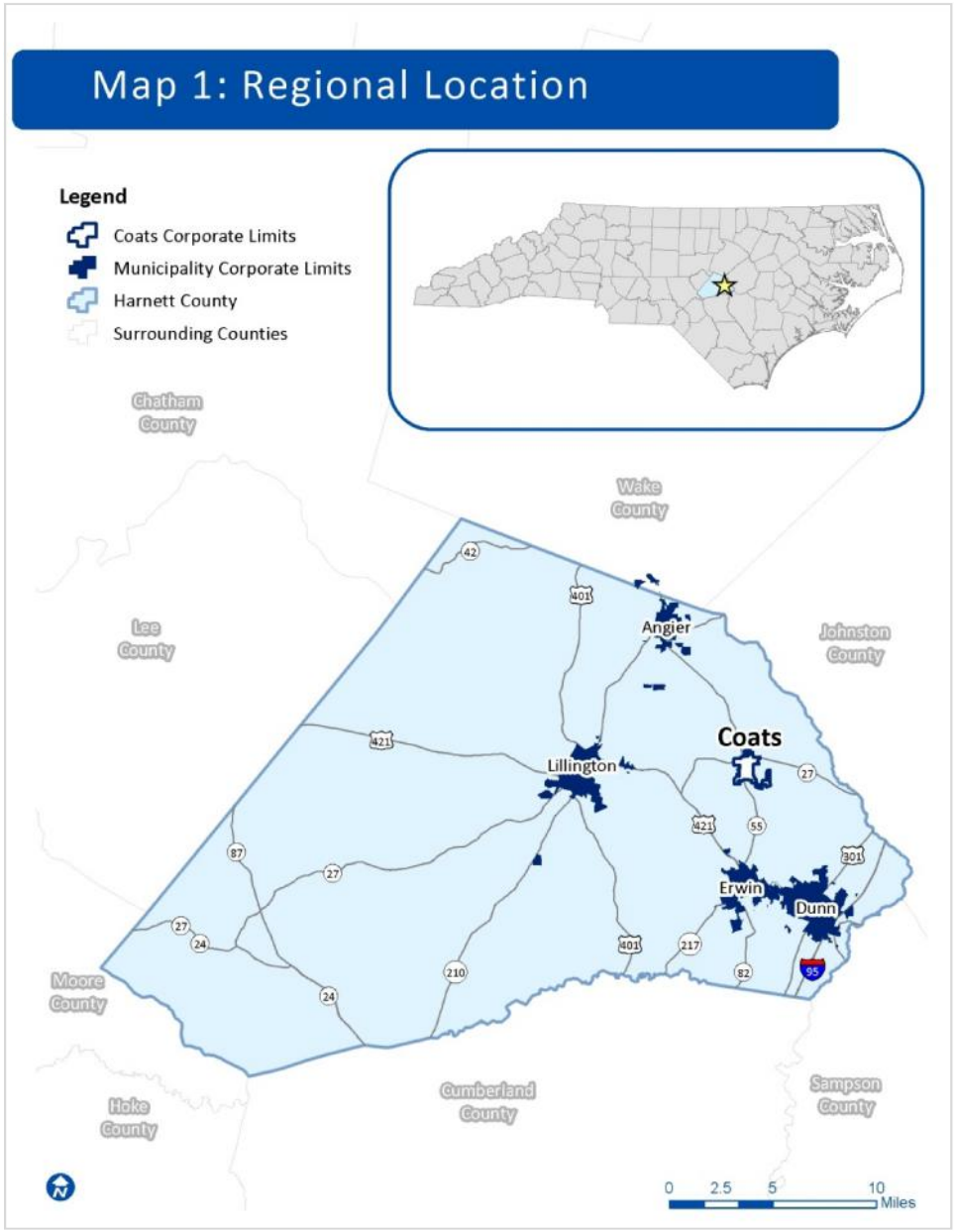
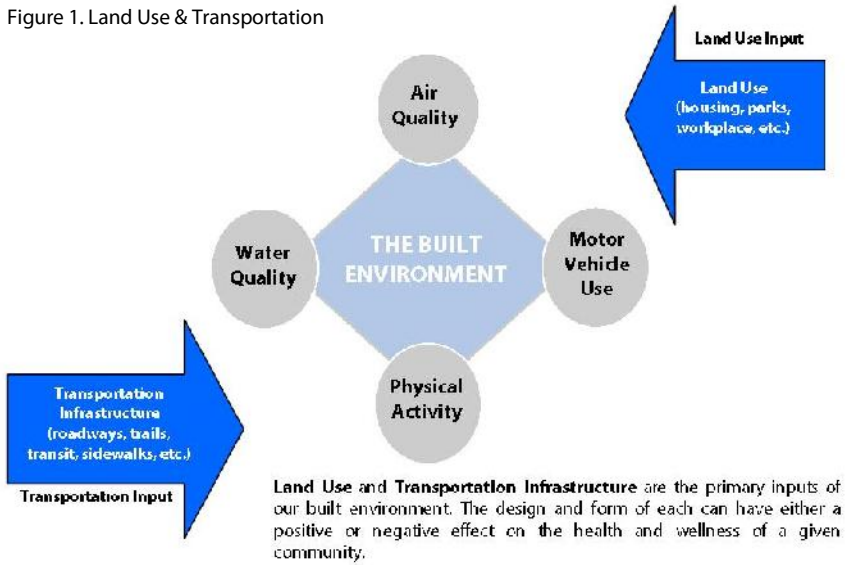


Figure 1. Land Use & Transportation



The increasing emphasis on public health as a part of the comprehensive land use planning process has created a new model for community officials. The enhanced plan addresses the basic elements of urban form and land use, but also focuses on planning for public health — including increasing the availability of nutritionally vigorous foods, increasing physical activity among citizens by ensuring community walkability, and providing access to parks and recreational facilities. All of these factors help foster healthy and sustainable communities. Through collaboration with a broad range of interest groups and disciplines, a community planning strategy may be developed that triggers impacts well beyond the issues of transportation and land use policy.

Process

As part of the health and wellness addendum, a community profile was drafted to depict existing demographic conditions as they relate to health. Analysis pertaining to income, education, mobility, and population are included in the Community Profile section. Statistics from the Harnett County 2013 Community Health Assessment and State of the County Health Report were used to establish a baseline of health issues facing the community. Health indicators or social determinants of health were then analyzed to understand the needs and barriers facing Coats' citizenry.

The Centers for Disease Control and Prevention (CDC) defines social determinants of health as "the complex, integrated, and overlapping social structures and economic systems that are responsible for most health inequities." These social structures and economic systems include the social environment, physical environment, access to health services, and structural and societal factors. The following social determinants of health were analyzed to determine level of need for health and wellness-related capital improvements, community programming, and policy change:

- Median Age
- Median Household Income
- Educational Attainment – Persons (25+) with No High School Diploma
- Cost Burdened Homeowners
- Households with No Vehicle
- Healthcare Provider Access
- Full-Service Grocery Availability
- Access to Active Transportation
- Access to Physical Activity

Historical Context of Planning & Public Health

In the 19th and early 20th centuries, architects and urban planners in cities across the country helped defeat infectious diseases like cholera and tuberculosis by retrofitting buildings, streets, neighborhoods, clean water systems, and parks. In particular, these buildings and streets were redesigned to increase air flow and provide daylight in an effort to combat bacteria. In the 21st century, planners and urban designers can again play a crucial role in combating the biggest public health epidemics of our time: obesity and related chronic diseases such as diabetes, heart disease, and some cancers. Today, an unhealthy diet and lack of physical activity are second only to tobacco use as the main cause of premature death in the United States.

Planning: Land Use & Transportation Basics

The term land use planning is often used interchangeably with urban planning. At its most basic level, land use planning determines what parts of a community will be used for residential, commercial, industrial, or recreational uses. This effort is achieved through land use ordinances such as zoning and subdivision regulations. Places in which we live, work, and play – planned and regulated by the aforementioned ordinances – are connected by transportation networks.

Roadways designed with only the automobile in mind, such as Stewart Street/NC Hwy 27, deter pedestrians and bicyclists from use and create barriers to active transportation choices. *(Image Source: HCP, Inc.)*

Land use decisions have an impact on the health and wellness of individuals within the community. Studies have shown that communities with a mix of land uses (residential, commercial, recreation, etc.) serve to increase the walkability of an area. Yet, conventional zoning districts often restrict multiple land uses, making new development single use in nature, thus contributing to a lack of walkability and active transportation users.

Transportation planning includes several components. In the United States, the automobile is often the dominant force behind urban design. Prior to the last decade, transportation planning primarily dealt with the efficient flow of only the automobile. The vast demand for private vehicular transportation regularly dictates the scale of our streets, the relationship between buildings, and the speed at which we experience our

environment. A recent shift in thinking has changed the way departments of transportation now perceive roadway design.

Now, planning for all modes of travel – the pedestrian, bicyclist, transit user, and motorist – has become increasingly important. This element of transportation planning has a tremendous effect on our ability to make travel mode choices. Roadways designed for all modes of use provide increased travel options with improved access to healthy food sources and support for a more active lifestyle.

Roadways designed for all users, such as East Main Street (shown above), have proven to increase multi-modal travel and active transportation use.
(Image Source: HCP, Inc.)

How to Use this Report

The "Healthy Living Assessment" is composed of four sections. Throughout the document, comparisons are made between similar size municipalities in the surrounding area. The introductory section provides purpose, process, and background information on the relationship between planning and public health.

Section Two includes a community profile, demographic information impacting health outcomes, and statistics such as educational attainment, elderly population, median household income, and housing values. Section Three is composed of health and wellness related analyses and barriers to active lifestyles. Section Four provides goals and strategies for public health improvements within the town that may be initiated through town government or through coordination with the Harnett County Health Department.

Section 2: Community Profile

Population

According to 2013 Population Estimates, the Town of Coats has approximately 2,340 residents. Surrounding municipalities with similar population figures are shown on Figure 2 below. Since 1980, the population in Coats has grown by more than 70%, slightly outpacing the growth of the statewide population. However, the town population grew by 11% between 2010 and 2013 while the state grew by only 3%.

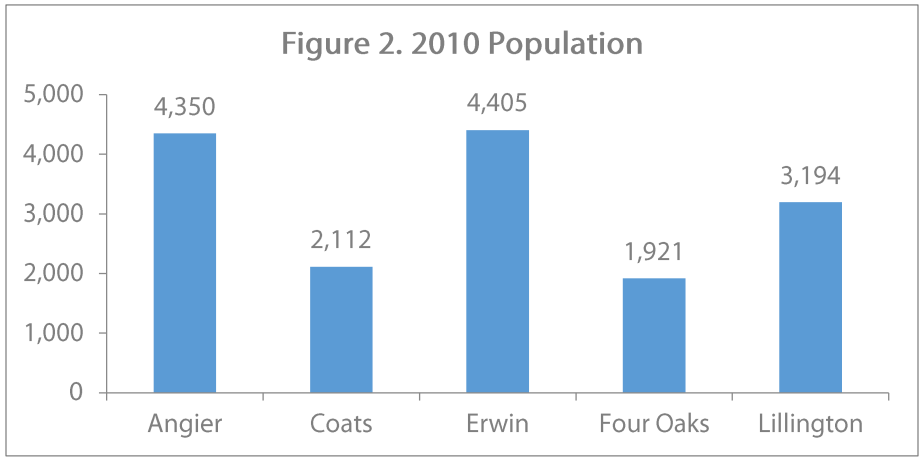
Table 1. Population 1980 – 2013

Year	Town of Coats		North Carolina	
	Population	% Change	Population	% Change
1980	1,365	N/A	5,795,278	N/A
1990	1,546	13%	6,626,118	14%
2000	1,903	23%	8,049,319	21%
2010	2,112	11%	9,535,483	18%
2013	2,340	11%	9,848,060	3%

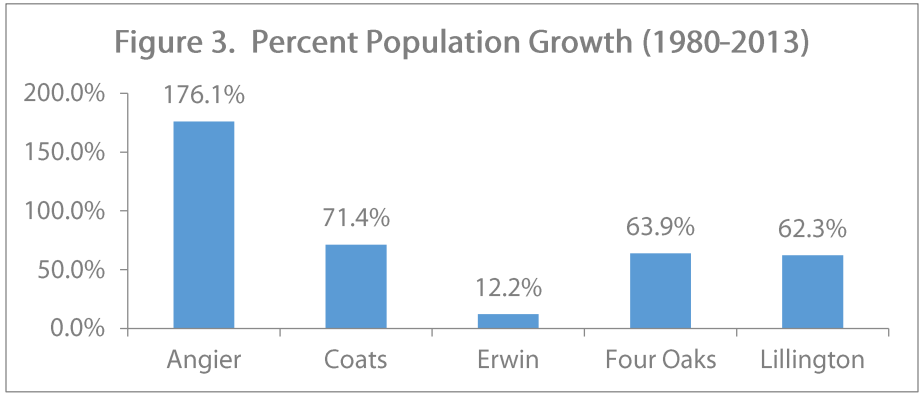
Source: US Census Bureau

Such substantial growth can be attributed to several factors, with proximity to the Raleigh Metropolitan Area and Fayetteville areas accounting for a large percentage. More importantly, this population growth should be viewed as a positive statistic as many smaller municipalities across the state are struggling with stagnant or declining populations.

Surrounding municipalities also experienced positive growth over the last thirty years. The Town of Angier experienced the most substantial growth, increasing its population more than 175%. Of the municipalities included in the comparative analysis, Coats was the second fastest growing municipality. The Town of Erwin grew by the smallest percentage over the last thirty years.



Source: US Census Bureau

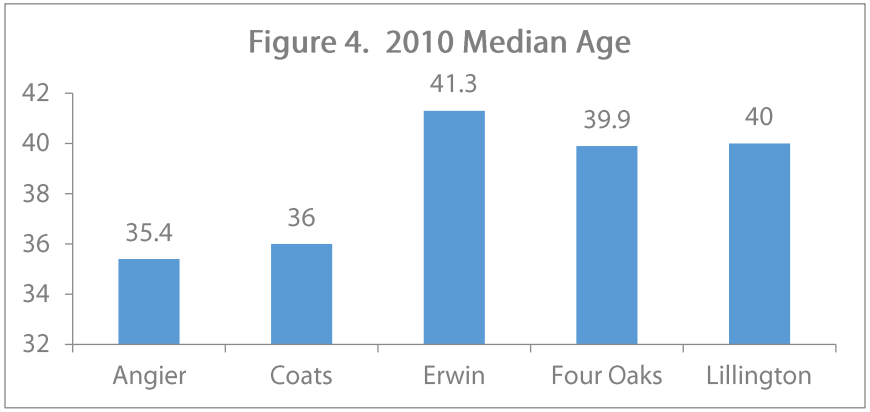


Source: US Census Bureau

Age

In the United States, over 90% of individuals over the age of 65 have at least one chronic disease and more than 75% have at least two.[1] To exacerbate the issue, in the next thirty years, the portion of the population over the age of 65 is expected to more than double.[2] Although estimates vary in terms of the extent to which this segment of the population will increase, all are certain that the increase will be nothing short of significant.

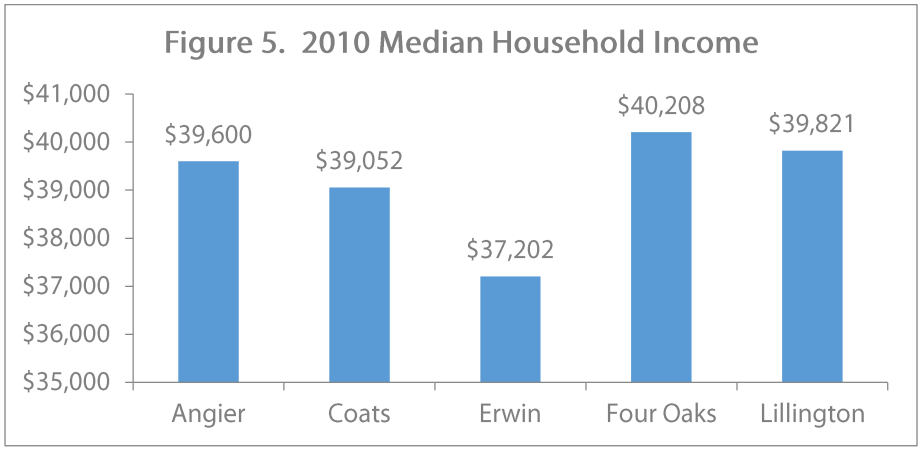
According to the NC Division of Aging and Adult Services, the population in Harnett County will remain relatively young. By 2032, only 17.6% of the county population is expected to be over the age of 65. In addition, the median age of both Coats and Angier (located in Harnett County) is much lower than that of other surrounding municipalities. Incidentally, the lower median age of Coats and Angier is also consistent with their higher rates of population growth. Both municipalities have a lower median age than the state overall.



Source: US Census Bureau

Income

Income plays a significant role in the health outcomes of individuals. Countless studies have noted the correlation between low-income populations and unhealthy lifestyles. The median household income in Coats is approximately 14% lower than the NC figure of $45,470. The median household income for other municipalities in the area is generally consistent.



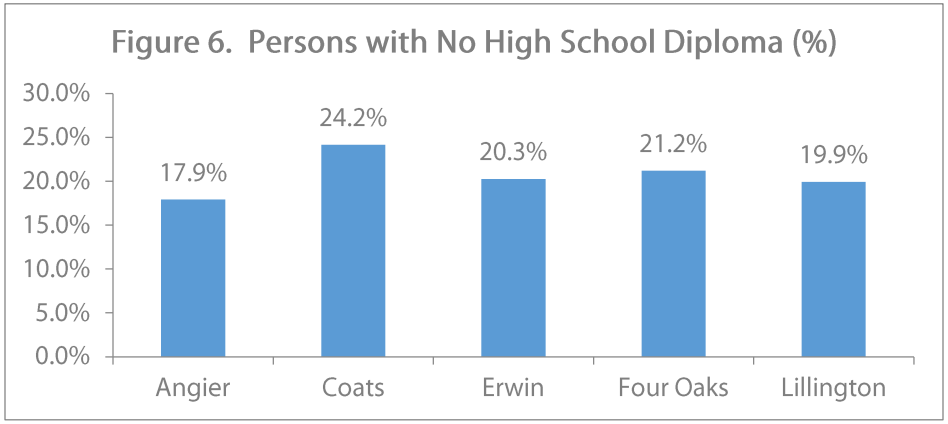
Source: US Census Bureau

[1]Anderson, Gerard, "The Growing Burden of Chronic Diseases in America." Public Health Reports, May-June 2004, Volume 119.
[2]Rosenbloom, Sandra. The Mobility Needs of Older Americans: Implications for Transportation Reauthorization. SI: The Brookings Institution, 2003.

Educational Attainment

Educational attainment is a key factor in the overall health of humans across the United States. There is a well-known, large, and persistent association between education and health. This pattern has been observed in many countries and time periods, and for a wide variety of health measures. The differences between the more and the less educated are significant: in 1999, the age-adjusted mortality rate of high school dropouts, aged 25 to 64, was more than twice as large as the mortality rate of those with some college education.[3]

According to 2010 Census data, approximately 24% percent of Coats residents above the age of twenty-five (25) did not complete high school. This percentage is much higher than the state overall. Accordingly, increasing educational attainment should be a goal for the Town of Coats.

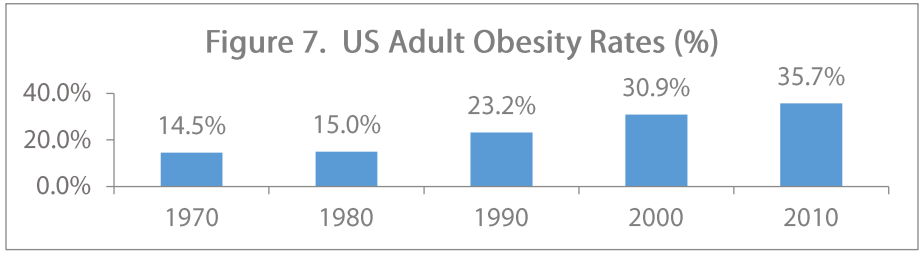


Source: US Census Bureau

[3]Cutler, David M. & Adriana Lleras-Muney, Education and Health: Evaluating Theories and Evidence. National Bureau of Economic Research.

Socioeconomic Status

Many studies have attempted to provide a correlation between Socioeconomic Status (SES) and chronic disease. Obesity, whose leading contributors are poor nutrition and lack of physical activity, is the second leading cause of death in the United States.[4] Obesity also increases the risk factor for a number of chronic diseases. In general, obesity tends to be a multi-faceted problem with no "one solution" to combating its occurrence.



Source: US Census Bureau

There are certain segments of the population, however, that are more likely to be obese or have a chronic disease—the two are more prevalent in the low socioeconomic status (SES) segments of society. Investigations have shown similar results in urban, suburban, and rural communities. In addition, a childhood spent in poor social and economic conditions has been shown to lead to a less healthy adulthood. In both adolescent boys and girls, low SES and parental education levels were related to an unfavorable risk factor profile, indicating a need for early intervention in low SES communities.

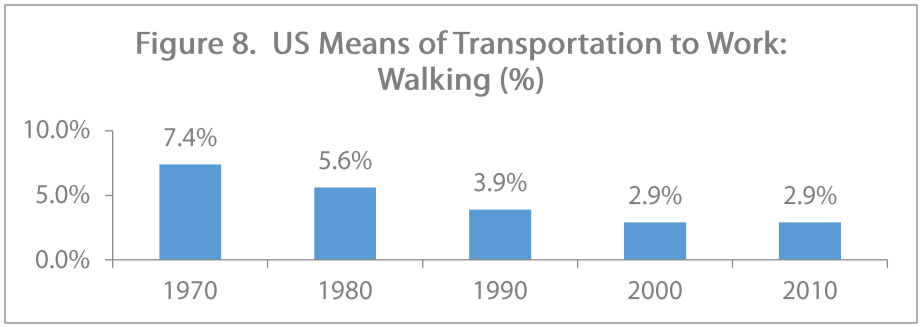
In general, many Coats residents are of low socioeconomic status. This circumstance is due to the lack of educated populace and low income levels. Public health education and intervention can be utilized to

[4] Actual causes of death in the United States, 2000. Mokdad AH, Marks JS, Stroup DF, Gerberding JL, 2004, Journal of the American Medical Association, pp. 1238 - 1245.

overcome several barriers faced by persons of low socioeconomic status. Understanding the difference between the healthy and unhealthy choice can be a powerful tool for combating obesity and chronic disease.

Mobility

Mobility is generally defined as the movement of people from place to place. In the last hundred years, travel modes have shifted dramatically. Unfortunately, over the last forty years, less emphasis has been placed on non-motorized forms of movement, often to the detriment of cyclists and pedestrians. Walking trips have experienced a dramatic decline in recent decades. From 1970 to 2010, the U.S. experienced a 155% decrease in the number of individuals walking to work. During that same time period, obesity rates increased by 149%[5].



Source: US Census Bureau

In fact, it was not until 1998 that the Federal Highway Administration authored a guidance manual addressing the design of bicycle and pedestrian facilities.[6] More recently, walking and cycling have begun to emerge again as more popular options for both travel and health. Meeting the recommended daily exercise guidelines can be easily accomplished by such trips.

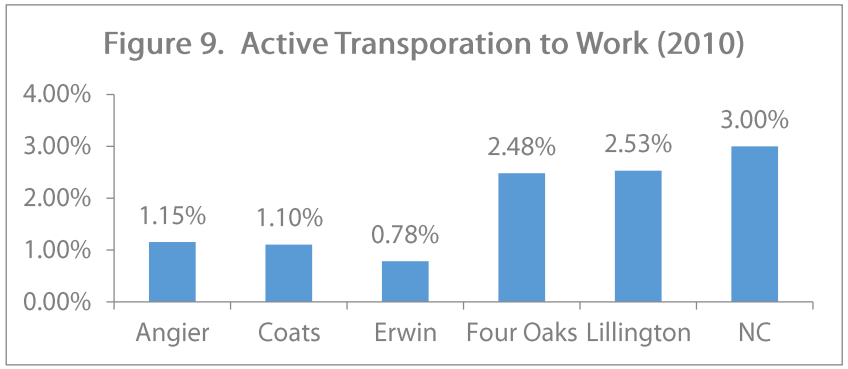
[5]FHWA Means of Transportation to Work and CDC.
[6]FHWA. Improving Conditions for Bicyclists and Pedestrians. Perquimans, D.C.:s.n., 1998.

Table 2. 2010 Means of Transportation to Work

Means of Transportation	Town of Coats		North Carolina	
Drove alone	672	82%	3,365,544	82%
Carpooled	84	10%	413,599	10%
Public Transportation (excluding taxicab)	5	1%	42,911	1%
Taxicab	0	0%	4,021	0%
Motorcycle	0	0%	5,306	0%
Bicycle	**0**	**0%**	**9,939**	**0%**
Walked	**4**	**0.5%**	**74,381**	**2%**
Other means	12	1.5%	28,818	1%
Worked at home	40	5%	166,151	4%
Total Workers	817	100%	4,110,670	100%

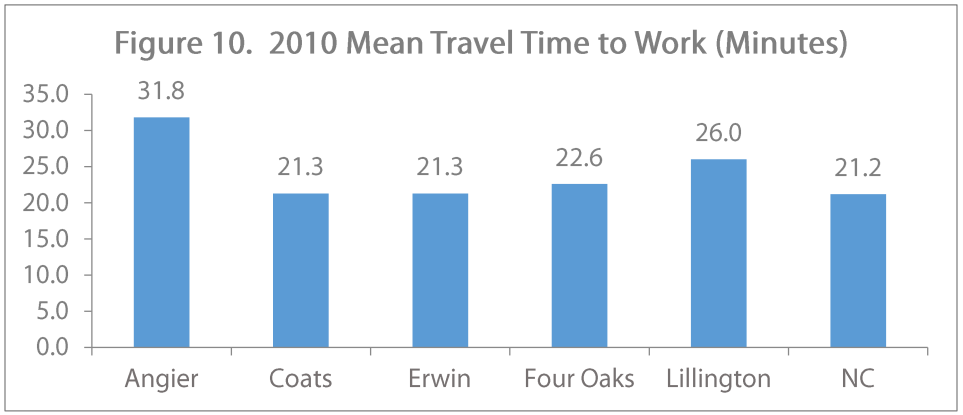
Source: US Census Bureau

According to the 2010 Census, approximately 0.5% of workers in Coats walked to work, while no individuals traveled by bicycle (see Table 2). Only four people traveled to work by an active transportation mode (walking or cycling). Public transportation is not included as an active transportation mode in Coats, whereas in more urban locations with fixed-route transit, the mode is considered active due to walking or cycling between the final destination/origin and stops.



Source: US Census Bureau

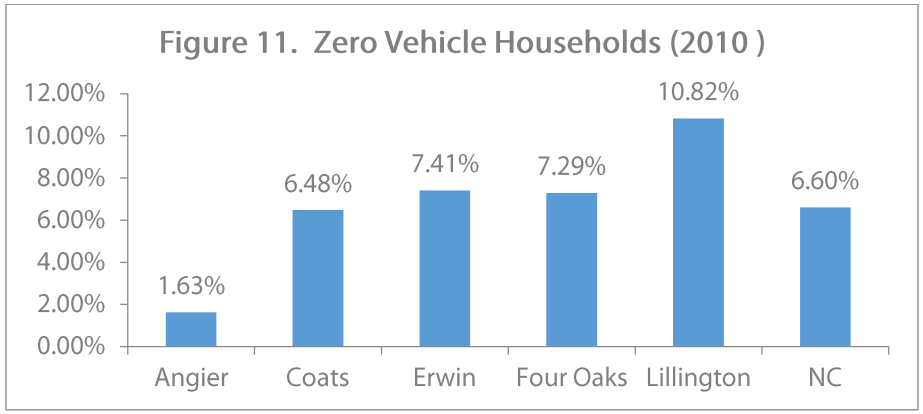
According to the 2010 Census, among the surrounding municipalities, Angier workers face the longest commute times. The 2010 Census mean travel time to work for Coats residents (21.3 minutes) is nearly identical to the statewide average of 21.2 minutes. Commute times vary significantly throughout the area, primarily due to the availability of employment and geography.



Source: US Census Bureau

The vast majority of residents in Coats (82%) reported driving alone to their place of employment. This figure is the same as statewide average of 82%.

Another statistic used to measure mobility is the availability of private vehicles by occupied households. In Coats, approximately 6.5% of households do not have access to a private vehicle. Thus, these households must rely on paratransit or a non-motorized means to get from place to place. The 6.5% figure is slightly lower than the statewide average of 6.6% of households without access to a private vehicle. Across the region, Lillington residents have the highest percentage of occupied households without access to a private vehicle.



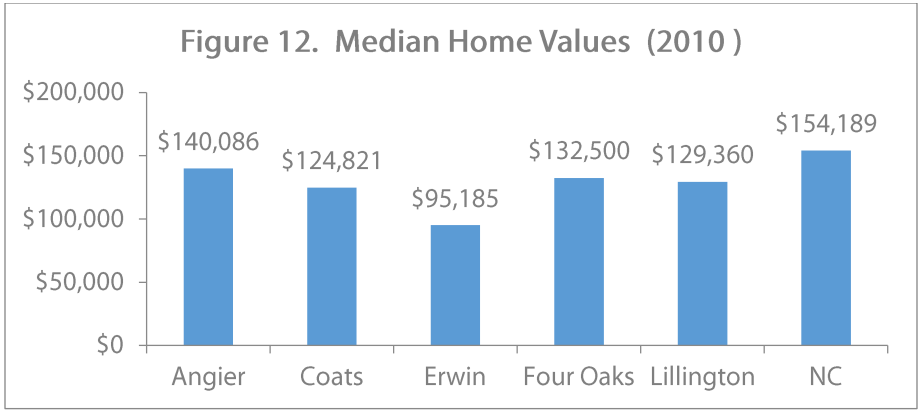
Source: US Census Bureau

Housing

Affordable housing is an increasing public health concern. Recent studies show that families contributing a large percentage of their income to housing are less likely to provide sufficient funds for essential items like food, health care, and medical insurance.[7] In Coats, median home values are much lower than the statewide figure (see Table 3), making housing affordability less of an issue for current and future residents.

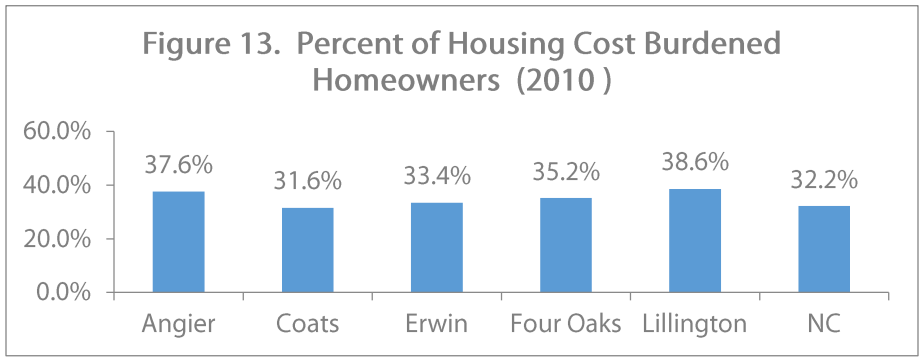
Table 3. Median Value of Owner Occupied Housing Units	
Town of Coats	**North Carolina**
$124,821	$154,189

Source: US Census Bureau



Source: US Census Bureau

It is difficult to obtain a precise picture of housing affordability in any jurisdiction. However, most measures of housing affordability consider 30% of gross income an allowable/affordable expenditure for housing. For homeowners, the cost includes mortgage payments, taxes, insurance, and utilities.



Source: US Census Bureau

Approximately 31.6% of homeowners in Coats are burdened by housing costs that exceed thirty percent of their income. This percentage is the lowest of other comparable municipalities and is also lower than the statewide figure. As such, housing affordability appears to be a positive aspect of living in Coats.

[7]Lipman, Barbara J. 2005. Something's Gotta Give: Working Families and the Cost of Housing. Perquimans, D.C.: Center for Housing Policy. Lee, Wang, Eric Beecroft, Jill Khadduri, and Rhiannon Patterson. 2003.

Section 3: Health & Wellness Issues

Introduction

A century ago in the United States, infectious diseases were the primary cause of death, but proper hygiene, immunization, and environmental design have led to the downfall of such cases. In current years, chronic diseases, such as diabetes and heart disease, have become the most common disease in the US. Chronic diseases differ from infectious or communicable diseases in the way that the illness occurs in individuals. Infectious diseases occur because of contact with an affected host, while chronic diseases may occur solely because of lifestyle choices. Chronic diseases are also the most preventable diseases and obesity is one of the leading causes.

Obesity increases the risk for a variety of chronic diseases including heart disease, stroke, glucose intolerance or diabetes, and some forms of cancer. It is not a direct cause of most diseases, but obesity unfavorably alters the person's risk factor profile. For example, obesity may lead to increases in blood pressure and blood cholesterol, which, in turn, can lead to cardiovascular disease and strokes. The design of the built environment plays a role in both chronic disease and obesity.

People are more likely to lead active lives, for example, if they live near parks or playgrounds, or in areas with sidewalks or bike paths to travel safely by bike or on foot to school, work, or shopping. People are less likely to be active if they live in sprawling areas where they must drive to destinations for active or recreational opportunities. Public officials are beginning to recognize that the design of their communities—residential developments, streets and sidewalks, shops, businesses, and industry—all affect the health and wellness of the population.

The newly installed streetscape on E Main Street is very conducive to walking. The design of the sidewalks, shallow building setbacks, and street trees encourage walking as a transportation choice. *(Image Source: HCP, Inc.)*

The choices we make for our settlement patterns can help physical activity become a natural part of people's everyday lives. A recent study found that people who live in less walkable neighborhoods were fifty percent (50%) more likely to develop diabetes than people who live in walkable areas.[1] Regular physical activity is associated with weight loss and insulin sensitivity. It can prevent obesity and some diabetes complications, and helps lower risk factors for high blood pressure and high cholesterol.

[1] Badger, Emily. The Atlantic Cities Politics. The Atlantic Cities. [Online] September 19, 2012. http://www.theatlanticcities.com/politics/ 2012/09/alarmingly-strong-link-between-diabetes-and-walkability/3326/#.UFuATg_B_G4.gmail.

Health & Wellness in the Community

In an effort to improve the health and wellbeing of its citizens, North Carolina has General Statutes which require each county to complete a Community Health Assessment (CHA) every four years, although many county health departments complete the assessment every three years. According to the North Carolina Division of Public Health, a Community Health Assessment is the foundation for improving and promoting the health of community members.

The role of the community assessment is to determine the general health of the local population, help identify the factors that affect the health of the community, and determine what resources are available within the community to adequately address these factors. It is a "systematic collection, assembly, analysis, and dissemination of information about the health of the community." Intermittently, each county must also complete a State of the County Health (SOTCH) Report. This report contains secondary data related to disease incidence, morbidity, and death rates.

The Harnett County Public Health Department (HCPHD) began discussions aimed at developing a shared CHA with several community partners. Although each entity had a different timetable for its assessment, schedules were adjusted with the goal of completing a joint assessment during 2013 which could then be simultaneously used by all partners in the communities. Therefore, the HCPHD agreed to begin a three-year cycle for the CHA document. The 2013 Harnett County Community Health Assessment provides valuable information such as data related to primary causes of death, community health concerns, and identification of local priorities.

Community Issues

The top three community issues for Harnett County are based on citizen input from the 2013 CHA effort. Table 4 depicts the top three community issues for citizens of Harnett County.

Table 4. Community Issues
1. Unemployment/underemployment
2. Lack of transportation
3. Lack of after school and summer youth activities

Source: 2013 Harnett County Community Health Assessment

Unhealthy Behaviors

The top three Unhealthy Behaviors for the county are based on community input as well. Table 5 depicts the top three unhealthy behaviors ranked by Harnett County residents.

Table 5. Unhealthy Behaviors
1. Use of illegal drugs/substance abuse
2. Tobacco use
3. Overweight/obesity

Source: 2013 Harnett County Community Health Assessment

Social Issues

The top three Community Social Issues for the county were ranked by Harnett County citizens. Table 6 depicts the top three social issues faced by citizens of the county.

Table 6. Social Issues
1. Difficulty earning a living/property
2. Lack of appropriate parenting skills
3. Juvenile delinquency

Source: 2013 Harnett County Community Health Assessment

Issues identified by the Community Health Assessment relate back to underlying cultural norms that influence choices. Overwhelmingly, the most pressing community issues relate to jobs and the local state of the economy. In turn, individuals of a lower socioeconomic status face more significant barriers to healthy lifestyles than do the more affluent members of society. Support and education for healthy lifestyle choices can lead to better health outcomes for the residents of Harnett County and the Town of Coats.

Leading Causes of Death

According to the Centers for Disease Control (CDC), chronic diseases are among the most costly of all health problems in the United States. The leading cause of death in Harnett County, as of 2013, was heart disease—considered a chronic disease and often associated with obesity and inactivity. Cancer and chronic lower respiratory disease, followed as the 2nd and 3rd leading causes of death in Harnett County.

Table 7. Leading Causes of Death
1. Heart Disease
2. Cancer
3. Chronic Lower Respiratory Disease

Source: 2013 Harnett County Community Health Assessment

Compared to North Carolina, Harnett County has higher age-adjusted mortality rates for:

- Unintentional Motor Vehicle Injury – by 38.7%
- Septicemia – by 25.7%
- Nephritis, Nephrotic Syndrome, Nephrosis – by 19.4%
- Homicide – by 19.0%
- Chronic Lower Respiratory Disease – by 17.0%
- Diseases of the Heart – by 16.2%
- Diabetes Mellitus – by 10%
- Cerebrovascular Disease – by 7.2%
- Cancer – by 3.5%
- Human Immunodeficiency Virus – by 2.85%

Access to Care

Medical Care

According to the NC Department of Commerce, in 2012 the statewide average number of primary care physicians per 10,000 residents was 7.6. Harnett County has approximately 3.6 primary care physicians per 10,000 people according to the NC Department of Commerce. The county lags significantly behind the statewide average—with physician availability more than ten times lower than the statewide average.

Compared with the state, Harnett County has a small number of dentists and pharmacists per capita as well. It should be noted, however, that many rural counties in North Carolina fall behind the statewide per capita averages for medical providers.

Table 8. 2012 Health Professionals per 10,000 Residents

Location	Primary Care Physicians	Registered Nurses	Pharmacists	Dentists
Harnett County	3.6	32.7	8.3	1.9
North Carolina	7.6	103.8	10.1	4.5

Source: NC Department of Commerce

Dental Care

North Carolina is ranked 47th in the nation for dentists per capita, having only 4.5 dentists per 10,000 people. In fact, only eight North Carolina counties have dentist-to-patient ratios which exceed the national average of 6.0 dentists per 10,000 people (Wake, Durham, Orange, Alamance, Guilford, Forsyth, Mecklenburg, and New Hanover Counties). Seventy-nine (79) North Carolina counties are recognized as federally designated dental shortage areas. Harnett County falls below the statewide average of dentists per capita at 1.9 per 10,000 people, as well. Further, there are no dental care facilities currently available within the Town of Coats.

Food & Nutrition

Encouraging consumption of fresh, healthy food and increasing access to the sources for healthy food are important ways to address chronic disease incidence and health care expenditures, particularly in underserved neighborhoods in the Town of Coats. Food insecurity is present across the state, meaning that many individuals or families lack adequate and consistent access to the wholesome foods necessary to lead active, healthy lifestyles. North Carolinians face a number of health challenges related to their food system, including the incidence of diet-related chronic diseases, such as obesity and diabetes, both of which are associated with the consumption of high-calorie, nutrient poor foods.

Access to fresh fruits and vegetables is critical to healthy development for children. *(Image Source: HCP, Inc.)*

Children's development, health, and wellbeing are also connected to nutrition, food security, and active living. Providing access to an ample quantity and variety of fruits and vegetables at home, at school, and in the community is critical. Access is especially important for school-age children, given that poor lifestyle and dietary habits in childhood can linger or worsen into the high school years and even further into adulthood.

Fresh Food Access

Local or regional food initiatives and programs can enhance the availability of local food sources. Currently, there are no local farmers' markets available to Coats residents. It should be noted, however, that the town's support for farmers is evident in its most significant yearly festival "Farmer's Day."

Supporting local food initiatives has a variety of local benefits—providing better access to healthier, fresher foods for the consumer is just the beginning. The benefits of a local and sustainable food system include:

- Supplying healthy and affordable food for everyone;
- Financially supporting farmers, farm workers, and other members of the local food supply chain;
- Preserving farmland, open spaces, natural wildlife habitats, and enriching our soil's fertility;
- Creating local jobs, sustaining local business, and keeping tax dollars in our area;
- Conserving and protecting the quality of our water and air and safeguarding our biodiversity; and
- Minimizing fossil fuel consumption and greenhouse gas emissions (food doesn't have to travel as far).

Local Farms

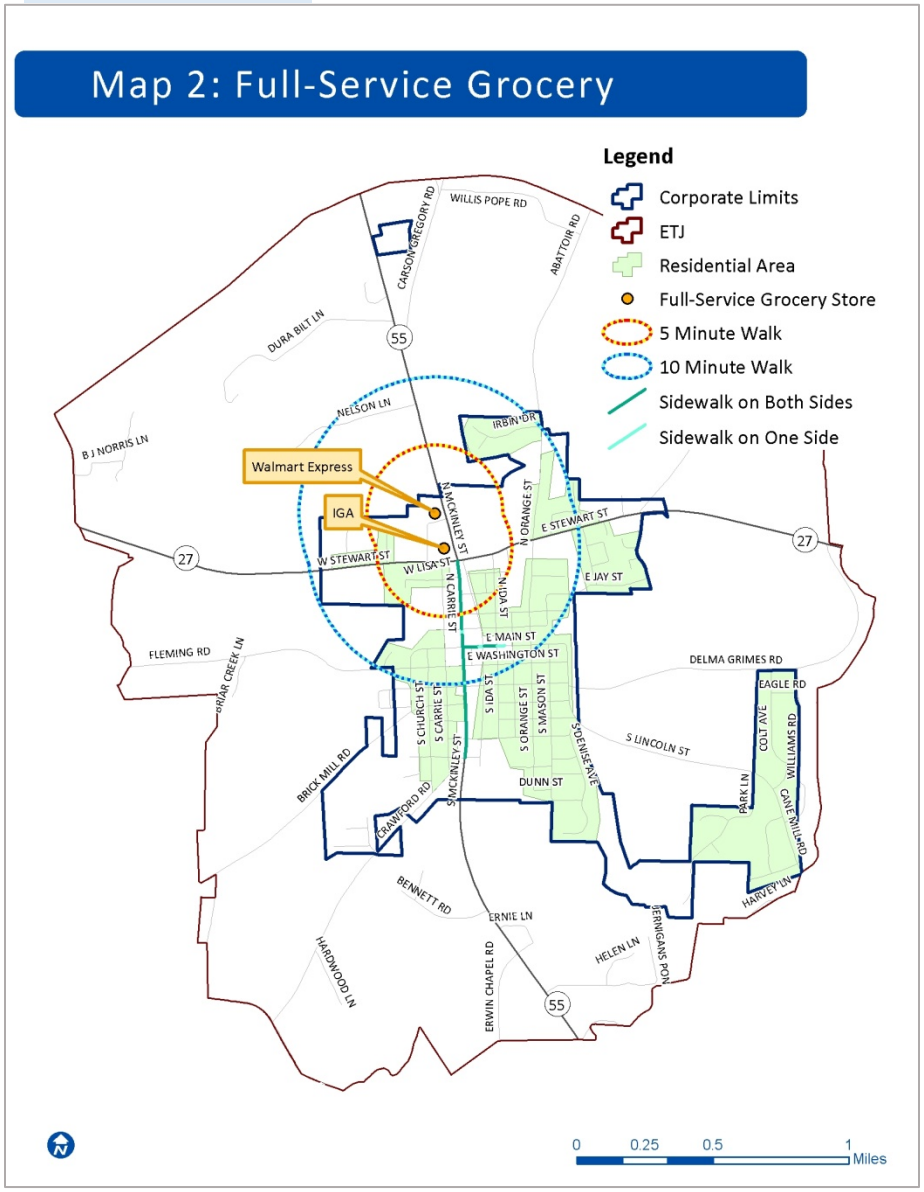
According to the 2012 Census of Agriculture, there are approximately 797 farms in Harnett County. Roughly 30% of the county is farmland, or nearly 120,000 acres. From 2007 to 2012 the county actually gained acres of farmland. For many counties in the state, there was a net loss of farmland. The county ranks 17th (out of 100) in the state for total agricultural products sold.

Full-Service Grocery Access

In Coats, there are two establishments that offer full-service grocery services. For the purposes of this assessment, a "full-service grocery" is defined as an establishment that offers a variety of fresh fruits and vegetables at competitive prices, and accepts the Supplemental Nutrition Assistance Program (SNAP), Electronic Benefits Transfer (EBT), and Benefits for Women, Infants, and Children (WIC) methods of payment.

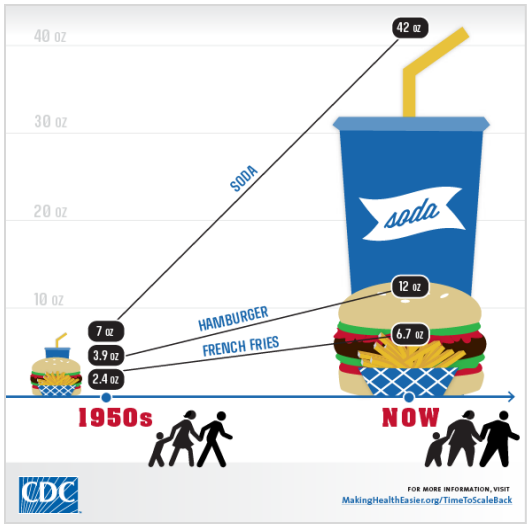
Many residents of Coats may have limited access to the available full-service grocers. The two establishments do not have safe access for non-motorized transportation users. More importantly, the grocery facilities are located on the northern boundary of Stewart Street/NC Hwy 27. The grocery facilities are also located greater than a ½ mile, or a ten minute walk, from the majority of the residential neighborhoods in Coats.

Coats IGA (Carlie C's), is one of two full-service grocers available to residents. *(Image Source: HCP, Inc.).*



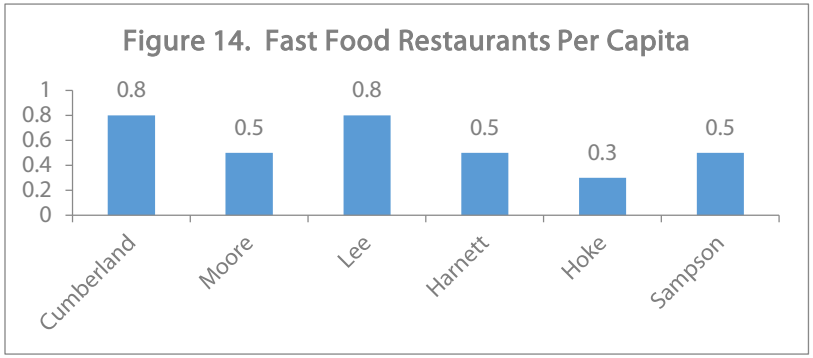
Quick Service Restaurants

Quick Service Restaurants, or Fast Food Restaurants, are establishments that provide customers with a quick, consistent meal, with little or no table service. Quite often, these are chain restaurants with many locations in a given region. According to the USDA, fast food accounted for a 325% increase in the share of calories in the diet of people in the US from 1978 to 2008[2].



Portion sizes have increased dramatically since the 1950's. *(Image Source: Centers for Disease Control and Prevention)*

Figure 14 depicts the ratio of fast food restaurants per 1,000 residents for Harnett County as well as comparable statistics for counties in the region. According to the USDA Food Environmental Atlas, Harnett County has approximately 0.5 fast food restaurants per 1,000 residents – a ranking consistent with that of other counties in the region.



Source: USDA Food Environmental Atlas.

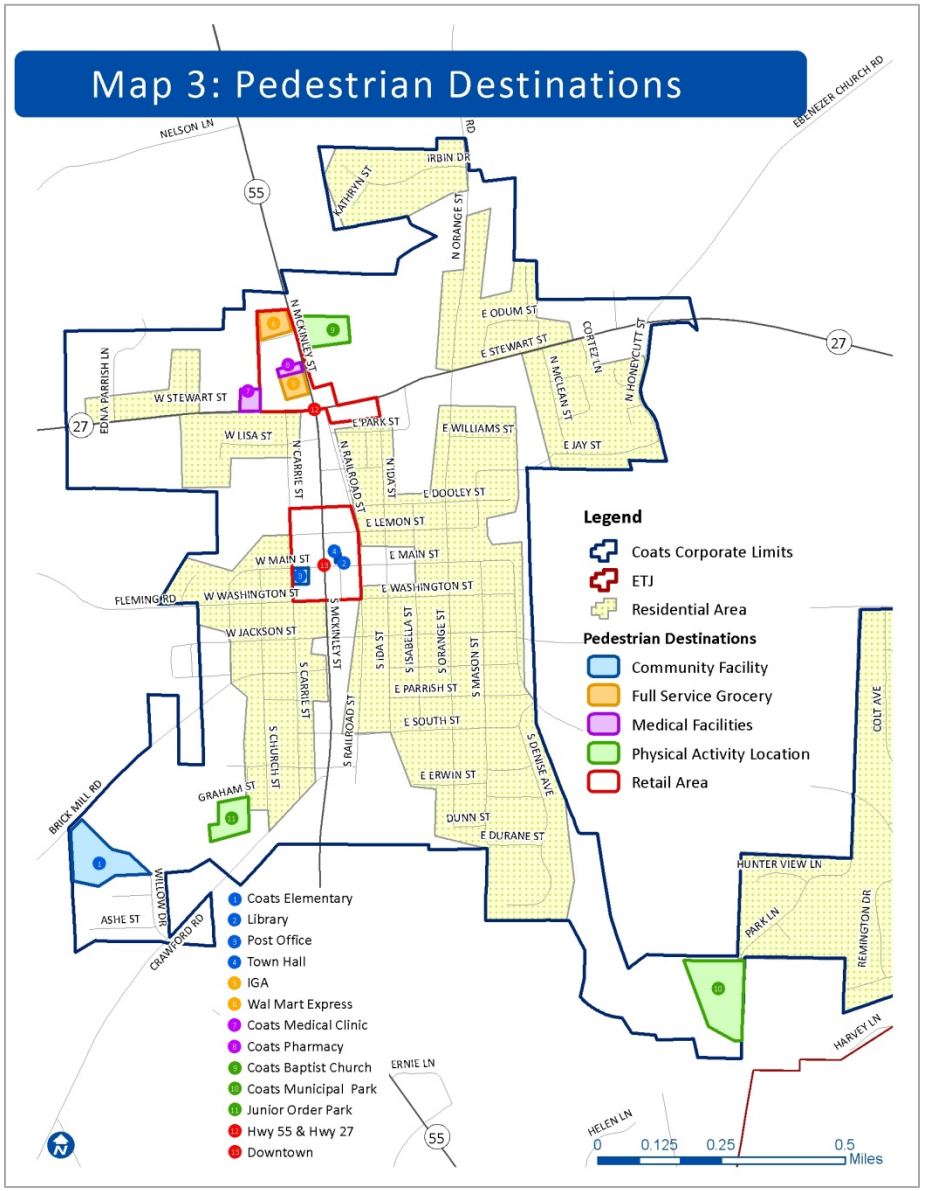
[2]USDA, Economic Research Service analysis using data from the 1977-1978 Nationwide Food Consumption Survey and the 2005-2008 National Health and Nutrition Examination Survey.

Active Transportation Access

Active transportation options include travel modes that require an individual to expend energy to reach his or her destination. Bicyclists and pedestrians are the two most common modes of active transport, but public transit riders may also fit into this category if they travel to transit stops by walking or riding a bicycle. Improvements to existing or investments in new transportation infrastructure can encourage use by non-motorized travelers.

Research suggests that providing pedestrian and cyclist infrastructure will increase use of non-motorized facilities while also promoting physical activity and healthy lifestyles.[3] These investments also make non-motorized travel a safer and more viable transportation option. According to NCDOT crash data, there were approximately 5 pedestrian crashes in Coats from 1998 to 2012, one of which resulted in death. Similarly, there was only one bicycle crash during the same period of time.

The compact nature of Coats encourages walkability; however, only a small portion of the community has facilities that support pedestrian use. In addition, there are no dedicated facilities for cyclists. Pedestrian destinations are displayed on Map 4. The majority of pedestrian destinations are concentrated within the town center and the retail area located at the intersection of NC Hwy 55 and NC Hwy 27.



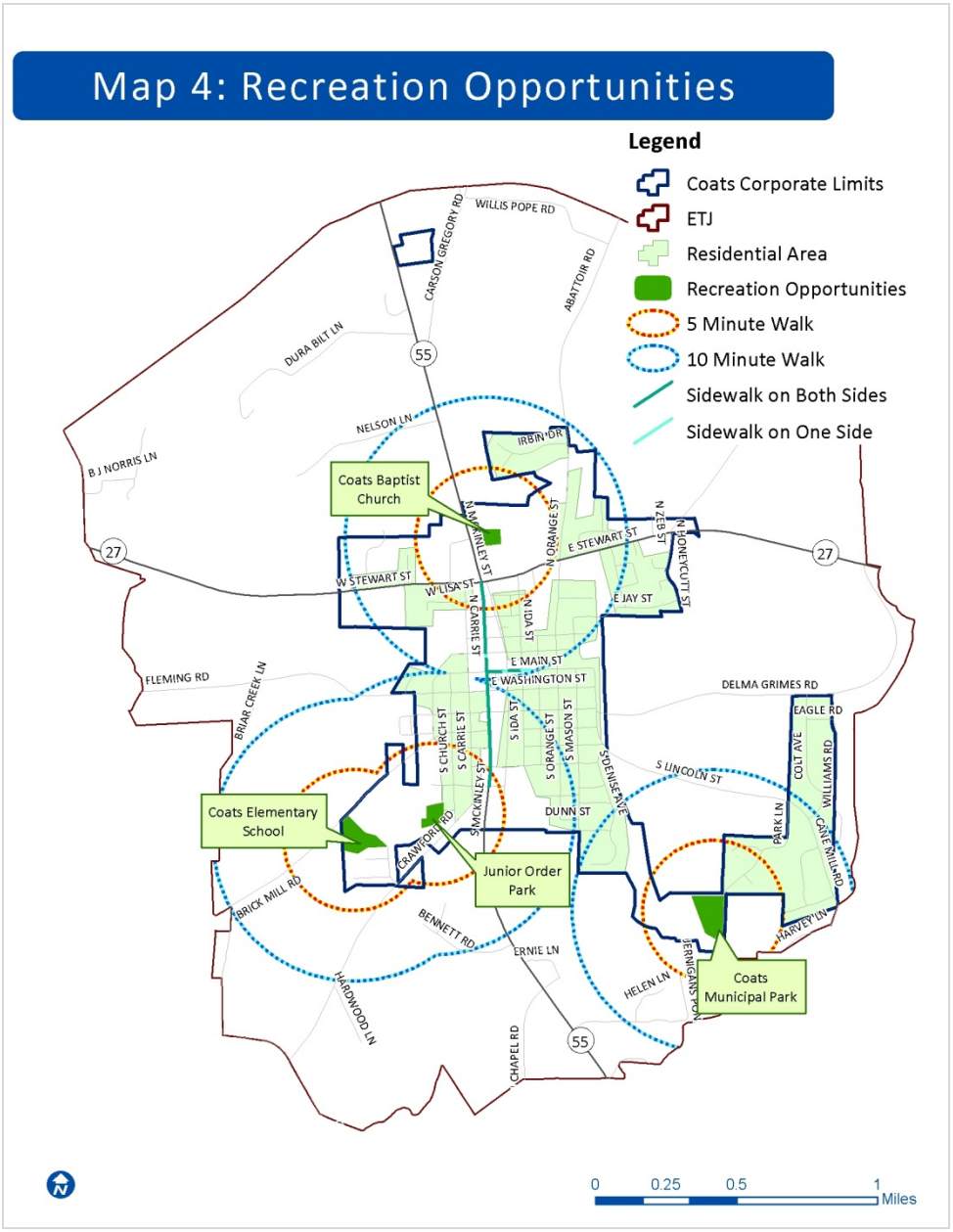
[3]Associations of Perceived Social and Physical Environmental Supports with Physical Activity and Walking Behavior. Addy, CL; DK Wilson, KA Kirtland. 2004, American Journal of Public Health, pp.440-443.

Access to Physical Activity and Recreation

Studies show one of the most effective ways to offset weight gain is through increased physical activity. Coincidentally, individuals looking to increase physical activity encounter barriers when access to recreational facilities is limited. In particular, parks without active transportation connections lessen the amount of physical activity an individual may experience when choosing to recreate. Further, individuals without access to a private vehicle will be less inclined to visit parks and recreation facilities without non-motorized access.

In order to determine areas of Coats lacking recreation access, all public recreation facility locations were geographically mapped. Analysis was completed to establish relative proximity to each physical activity resource. Map 4 displays the proximity of citizens to recreational or physical activity facilities.

Facilities within one-half (1/2) mile are accessible via a ten-minute walk, while facilities within a quarter (1/4) mile are approximately a five-minute trip. Physical activity resources located more than a mile from an individual's place of employment or residence generally require vehicular access. In Coats, most residents must drive to the municipal park to access this physical activity location.



Access to recreational facilities is important to healthy lifestyles. *(Image Source: HCP,*

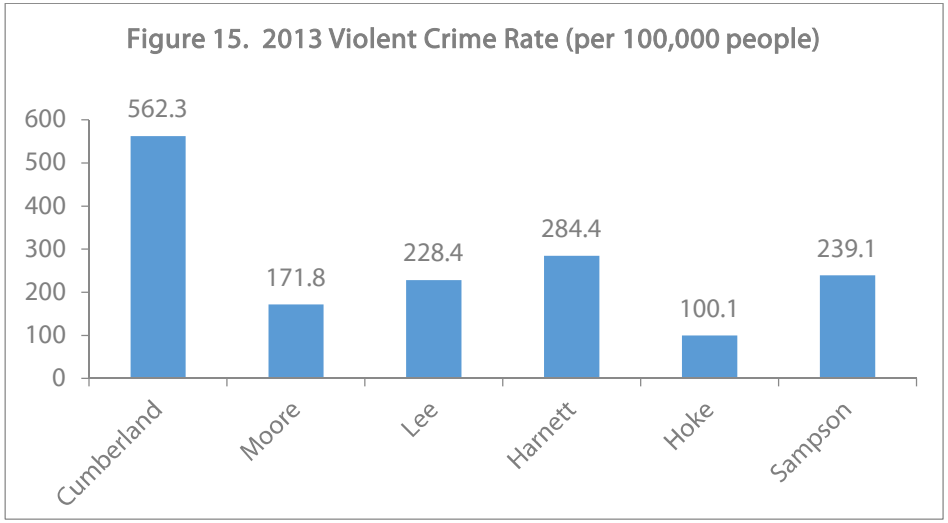
Neighborhood Safety

Neighborhood safety and perception of crime are consistently cited in studies as a barrier to walking and recreational or physical activity. Low socioeconomic status (SES) areas often report higher rates of neighborhood crime, unattended dogs, and untrustworthy neighbors. Substandard housing and vacant or deteriorated structures also lead to a less relative sense of safety in neighborhoods and may also foster criminal activity.

Vacant or deteriorated structures can lead to a less relative sense of safety in neighborhoods and may also foster criminal activity. *(Image Source: HCP, Inc.)*

Violent crimes or crimes against a person instill a sense of fear in individuals. Violent offenses include crimes of murder and manslaughter, forcible rape, robbery, aggravated assault, and property crimes such as burglary, larceny-theft, motor vehicle theft, and arson. Such crimes may lessen the likelihood of travel by foot or bicycle to the grocery store or local recreation facility.

Statistics related to violent criminal instances are available through the North Carolina Uniform Crime Reporting Program. Figure 13, below, recounts violent crime rates per 100,000 people for counties within the region. The violent crime rate in Harnett County (284.4 per 100,000 people) is much lower than the 2012 statewide average (339.5 per 100,000 people) however, violent crime rates within the region are highest in Cumberland and Harnett counties.



Source: NC Uniform Crime Reporting Program

Section 4: Goals, Implementing Strategies, and Funding Sources

Introduction

This chapter details input received from the Health and Wellness Advisory Committee. Information collected from committee participation helped identify obstacles and priorities for health and wellness opportunities in the town. Goals, implementing strategies, and funding sources can also be found in this section of the Town of Coats Healthy Living Assessment.

The committee input session was held August 21, 2014, to discuss the various barriers enhancing health outcomes in the Town of Coats. This brainstorming exercise was designed to solicit input from the advisory committee towards establishing a basis for the goals and implementing strategies to be included as part of this plan. The wording and results collected as part of this exercise were used to create a "word cloud" graphic. The more a word or phrase is repeated, the larger it is shown in the graphic. See the figure to the right for more information.

A lack of safe pedestrian facilities and passive recreation opportunities was identified as the most significant barrier to health and wellness in the Town of Coats. Passive recreation refers to opportunities that are unorganized. Nationwide, there is an increasing demand for passive recreation opportunities such as walking, picnicking, and outdoor gatherings. This trend is a shift away from the high-intensity, organized activities that have long been the focus of parks and recreation departments nationwide.

The intersection of Stewart St (NC 27) and Mckinley St (NC 55) is hazardous to pedestrians as no crossing facilities are present. Further, the intersection experiences a high volume of vehicular traffic on a daily basis. *(Image Source: HCP, Inc.)*

The above graphic is the Word Cloud displaying the results of committee input. *(Image Source: HCP, Inc.)*

Pedestrian safety was identified as the top priority for enhancing health outcomes in the town. The majority of roadways within the town do not presently have sidewalks. The town's primary intersection (NC Hwy 55 and NC Hwy 57) also lacks pedestrian crossing facilities. Another item of concern was the location of the Coats Municipal Park. The committee believed that a more centralized location for physical activity would be a valuable asset to residents.

The entrance to Coats Municipal Park is accessible primarily by automobile. In addition, the park is located in the southern vicinity of town, more than a half mile from the majority of residents *(Image Source: HCP, Inc.)*.

The committee was also tasked with ranking indicators that may have a positive or negative effect on health outcomes. Ranked highest was the proximity to parks and recreation facilities, followed by access to non-motorized transportation facilities. The committee felt that being of a low socioeconomic status was the least significant factor for which the town should focus on improving health outcomes. This ranking is consistent with the barriers to health and wellness identified during the input session.

Table 9. Committee Health Indicator Ranking

Health Indicator	Rank
Proximity to Parks and Recreational Facilities	1
Access to Non-Motorized Transportation (sidewalks, bicycle facilities, etc.)	2
Proximity to Full-Service Grocery Store	3
Age (65+)	4
Proximity to Health Care Provider	5
Low Socioeconomic Status (income, education level)	6

Goals and Implementing Strategies

Goals and implementing strategies have been authored in four different focus areas relating to health and wellness. An overarching goal and corresponding implementing strategies are provided for each of the following categories as follows:

- Active Transportation
- Recreation Opportunities
- Healthy Eating
- Health in All Policies

Implementing strategies are numbered consecutively throughout the section for ease of reference. The Board of Commissioners, with input from the Planning Board and Recreation Committee, will be responsible for directing the implementation effort.

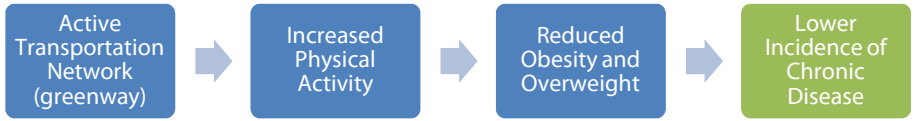
Goals

Goals and implementing strategies are provided for a range of items relating to the built environment and corresponding impacts upon health. A proposed town-wide greenway system is provided as a recommendation. The details are included in this section. Goals for the Healthy Living Assessment are provided, followed by implementation strategies.

Goal 1: The Town of Coats should promote active transportation through a connected network of multi-use paths (greenways), sidewalks, and pedestrian-friendly intersections. Such a network should traverse much of the town, connect the municipal park, and provide an alternative (active) transportation option for residents.

Greenways have grown in popularity over the last ten years. Increasingly, individuals are utilizing these facilities for an alternative (active) transportation option for residents. Research suggests that active members of the community lead more healthy lifestyles, may be more productive at their place of work, and account for lower health care costs.

In North Carolina, walking is the most popular form of exercise. Providing options for active transportation will lead to increased physical activity, a reduction in obesity and overweight, fewer incidences of chronic disease, and finally an enhanced quality of life and lower health care expenditures. See the graphic below detailing the conceptual pathway to healthier lifestyles.



The proposed greenway network is composed of six sections, spanning approximately 6.3 miles. The proposed network is designed to serve the majority of residents while also connecting schools, the Municipal Park, and primary points of interest. See Map 5 (next page and full size in Appendix 1) for the approximate location of the proposed network. Cost estimates are provided for the proposed network based upon installation of a ten-foot wide asphalt path. Funding options exist through grants and the NCDOT Strategic Transportation Investments (STI).

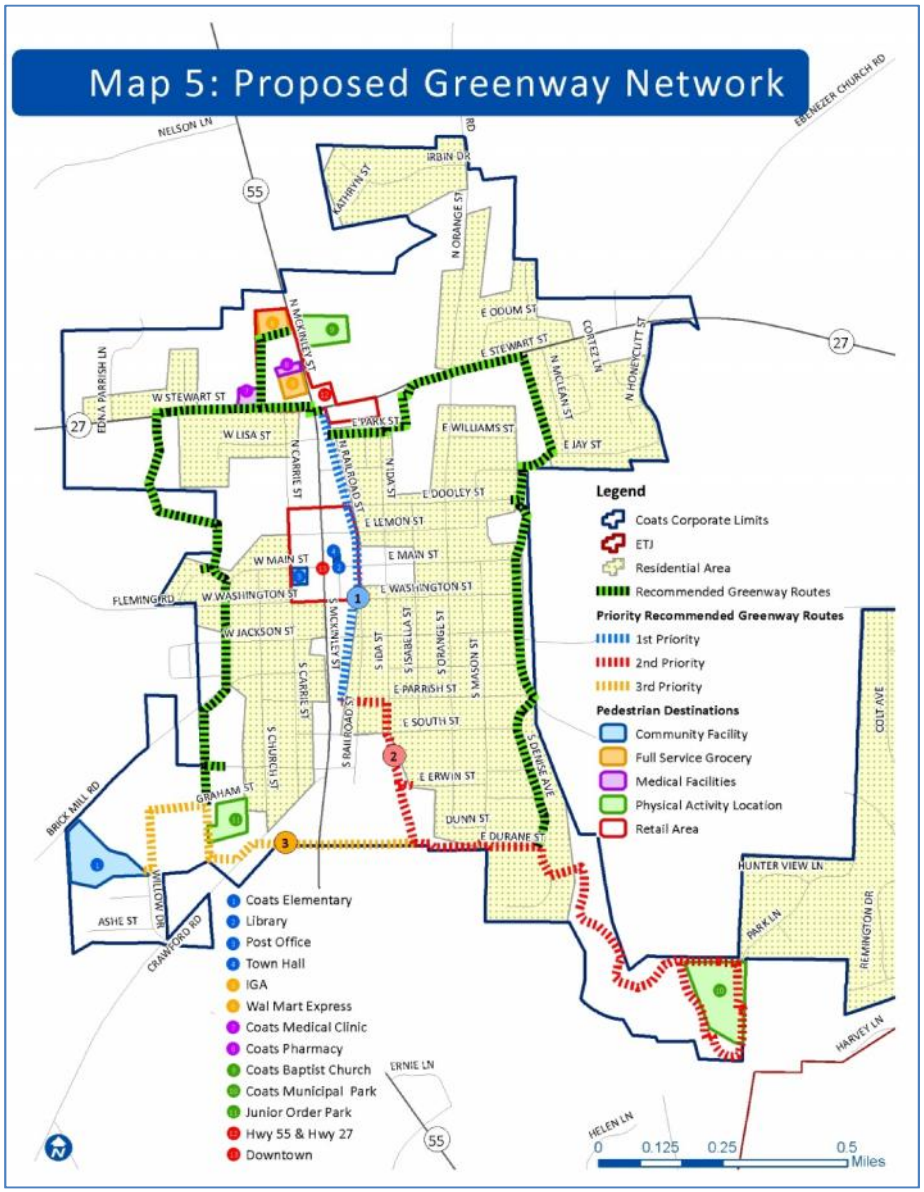


Table 10: Proposed Greenway Networks

Segment Name	From	To	Length (Ft)	Length (Miles)	Estimated Cost
1st Priority: Central	E Stewart Street	W Parrish St	3,194.93	0.61	$ 293,654
2nd Priority: Southern / Coats Park	End Segment 1, Railroad Street & S McKinley Street	Coats Municipal Park	9,474.38	1.79	$ 861,706
3rd Priority: Coats Elementary Connector	Coats Elementary	Segment 2, South of E Erwin Street	4,141.37	0.78	$ 375,492
West Connector	N Railroad Street—Along W Stewart	Graham Street	7,072.84	1.34	$ 645,076
East Connector	N Railroad Street (Along E Park/ E Stewart)	East Durane Street	8,364.88	1.58	$ 760,612
Northern Retail Connector	W Stewart Street	N McKinley Street	1,062.27	0.2	$ 96,280
Total			**33,310.7**	**6.30**	**$ 3,032,820**

The town should also enhance key intersections with pedestrian crossing facilities. Crossing enhancements allow for safer travel by pedestrians. Proposed improvements are provided for the intersection of Stewart Street (NC Hwy 27) and McKinley Street (NC Hwy 55). A conceptual rendering detailing the proposed improvements is provided on the next page. Pedestrian and bicycle facility improvement design guidelines are provided in Appendix 2.


Existing Conditions
Pedestrian Countdown Signals Installed
ADA Curb Ramp
Stop Bar Relocated
High Visibility Crosswalk
HESS
IGA
Stewart St (NC 27) & McKinley St (NC 55):
Conceptual Rendering

Implementing strategies for Active Transportation are provided below.

I.1 Establish an advisory board to oversee the implementation of the greenway network recommendations. The advisory board should meet quarterly and should be composed of town staff and citizens. The first goals of the advisory board should be the identification of priority greenway segments.

I.2 Pursue grant funding to complete a NCDOT, Division of Bicycle and Pedestrian Transportation, combined bicycle and pedestrian plan. Grant applications are due yearly in December. A 10% cash match would be required should the town receive the grant.

I.3 Work in collaboration with Harnett County to pursue funding for the completion of a countywide greenways master plan.

I.4 Support and continue to seek funds for pedestrian and bicyclist improvements. Specifically, Coats should adopt a pedestrian/bicycle plan with identified non-motorized recommendations. The plan should include public involvement. To secure NCDOT funding, a pedestrian/bicyclist project must be identified in a locally adopted plan.

I.5 Adopt a Complete Streets Policy that includes detail for the handling of road maintenance and construction as it pertains to non-motorized enhancements.

I.6 Work with the NCDOT Division 6 Planning Engineer to provide pedestrian safety enhancements at key intersections within Coats. Specific intersections include NC Hwy 55 and NC Hwy 27, Main Street and McKinley Street, and Erwin/Crawford Street and McKinley Streets.

I.7 Encourage local access street connections between adjoining residential subdivisions which have public roads, and connections between parking lots of adjoining commercial developments.

I.8 Promote and support "Walk to Work" and "Walk to School" programs that strive to increase physical activity and active transportation.

I.9 Provide adequate street and park furniture: benches, resting places and awnings for shade.

I.10 Pursue funding through the NC Safe Routes to School Program to construct sidewalks to connect local schools.

Goal 2: Increase recreation opportunities for Coats' residents. While high intensity sports activities currently exist, more passive opportunities are desired. This effort may be accomplished through the construction of new facilities, shared use of school property, or by developing or strengthening partnerships.

A broader range of recreation opportunities should be provided to residents. A centralized passive recreation facility should be provided that will connect residents with the outdoors, encourage physical activity, and promote community engagement. Popular passive recreation amenities include dog parks, playgrounds, and picnic shelters.

Picnic shelters at the Municipal Park are a great example of a passive recreation amenity. Their location, however, limits their use to people who drive to the facility or live in the southern portion of town. A more centralized location for passive recreation opportunities should be provided for Coats' residents. *(Image Source: HCP, Inc.)*

Implementing strategies for Recreation Opportunities are provided below.

I.11 Complete a town-wide parks and recreation master plan. This plan should include site-specific recommendations for a passive recreation facility that will be located in the center of town.

I.12 Work in collaboration with local non-profits, faith organizations, and Harnett County to increase access to recreation facilities and programs. These efforts should specifically target youth and elderly populations.

I.13 Support the provision of public recreational facilities and pursue grant funds for recreation facilities.

I.14 Seek state and federal technical and financial assistance to provide recreational facilities for the disabled.

I.15 Solicit public input for the alternative use of facilities within the Coats Municipal Park. Neighborhood meetings and/or a survey process may be utilized to gauge public input for the future of each facility.

I.16 Construct or renovate all facilities to include consideration of accessibility for the disabled. Such consideration is required by many types of grant funds.

I.17 Promote and support workplace wellness programs that strive to increase physical activity during operating hours, particularly for primarily sedentary employment.

Goal 3: The town should take steps to become a community that supports locally grown foods and provides access to affordable and healthy foods for all residents. In concert with increasing access, the town and applicable community agencies should strive to increase the demand for healthy foods by providing cooking classes, examples of meal options, and desired product purchases.

Implementing strategies for Healthy Eating are provided in the column to the right.

I.18 Work in conjunction with the Harnett County Health Department and the Harnett County Cooperative Extension Office to establish a promotional campaign focused on increasing the availability of fresh fruits and vegetables at corner and country store locations.

I.19 Pursue funding to establish a local farmers' market. Analysis should take place to determine the level of need prior to the establishment of the market.

I.20 Support efforts to establish a local food system focused on economic development and improving access to healthy eating options for under-served populations. Particular interest should be based upon connecting many of the county's fruit and vegetable producers with local consumers.

I.21 Support local efforts to improve access to produce and value-added agricultural products. This effort will serve as an economic development tool for improving access to healthy eating options for under-served populations.

I.22 Protect farmland through the following measures:

- Support of NC legislative changes that enable the transfer of development rights for protection of prime farmland areas.
- Support of the Harnett County Voluntary Agricultural District program.
- Support of land use decisions which will protect agricultural lands and encourage new developments to locate near existing subdivisions.

I.23 Pursue grant funds which may assist with the preservation of agricultural lands.

I.24 Facilitate the provision of transportation services to health and human services and healthy food retail.

Goal 4: "Health in All Policies" refers to a concept that includes health as a component of nearly all functions of local government. Considerations for the health of its citizens can and should be a part of the daily functioning of the Town of Coats government.

Implementing strategies for Health in All Policies are provided below.

I.25 Take steps to ensure, to the maximum extent practicable, that all public buildings and facilities are handicap accessible.

I.26 Involve all town departments in developing grant applications for health initiatives.

I.27 As Planning Board membership vacancies occur, recruit members who have interest and/or expertise in public health.

I.28 Promote social cohesion through community programming by the Health Department, faith-based organizations, or local non-profits.

I.29 Implement the following activities to enhance the health of residents:

- Work with state and federal legislators to obtain grant money for initiatives to reduce health care costs.
- Incorporate health and wellness concerns into future hazard mitigation planning.
- Work with local religious groups to provide emergency support systems for large scale or traumatic events.

I.30 Promote ordinances to limit exposure to second-hand smoke by creating smoke-free spaces.

I.31 Conduct a health and wellness audit of zoning and subdivision ordinances within the town. Findings should focus on language that may be revised to promote active and healthy lifestyles.

Funding Sources

Many options exist in the pursuit of funding. Grant opportunities at the state and federal levels can be used to realize the vision established for enhancing the health and wellness of Coats' residents. Below is a brief summary of grant opportunities that may be suitable for the town.

State Opportunities

North Carolina Parks and Recreation Trust Fund

The purpose of the Parks and Recreation Trust Fund is to fund improvements in the state's park system and to fund grants for local governments. Awards are given with a $500,000 maximum and require a 50% local match. Applications are due in January of each year.

North Carolina Clean Water Management Trust Fund

Clean Water Management Trust Fund awards may be used for enhancement or restoration of degraded waters, protection of unpolluted waters, creating a network of riparian buffers and greenways for environmental, educational, and recreational benefits. Annual applications are reviewed by 21-member Board of Trustees. The annual application deadline is February 1st. No match is required, but matching is preferred.

Adopt-a-Trail Program

The Adopt-a-Trail Program, administered through the North Carolina Trails Program, can be used for trail building, trail signage and facilities, trail maintenance, trail brochures and maps, and other related uses. The award cycle has an annual application deadline in January, and no local match is required.

Recreational Trails Program

The Recreational Trails Program (RTP) is a grant program administered by staff of the State Trails Program of the NC Division of Parks and Recreation. RTP grants may be used to develop and maintain recreational trails and

trail-related facilities, for both motorized and non-motorized recreational trail uses. Specifically, funds from the RTP may be used for renovation and maintenance of existing trails, development and renovation of trailhead and trailside facilities, the purchase and lease of trail construction and maintenance equipment, construction of new trails, and land acquisition for trail development, with an award preference for projects that connect existing trails, parks, schools, and other community features. The program requires a 25% match from local funding, and applications are accepted on a yearly basis. Maximum award amounts vary on the type of project; the maximum amount awarded for new trail development is $1,000,000, while the maximum amount awarded for trail renovation is $75,000. The minimum award granted for projects is $25,000.

Federal Opportunities

Federal Land and Water Conservation Fund

The Federal Land and Water Conservation Fund provides grants to states for conservation and outdoor recreation purposes, and through the state's local governments to address "close to home" outdoor recreation needs. Applications must be submitted to the National Parks Service at least 60 days in advance of the proposed acquisition or the beginning of construction, except, in accordance with retroactivity provisions, to allow sufficient time for federal review in determining eligibility and federal compliance. Assistance shall not exceed 50% of the total eligible costs (except as provided for the Insular Areas) and is provided primarily on a reimbursement basis.

Healthy People 2020 Community Implementation Grants Program

Over the next ten years, the Federal Department of Health and Human Services plans to award hundreds of "micro-grants" to community organizations for activities that support the far-reaching goals of Healthy People 2020, including promoting health education, quality care, access to care, and other projects. Healthy People 2020 is the nation's public health agenda for the next decade, and these micro-grants represent a new, low-cost approach to fostering effective prevention efforts at the community level.

Other Opportunities

NRPA – CDC ACHIEVE Grant

The National Recreation and Park Association (NRPA) receives funding from the Centers for Disease Control and Prevention (CDC) to enhance local communities' abilities to develop and implement policy, systems, and environmental change strategies that will help prevent or manage health-risk factors for heart disease, stroke, diabetes, cancer, obesity, and arthritis. ACHIEVE, now in its third year, is part of a broader Healthy Communities collaborative with the CDC, National Association of County and City Health Officials (NACCHO), National Association of Chronic Disease Directors (NACDD) and the YMCA of the USA. In 2010, NRPA will fund ten park and recreation agencies at $35,000 each to develop coalitions of local stakeholders and community leaders to address chronic disease risk factors.

North Carolina Tobacco Trust Fund

The North Carolina Tobacco Trust Fund has awarded nearly $39 million in grants over the last eight years to a variety of farm organizations, local and state government agencies, commodity groups, non-profits, and others. The NC Tobacco Trust Fund Commission was created by the North Carolina General Assembly to receive and disburse funds from the Master Settlement Agreement (MSA) between the state and various cigarette manufacturers.

The Commission recognizes that North Carolina's prosperity has been historically supported by agriculture, specifically the tobacco-related segment of agriculture. Through its programs, the Commission seeks to mitigate the general decline in the tobacco-related segment of our economy. Funds are available for the public purpose of alleviating or avoiding unemployment and quantifiable adverse fiscal impacts, stabilizing local tobacco-dependent communities and tax bases, and to provide for the optimal use of natural resources.

Eligible projects for which Coats may seek funding assistance through this program include experimental agriculture programs, community gardens, and farmers' markets. Applications are due annually in early December, and award recipients are announced in early May of the following year. More information is available on the program's website: www.tobaccotrustfund.org.

The Global ReLeaf Forest Program

The Global ReLeaf Forest Program is American Forests' education and action program that helps individuals, organizations, agencies, and corporations improve the local and global environment by planting and caring for trees. The program provides funding for planting tree seedlings on public lands, and the program is particularly interested in partnering with private and public sector organizations and agencies to plant trees and improve the environment in projects that would otherwise not be feasible. To date, the project has helped plant more than 23 million trees in more than 500 forest ecosystem restoration projects and urban and community forest projects. The Global ReLeaf projects cover 18,000 acres of land, most of which is considered difficult to plant.

The Robert Wood Johnson Foundation

The Robert Wood Johnson Foundation seeks to improve the health and health care of all Americans, including one primary goal to "promote healthy communities and lifestyles." Specifically, the Foundation has an "Active Living by Design" grant program that promotes the principles of active living, including non-motorized transportation. Many communities across the nation have received grants related to promotion of trails and other non-motorized facilities. More information may be found at the Foundation's website: www.rwjf.org

National Tree Trust (NTT)

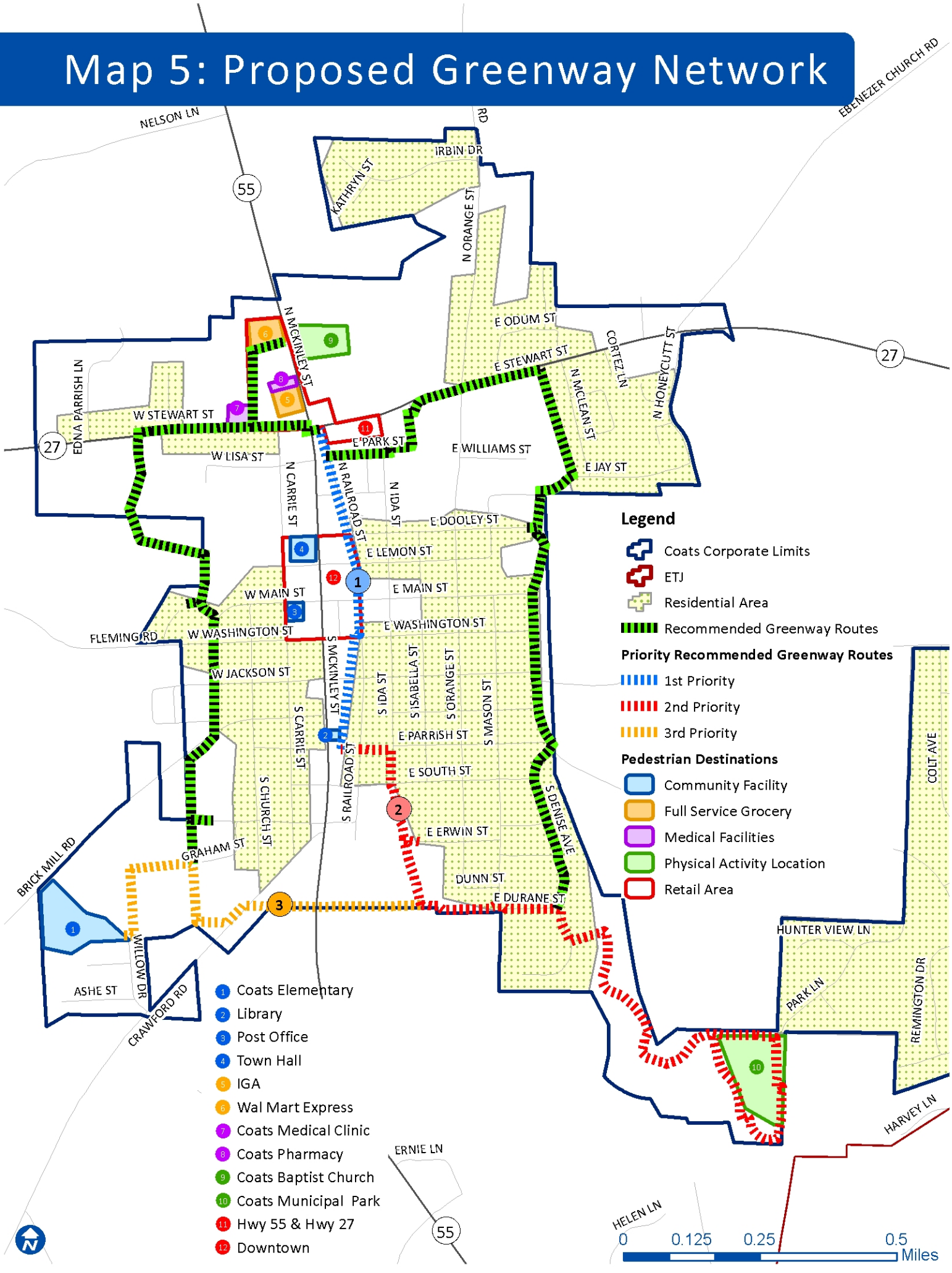
The National Tree Trust has a grant program available that provides a way for communities to beautify themselves, replant a neglected area, or just get some fresh air by planting tree seedlings. The seedlings are available from January through April, and the proposed project must adhere to several requirements including: trees must be planted on public land; projects must use volunteers for planting and/or maintaining seedlings; and two years of annual reporting are required for each grant. Matching funds are required, which can include volunteer hours, donated items, and nonfederal funding. More information on the NTT program may be found at the website: www.nationaltreetrust.org

Let's Play Community Construction Grants

Dr Pepper™, Snapple™, and KaBOOM! are offering $15,000 grants to qualifying US-based organizations to be used toward the purchase of playground equipment that will be built using the KaBOOM! Community-Build Model. Grantees will plan their project and share best practices and challenges through Our Dream Playground. "Imagination Playground in a Cart" Construction Grants are also available for those communities that cannot build a fixed play space. More information can be obtained by contacting grants@kaboom.org.

Appendix 1: Proposed Greenway Network

Map 5: Proposed Greenway Network



Appendix 2: Design Guidelines

Introduction

The following guidelines are provided to serve as a basis for facility design in Coats. Alterations may be necessary for specific projects. Consultation with a professional engineer or licensed landscape architect should take place when designing and installing any of the listed facilities. Coordination with the NC Department of Transportation may be required in instances where innovative practices are utilized. The following resources were used in the creation of these guidelines:

- NC Complete Streets
- Model Design Manual for Living Streets
  www.Modelstreetdesignmanual.com
- Pedestrian and Bicycle Information Center, 2010
  www.walkinginfo.org/engineering/
  www.bicyclinginfo.org/engineering/
- Bicycle Parking Design Guidelines
  www.bicyclinginfo.org/engineering/parking.cfm
- Manual on Uniform Traffic Control Devices (MUTCD) U. S. Department of Transportation, Washington, DC, 2009
  http://mutcd.fhwa.dot.gov
- Context Sensitive Solutions in Designing Major Urban Thoroughfares for Walkable Communities: An ITE Proposed Recommended Practice.

Pedestrian Facilities

ESSENTIAL PRINCIPLES OF PEDESTRIAN CROSSINGS

The following principles should be incorporated into every pedestrian crossing improvement:

- The safety of all street users, particularly more vulnerable groups, such as children, the elderly, and those with disabilities, and more vulnerable modes, such as walking and bicycling, must be considered when designing streets.
- Pedestrian crossings must meet accessibility standards and guidelines.
- Real and perceived safety must be considered when designing crosswalks—crossing must be "comfortable." A "safe" crossing that no one uses serves no purpose.
- Crossing treatments that have the highest crash reduction factors (CRFs) should be used when designing crossings.
- Safety should not be compromised to accommodate traffic flow.
- Good crossings begin with appropriate speed. In general, urban arterials should be designed to a maximum of 30 mph or 35 mph (note: 30 mph is the optimal speed for moving motor vehicle traffic efficiently).
- Every crossing is different and should be selected and designed to fit its unique environment.
- Ideally, uncontrolled crossing distances should be no more than 21 feet, which allows for one 11-foot lane and one 10-foot lane. Ideally, streets wider than 40 feet should be divided (effectively creating two streets) by installing a median or two crossing islands.

Crosswalk Markings

According to the MUTCD, the minimum crosswalk marking shall consist of solid white lines. They shall not be less than 6 inches or greater than 24 inches in width.

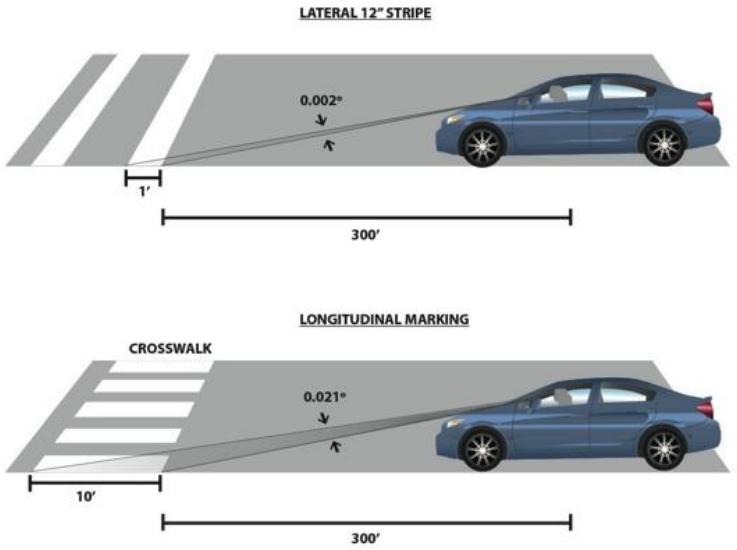
Placement

The best locations to install marked crosswalks are:

- All signalized intersections
- Trail crossings
- High land use generators
- School walking routes
- When there is a preferred crossing location due to sight distance
- Where needed to enable comfortable crossings of multi-lane streets between controlled crossings spaced at convenient distances

High-Visibility Crosswalks

Because of the low approach angle at which pavement markings are viewed by drivers, the use of longitudinal stripes in addition to or in place of transverse markings can significantly increase the visibility of a crosswalk to oncoming traffic. While research has not shown a direct link between increased crosswalk visibility and increased pedestrian safety, high-visibility crosswalks have been shown to increase motorist yielding and channelization of pedestrians, leading the Federal Highway Administration to conclude that high-visibility pedestrian crosswalks have a positive effect on pedestrian and driver behavior. Colored and stamped crosswalks should only be used at controlled locations.



Longitudinal crosswalk markings are more visible than lateral crosswalk markings. *(Credit: Michele Weisbart)*

Staggered longitudinal markings reduce maintenance since they avoid vehicle wheel paths.

Typical crosswalk markings: Continental, Ladder, Staggered Continental *(Credit: Michele Weisbart)*

Continental striping (far left) provides the highest visibility.

Crosswalks and Accessibility

Longitudinal crosswalk markings provide the best visibility for pedestrians with limited vision.

Decorative crosswalk treatments, as shown here in Ayden, NC made of distinctive materials can become uneven over time.

Decorative crosswalk pavement materials should be chosen with care to ensure that smooth surface conditions and high contrast with surrounding pavement are provided. Textured materials within the crosswalk are not recommended. Without reflective materials, these treatments are not visible to drivers at night.

Decorative pavement materials often deteriorate over time and become a maintenance problem while creating uneven pavement. The use of color or material to delineate the crosswalks as a replacement of retro-reflective pavement marking should not be used, except in slow speed districts where intersecting streets are designed for speeds of 20 mph or less.

Raised/Landscaped Medians

Staggered median crossing
(Credit: Marcel Schmaedick)

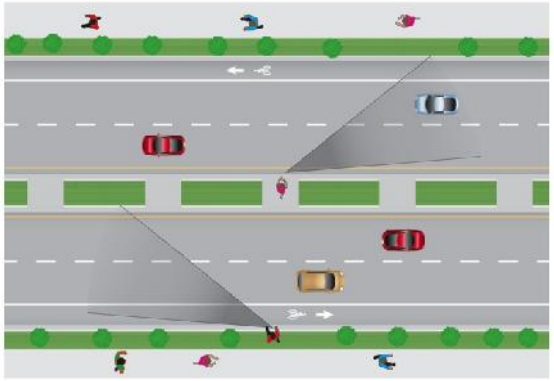
Raised islands and medians are the most important, safest, and most adaptable engineering tool for improving street crossings. *Note* on terminology: a median is a continuous raised area separating opposite flows of traffic. A crossing island is shorter and located just where a pedestrian crossing is needed.
Raised medians and crossing islands are commonly used between intersections when blocks are long (500 feet or more in downtowns) and in the following situations:

- Speeds are higher than desired
- Streets are wide
- Traffic volumes are high
- Sight distances are poor

Raised islands have nearly universal applications and should be placed where there is a need for people to cross the street. They are also used to slow traffic.

Reasons for Effectiveness

Their use changes a complex task, crossing a wide street with traffic coming from two opposing directions all at once, into two simpler and smaller tasks. With their use, conflicts occur in only one direction at a time, and exposure time can be reduced from more than 20 seconds to just a few seconds.



Medians and crossing islands allow pedestrians to complete the crossing in two stages.
(Credit: Michele Weisbart)

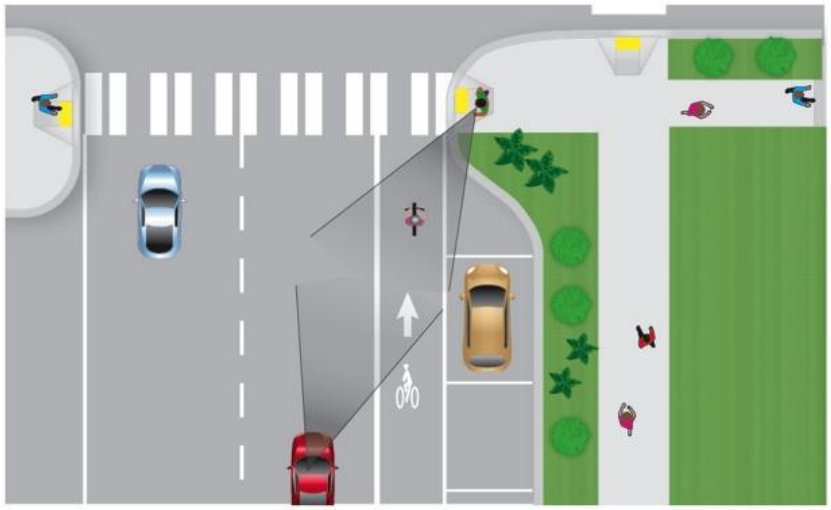
On streets with traffic speeds higher than 30 mph, it may be unsafe to cross without a median island. At 30 mph, motorists travel 44 feet each second, placing them 880 feet out when a pedestrian starts crossing an 80-foot wide multi-lane road.

In this situation, this pedestrian may still be in the last travel lane when the car arrives there; that car was not within view at the time he or she started crossing. With an island on multi-lane roadways, people would cross two or three lanes at a time instead of four or six. Having to wait for a gap in only one direction of travel at a time significantly reduces the wait time to cross. Medians and crossing islands have been shown to reduce crashes by 40 percent (Federal Highway Administration, Designing for Pedestrian Safety course).

As a general rule, crossing islands are preferable to signal-controlled crossings due to their lower installation and maintenance cost, reduced waiting times, and their safety benefits.

Curb Extensions

Curb extensions extend the sidewalk or curb line out into the parking lane, which reduces the effective street width. Curb extensions significantly improve pedestrian crossings by reducing the pedestrian crossing distance, visually and physically narrowing the roadway, improving the ability of pedestrians and motorists to see each other, and reducing the



Curb extensions. *(Credit: Michele Weisbart)*

time that pedestrians are in the street. Reducing street widths improves signal timing since pedestrians need less time to cross.

Motorists typically travel more slowly at intersections or mid-block locations with curb extensions, as the restricted street width sends a visual cue to slow down. Turning speeds are lower at intersections with curb extensions (curb radii should be as tight as is practicable). Curb extensions also prevent motorists from parking too close to the intersection.

Curb extensions also provide additional space for two curb ramps and for level sidewalks where existing space is limited, increase the pedestrian waiting space, and provide additional space for pedestrian push button poles, street furnishings, plantings, bike parking and other amenities. A benefit for drivers is that extensions allow for better placement of signs (e.g., stop signs and signals).

Example of curb extensions. *(Credit: Marcel Schmaedick)*

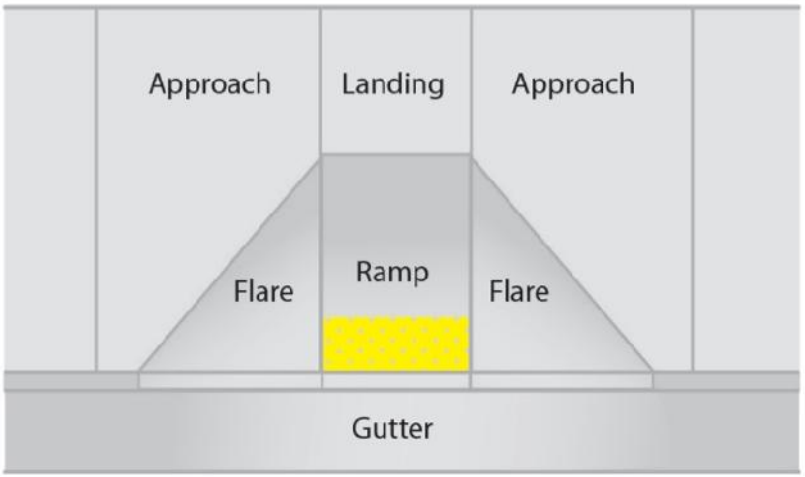
Curb extensions are generally only appropriate where there is an on-street parking lane. Where street width permits, a gently tapered curb extension can reduce crossing distance at an intersection along streets without on-street parking, without creating a hazard. Curb extensions must not extend into travel lanes or bicycle lanes.

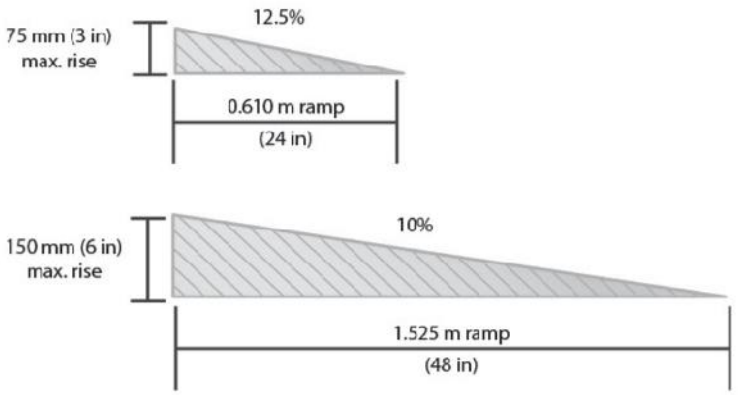
Curb extensions can impact other aspects of roadway design and operation as follows:

- May impact street drainage and require catch basin relocation
- May impact underground utilities
- May require loss of curbside parking, though careful planning often mitigates this potential loss, for example by relocating curbside fire hydrants, where no parking is allowed, to a curb extension
- May complicate delivery access and garbage removal
- May affect the turning movements of larger vehicles such as school buses and large fire trucks

Curb Ramps

Proper curb ramp design is essential to enable pedestrians using assistive mobility devices (e.g., scooters, walkers, and crutches) to transition between the street and the sidewalk. These design guidelines provide a basic overview of curb ramp design. The ADA requires installation of curb ramps in new sidewalks and whenever an alteration is made to an existing sidewalk or street. Curb ramps are typically installed at intersections, mid-block crossings (including trail connections), accessible on-street parking, and passenger loading zones and bus stops.





Curb ramp components, and alternate ramp slopes. *(Credit: Michele Weisbart)*

The following define the curb ramp components along with minimum dimensions:

- **Landing** – the level area at the top of a curb ramp facing the ramp path. Landings allow wheelchairs to enter and exit a curb ramp, as well as travel along the sidewalk without tipping or tilting. This landing must be the width of the ramp and measure at least 4 feet by 4 feet. There should also be a level (not exceeding a 2 percent grade) 4 foot by 4 foot bottom landing of clear space outside of vehicle travel lanes.

- **Approach** – the portion of the sidewalk on either side of the landing. Approaches provide space for wheelchairs to prepare to enter landings.

- **Flare** – the transition between the curb and sidewalk. Flares provide a sloped transition (10 percent maximum slope) between the sidewalk and curb ramp to help prevent pedestrians from tripping over an abrupt change in level. Flares can be replaced with curb where the furniture zone is landscaped.

- **Ramp** – the sloped transition between the sidewalk and street where the grade is constant and cross slope at a minimum. Curb ramps are the main pathway between the sidewalk and street.

- **Gutter** – the trough that runs between the curb or curb ramp and the street. The slope parallel to the curb should not exceed 2 percent at the curb ramp.

- **Detectable Warning** – surface with distinct raised areas to alert pedestrians with visual impairments of the sidewalk-to-street transition.

There are several different types of curb ramps. Selection should be based on local conditions. The most common types are diagonal, perpendicular, parallel, and blended transition.

Diagonal Curb Ramps

Diagonal curb ramps are single curb ramps at the apex of the corner. These have been commonly installed by many jurisdictions to address the requirements of the ADA, but have since been identified as a non-preferred design type as they introduce dangers to wheelchair users. Diagonal curb ramps send wheelchair users and people with strollers or carts toward the middle of the intersection and make the trip across longer.

Perpendicular Curb Ramps

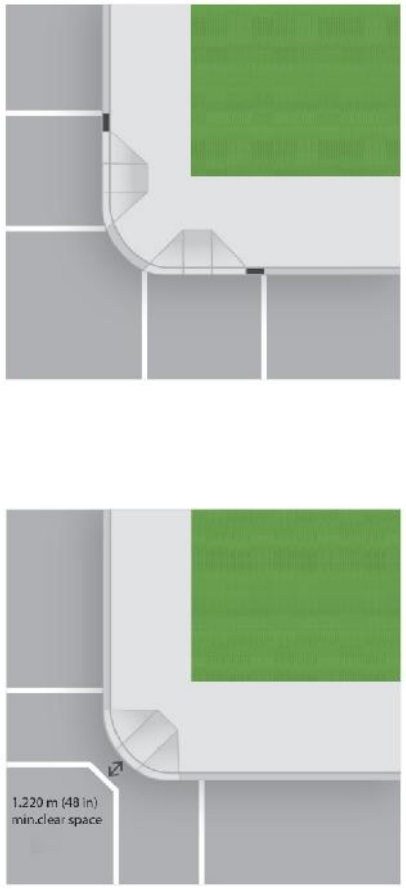
Perpendicular curb ramps are placed at a 90-degree angle to the curb. They must include a level landing at the top to allow wheelchair users to turn 90 degrees to access the ramp, or to bypass the ramp if they are proceeding straight. Perpendicular ramps work best where there is a wide sidewalk, curb extension, or planter strip. Perpendicular curb ramps provide a direct, short trip across the intersection.

Parallel Curb Ramps

Parallel curb ramps are oriented parallel to the street; the sidewalk itself ramps down. They are used on narrow sidewalks where there isn't enough room to install perpendicular ramps. Parallel curb ramps require pedestrians who are continuing along the sidewalk to ramp down and up. Where space exists in a planting strip, parallel curb ramps can be designed in combination with perpendicular ramps to reduce the ramping for through pedestrians. Careful attention must be paid to the construction of the bottom landing to limit accumulation of water and/or debris.

Curb Ramp Placement

One ramp should be provided for each crosswalk, which usually translates to 2 per corner. This maximizes access by placing ramps in line with the sidewalk and crosswalk, and by reducing the distance required to cross the street, compared with a single ramp on the apex.



One ramp per crosswalk vs. single ramp at the apex
(Credit: Michele Weisbart)

A single ramp at the apex requires users to take a longer, more circuitous travel path to the other side and causes users to travel towards the center of the intersection where they may be in danger of getting hit by turning cars; being in the intersection longer exposes the user to greater risk of being hit by vehicles. A single ramp at the apex should be avoided in new construction and may be used only for alterations where a design exception is granted because of existing utilities and other significant barriers. In all cases, reducing the curb radius makes ramp placement easier.

Signs

Signs can provide important information to improve road safety by letting people know what to expect, so they can react and behave appropriately. Sign use and placement should be done judiciously, as overuse breeds noncompliance and disrespect. Too many signs create visual clutter. Regulatory signs, such as STOP, YIELD, or turn restrictions, require driver actions and can be enforced. Warning signs provide information, especially to motorists and pedestrians unfamiliar with an area.

Advance pedestrian warning signs should be used where motorists may not expect pedestrian crossings, especially if there are many motorists who are unfamiliar with the area. The fluorescent yellow/green color is designated specifically for pedestrian, bicycle, and school warning signs (Section 2A.10 of the 2009 MUTCD) and should be used for all new and replacement installations. This bright color attracts the attention of drivers because it is unique.

Sign R1-5 should be used in conjunction with advance yield lines, as described below. Sign R1-6 may be used on median islands, where they will be more visible to motorists than signs placed on the side of the street, especially where there is on-street parking.

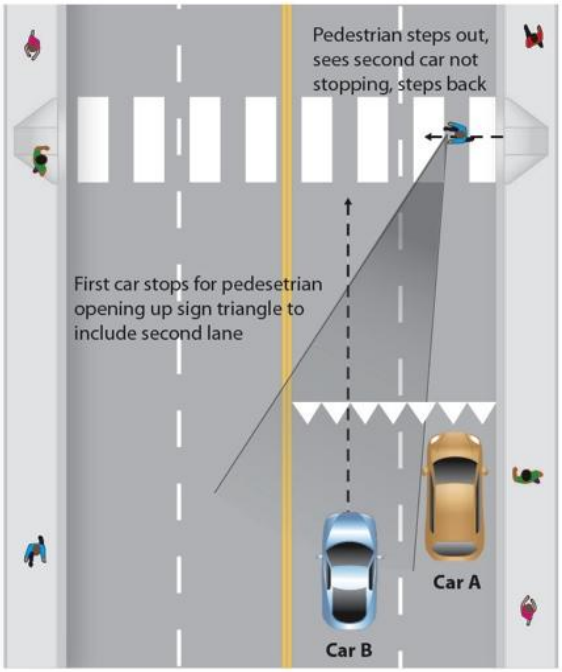
All signs should be periodically checked to make sure that they are in good condition, free from graffiti, reflective at night, and continue to serve a purpose.

All sign installations need to comply with the provisions of the MUTCD.

Advanced Yield/Stop Lines

Stop lines are solid white lines 12 to 24 inches wide, extending across all approach lanes to indicate where vehicles must stop in compliance with a stop sign or signal. Advance stop lines reduce vehicle encroachment into the crosswalk and improve drivers' view of pedestrians. At signalized intersections, a stop line is typically set back between 4 and 6 feet.

At uncontrolled crossings of multi-lane roads, advance yield lines can be an effective tool for preventing multiple threat vehicle and pedestrian collisions. Section 3B.16 of the MUTCD specifies placing advanced yield markings 20 to 50 feet in advance of crosswalks, depending upon location-specific variables such as vehicle speeds, traffic control, street width, on-street parking, potential for visual confusion, nearby land uses with vulnerable populations, and demand for queuing space. Thirty feet is the preferred setback for effectiveness at many locations. This setback allows a pedestrian to see if a car in the second (or third) lane is stopping after a driver in the first lane has stopped.



Bicycle Facilities

ESSENTIAL PRINCIPLES OF BIKEWAY DESIGN

The following principles should be followed when designing facilities for bicyclists:

- Bicyclists should have safe, convenient, and comfortable access to all destinations.
- Every street is a bicycle street, regardless of bikeway designation.
- Street design should accommodate all types, levels, and ages of bicyclists.
- Bicyclists should be separated from pedestrians.
- Bikeway facilities should take into account vehicle speeds and volumes, with
    - Shared use on low volume, low-speed roads.
    - Separation on higher volume, higher-speed roads.
- Bikeway treatments should provide clear guidance to enhance safety for all users.
- Since most bicycle trips are short, a complete network of designated bikeways has a grid of roughly ½ mile.

Bicycle Lanes

Bike lanes are a portion of the traveled way designated for preferential use by bicyclists; they are most suitable on avenues and boulevards. Bike lanes may also be provided on rural roads where there is high bicycle use. Bike lanes are generally not recommended on local streets with relatively low traffic volumes and speeds, where a shared roadway is the appropriate facility. There are no hard and fast mandates for providing bike lanes, but as a general rule, most jurisdictions consider bike lanes on roads with traffic volumes in excess of 3,000-5,000 ADT or traffic speeds of 30 mph or greater.

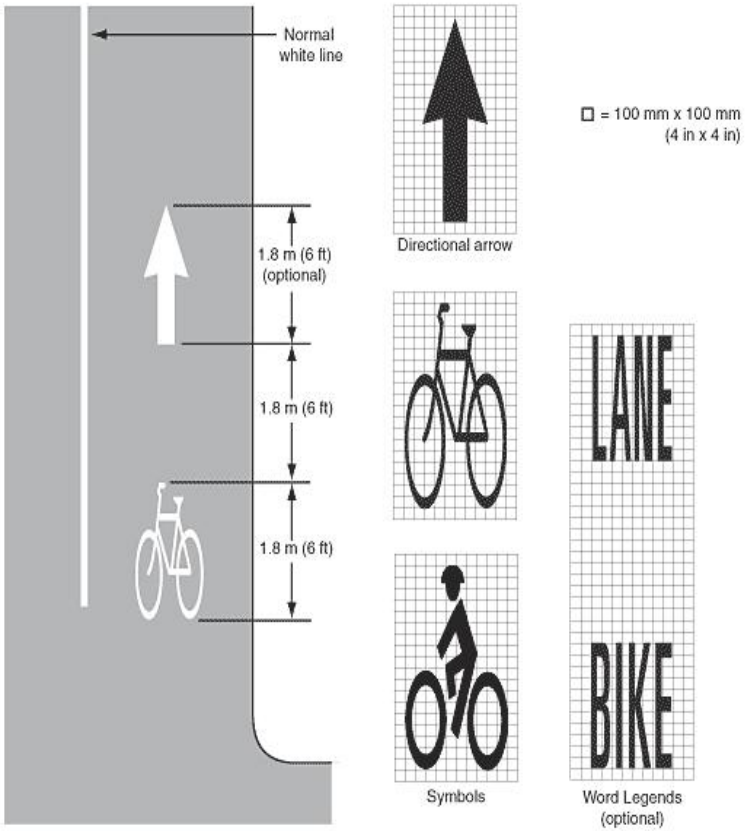
Bike lanes have the following advantages:

- They enable cyclists to ride at a constant speed, especially when traffic in the adjacent travel lanes speeds up or slows down (stop-and-go).
- They enable bicyclists to position themselves where they will be visible to motorists.
- They encourage cyclists to ride on the traveled way rather than the sidewalk.

Bike lanes are created with a solid stripe and stencils. Motorists are prohibited from using bike lanes for driving and parking, but may use them for emergency avoidance maneuvers or breakdowns. Bike lanes are one-way facilities that carry bicycle traffic in the same direction as adjacent motor-vehicle traffic. Bike lanes should always be provided on both sides of a two-way street. One exception is on hills where topographical constraints limit the width to a bike lane on one side only; the bike lane should be provided in the uphill direction as cyclists ride slower uphill, and they can ride in a shared lane in the downhill direction.

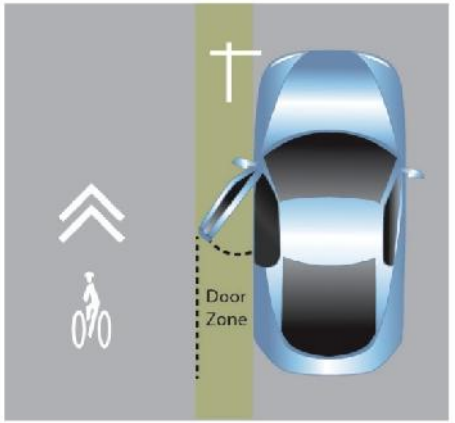
The minimum bike lane width is 5 feet from the face of a curb, or 4 feet on open shoulders. If on-street parking is permitted, the bike lane should be placed between parking and the travel lane with a preferred width of 6 feet so cyclists can ride outside the door zone. Streets with high volumes of traffic and/or higher speeds need wider bike lanes (6 feet to 8 feet) than those with less traffic or slow speeds. On curbed sections, a 4-foot (minimum 3 feet) wide smooth surface should be provided between the gutter pan and stripe. This minimum width enables cyclists to ride far enough from the curb to avoid debris and drainage grates and far enough from other vehicles to avoid conflicts. By riding away from the curb, cyclists are more visible to motorists than when hugging the curb. Where on-street parking is permitted, delineating the bike lane with two stripes, one on the street side and one on the parking side, is preferable to a single stripe.

Figure 9C-6. Example of Optional Word and Symbol Pavement Markings for Bicycle Lanes



Shared Lanes (sharrow)

Shared-lane marking stencils ("SLMs," also commonly called "sharrows") may be used as an additional treatment for shared roadways. The stencils can serve a number of purposes: they remind bicyclists to ride further from parked cars to prevent "dooring" collisions, they make motorists aware of bicycles potentially in the travel lane, and they show bicyclists the correct direction of travel. Sharrows installed next to parallel parking should be a minimum distance of 11 feet from the curb. Installing farther than 11 feet from the curb may be desired in areas with wider parking lanes or in situations where the sharrow is best situated in the center of the shared travel lane to promote cyclists taking the lane. Placing the sharrow between vehicle tire tracks increases the life of the markings and decreases long-term maintenance costs.



Sharrow
(Credit: Michele Weisbart)

Example of a sharrow.
(Credit: Ryan Snyder)

Bicycle Parking

Secure bicycle parking at likely destinations is an integral part of a bikeway network. Bicycle thefts are common and lack of secure parking is often cited as a reason people hesitate to ride a bicycle. The same consideration should be given to bicyclists as to motorists, who expect convenient and secure parking at all destinations. Bicycle parking should be located in well-lit, secure locations close to the main entrance of a building, no further from the entrance than the closest automobile parking space. Bike parking should not interfere with pedestrian movement.

Bike racks along sidewalks should support the bicycle well, and make it easy to lock a U-shaped lock to the frame of the bike and the rack. The sample below shows an "inverted –U" rack.

Inverted U Bike Rack. *(Credit: Sky Yim)*

Maintenance

Maintenance is a critical part of safe and comfortable bicycle access. Two areas that are of particular importance to bicyclists are pavement quality and drainage grates. Rough surfaces, potholes, and imperfections, such as joints, can cause a rider to lose control and fall. Care must be taken to ensure that drainage grates are bicycle-safe; otherwise a bicycle wheel may fall into the slots of the grate, causing the cyclist to fall. The grate and inlet box must be flush with the adjacent surface. Inlets should be raised after a pavement overlay to the new surface. If this is not possible or practical, the new pavement should taper into drainage inlets so the inlet edge is not abrupt.

The most effective way to avoid drainage-grate problems is to eliminate them entirely with the use of inlets in the curb face. This may require more grates to handle bypass flow, but is the most bicycle-friendly design.

Greenways/Multi-Use Path

Width and Clearance

Ten feet is the recommended minimum width for a two-way, shared use path on a separate right- of-way. Other critical measurements include:

- 8 feet (2.4m) may be used where bicycle traffic is expected to be low at all times, pedestrian use is only occasional, sightlines are good, passing opportunities are provided, and maintenance vehicles will not destroy the edge of the trail.
- 12 feet is recommended where substantial use by bicycles, joggers, skaters, and pedestrians is expected, and where grades are steep (see later).
- 2 feet of graded area should be maintained adjacent to both sides of the path.

- 3 feet of clear distance should be maintained between the edge of the trail and trees, poles, walls, fences, guardrails or other lateral obstructions.
- 8 feet of vertical clearance to obstructions should be maintained; rising to 10 feet in tunnels and where maintenance and emergency vehicles must operate.

Design Speed, Horizontal and Vertical Alignment

The design of a shared use path should take into account the likely speed of users, the ability of bicyclists to turn corners without falling over, skidding, or hitting their pedal on the ground as they lean over.
The AASHTO Guide for the Design of Bicycle Facilities has a number of tables, and equations to help designers meet the tolerances of a bicyclist based on the following key numbers:

- 20 miles per hour (30 km/h) is the minimum design speed to use in designing a trail
- 30 miles per hour (50 km/h) should be used where downgrades exceed 4 percent
- 15 miles per hour (25 km/h) should be used on unpaved paths where bicyclists tend to ride more slowly (and cannot stop as fast without skidding or sliding on a loose surface)

The result is a series of recommended desirable minimum curve radii for corners that should be safe for bicyclists.

Grade

Another critical factor in trail design is the grade or slope of the path. Generally, grades greater than 5 percent (one feet of climbing for every 20 feet traveled forward) are undesirable as they are hard for bicyclists to climb and may cause riders to travel downhill at a speed where they cannot control their bicycle. However, recognizing that trails cannot always remain quite flat, the AASHTO Guide offers the following suggested lengths for certain grades:

- 5-6 percent is acceptable for up to 800 feet (240m)
- 7 percent is acceptable for up to 400 feet (120 m)
- 8 percent is acceptable for up to 300 feet (90m)
- 9 percent is acceptable for up to 200 feet (60m)
- 10 percent is acceptable for up to 100 feet (90m)
- 11 percent plus is acceptable for up to 50 feet (15m)

However, slopes with 9 percent grade are not acceptable for inexperienced bicyclists and are not compliant with Americans with Disabilities Act (ADA) guidelines. Consider the ADA grade guidelines as a guide to better meet the needs of pedestrians or bicyclists with disabilities and inexperienced bicyclists.

And, suggestions are offered for ways to mitigate the impact of steeper slopes, such as:

- adding 4-6 feet of additional width to the trail to allow sufficient space for a cyclist to dismount and walk their bicycle without blocking the trail, or to allow cyclists to pass each other,
- alerting cyclists to the approaching grade with appropriate signs and markings posting a recommended descent speed
- exceeding the usual minimum stopping sight distances to allow for the higher speeds
- exceeding the usual minimum thresholds for providing recovery areas, railings etc
- using a series of short switchbacks to contain the speed of descending riders

Sight Distances

The ability of a cyclist to stop or slow down to avoid a collision or crash is affected by many things. The rider must have time to identify a potential problem and react accordingly, which means that they must be able to see approaching intersections or corners in plenty of time even when they are traveling at the design speed of the trail. The bicycle itself must be able to be stopped or brought under control in time, which is affected by the braking ability of the bike, the surface material (a loose surface requires greater stopping distance), and the weather (wet conditions require greater stopping distances than dry). Once again, the AASHTO Guide and state/local manuals have tables and charts to enable the designer to calculate the appropriate sight distances in a range of situations.

Drainage

In response to a message about trail maintenance posted recently to an e-mail listserv, one trail manager identified the three most important issues: drainage, drainage and drainage. Poor drainage can ruin a good trail. The AASHTO Guide recommends a minimum cross slope of 1 percent and the need to make trails accessible to people using wheelchairs demands a maximum cross slope of 2 percent. Other considerations to ensure adequate drainage include:

- slope the trail in one direction rather than having a crown in the middle of the trail
- ensure a smooth surface to prevent ponding and ice formation
- place a ditch on the upside of a trail constructed on the side of a hill (where needed)
- place drainage grates, utility covers etc out of the travel path of bicyclists, unless they can be made fully bicycle-friendly.
- preserve natural ground cover adjacent to the trail to inhibit erosion

Surface

Another important consideration in trail design is the type of surface that will be provided. A hard surface, such as cement or asphalt, will generally see cyclists operating at a faster speed than a soft surface, but may not be as popular with joggers and is more expensive to install. A soft surface trail (i.e. crushed granite) will discourage or prevent in-line skating but may be less expensive to install (although it will require more maintenance than concrete). Factors such as weather conditions and soil types can affect the choice of asphalt, concrete, or crushed rock. Choices in surface will affect requirements for periodic monitoring of the path surface and appropriate levels of maintenance.

Structures

One of the great advantages and unique features of trails along former railroad corridors is that they often have grade separated intersections with the highway system, and have bridges to carry them over rivers or stream valleys. However, not all corridors have this asset and structures of all kinds are needed to carry trail users under or over obstacles such as highways, rivers, freeways etc. The critical dimensions to use in designing underpasses, overpasses, bridges and tunnels, include:

a. the minimum width of the trail (usually 10 feet) should be maintained through the structure
b. the clear distance of two feet on either side of the trail surface should also be maintained through the structure — otherwise, riders will tend to ride in the center of the trail to stay away from the wall or railing of the structure
c. an overhead clearance of 10 feet (8 feet with good horizontal and vertical clearance, good sightlines etc) should be maintained through an underpass or tunnel
d. railings, fences, or barriers on both sides of a path on a structure should be at least 42 inches (1.1m) high, and where they are higher than this a rub rail should be provided at the approximate handlebar height of 42 inches.

e. clearances should allow for maintenance and emergency vehicles, as should the strength of the bridge (live loading)

Under-crossings are generally less expensive than overpasses and require less change in grade as a clearance height of only 10 feet is required. However, they may present security problems due to reduced visibility and drainage problems, both of which can be expensive to fix.

Over-crossings are more open and present fewer security problems but they require much longer approaches to achieve the minimum 17 feet of clearance from a roadway, and they are often more expensive. Overpasses also may result in complaints from nearby residences due to a loss of privacy or due to aesthetic concerns.

Another issue is when retrofitting a shared use path onto an existing highway bridge, should a separate path on one side, both sides, or an on-street facility be recommended.

The Florida DOT's Bicycle Facilities Planning and Design Handbook discusses the various options and recommends that:

- the shared use path should be carried across the bridge on one side where:
    - the bridge facility connects to a shared use path at both ends
    - sufficient width exists on one side of the bridge, or can be obtained by widening or restriping lanes
- provisions are made to physically separate bicycle and pedestrian traffic from motor vehicle traffic on-street facilities such as bike lanes may be advisable where:
    - the shared use path transitions into bicycle lanes at one end of the bridge
    - sufficient width exists or can be obtained by widening or restriping.

The AASHTO Guide also warns that this latter option must only be used if the transition from bike lanes to shared use path can be achieved without increasing the potential for wrong way riding or inappropriate crossing movements.

Lighting

Shared use paths in urban and suburban areas often serve travel needs both day and night, for example, commuter routes and trails accessing college campuses. Fixed source lighting improves visibility along trails and at intersections, and is critical for lighting tunnels and underpasses. The AASHTO guide recommends using average maintained illumination levels of between 5 and 22 lux.

Preventing Motor Vehicle Use of Paths

In some locations, shared use paths may be mistaken for motor vehicle roads or may suffer from illegal or unauthorized motorized use. At intersections with roadways, therefore, the path should be clearly signed, marked and/or designed to discourage or prevent unauthorized motorized access. A variety of alternatives exist to achieve this:

a. Bollards. Probably the most common device is the bollard, often lockable, collapsible or removable to allow for authorized access to the trail. Great care should be used in locating the bollard to ensure that they are visible, allow trail users through, and are not placed so as to channel both directions of trail users towards the same point in the trail. If bollards are to be used, they should be retro-reflective, brightly colored, and have pavement markings around them. On a ten foot trail, one bollard should be used in the center of the trail. If more than one bollard is necessary, there should be five feet between them.

b. Splitting the trail in two. Many manuals suggest the option of splitting a ten foot trail into two five foot approaches to an intersection, with a planted triangle between them. This may increase maintenance costs.
c. Medians. The Florida DOT manual notes that "curbing with tight radii leading up to the roadway can often prevent motorists from attempting to enter the path. Medians should be set back from the intersection 25 feet (8m) to allow bicyclists to exit the roadway fully before navigating the reduced pathway width."

Signing and Marking

While fewer signs may be needed on paths compared to on-street facilities, adequate signing and marking are essential on shared use paths, just as they are on streets and highways. Trail users need to know about potential conflicts, regulatory information, destinations, cross streets etc. The Manual on Uniform Traffic Control Devices (MUTCD) provides some minimum traffic control measures that should be applied and a range of options.

Striping: a yellow center line stripe is recommended where trails are busy, where sight distances are restricted, and on some unlit trails where night time riding is expected. The line should be dashed when adequate passing sight distance exists, and solid when no passing is recommended. A solid white line may be used to separate pedestrians from bicycle/blading traffic, and solid white edge stripes may also be useful where nighttime riding is expected.

Warning signs: a range of warning signs can be used to inform users that recommended design criteria cannot be met, for example curve radii or grades or where unexpected conditions may exist.

Informational signs: trail users need to know where they are, where they are going, what cross streets they are crossing, how far destinations are away, and what services are available close to the trail. The MUTCD has information on the appropriate signs to use in these instances. Although not in the MUTCD, many trails post signs encouraging uniform trail user etiquette (e.g. "give audible signal when passing" or which type of trail user has the right-of-way).

Intersection markings and signs: pavement marking and signs at intersections should channel users to cross at clearly defined locations and indicate that crossing traffic is to be expected. Similar devices to those used on roadways (STOP and YIELD signs, stop bars, etc) should be used on trails as appropriate.

The AASHTO Guide notes that in addition to traditional warning signs in advance of intersections, motorists can be alerted to the presence of a trail crossing through flashing warning lights, zebra-style or colored pavement crosswalks, raised crosswalks, signals, and neck-downs/curb-bulbs. However, some devices such as flashing warning lights are expensive to install and maintain and should be kept to a minimum.

Streetscape

Urban Forestry

The urban forest includes all trees, shrubs, and other understory plantings on both public and private lands. Street trees and landscaping are essential parts of the urban forest, as they contribute positively to the urban environment—to climate control, stormwater collection, and the comfort and safety of people who live or travel along the street. A street lined with trees and other plantings looks and feels narrower and more enclosed, which encourages drivers to slow down and to pay more attention to their surroundings. Trees provide a physical and a psychological barrier between pedestrians and motorized traffic, increasing safety as well as making walking more enjoyable.

A healthy urban forest is also a powerful stormwater management tool. Leaves and branches catch and slow rain as it falls, helping it to soak into the ground. The plants themselves take up and store large quantities of water that would otherwise contribute to surface runoff. Part of this moisture is then returned to the air through evaporation to further cool the town.

As an important element along sidewalks, street trees must be provided with conditions that allow them to thrive, including adequate uncompacted soil, water, and air. This section provides guidance for appropriate conditions and selecting, planting, and caring for street trees, as well as for other landscaping along streets.

Street Trees

Goals and Benefits of Street Trees

The goal of adding street trees is to increase the canopy cover of the street, the percentage of its surface either covered by or shaded by vegetation, not simply to increase the overall number of trees. The selection, placement, and management of all elements in the street should enhance the longevity of a town's street trees and healthy, mature plantings should be retained and protected whenever possible.

Principles for Street Trees

The following principles influence the selection of street trees and landscaping design:

- **Seek out and reclaim space for trees**. Streets have a surprising number of residual or left-over spaces between areas required for travel lanes and parking, once they are examined from this perspective. Traffic circles, medians, channelization islands, and curb extensions can provide space for trees and landscaping.
- **Create optimum conditions for growth.** Space for roots and above ground growth is the main constraint to the urban forest achieving its highest potential. Typically a 6 to 8-foot wide, continuous sidewalk furniture zone must be provided, with uncompacted soil to a minimum of a 3-foot depth. If space for trees is constrained, provisions should be made to connect these smaller areas below the surface to form larger effective areas for the movement of air, root systems, and water through the soil.
- **Select the right tree for the space**. In choosing a street tree, consider what canopy, form, and height will maximize benefits over the course of its life. Provide necessary clearances below overhead high-intensity electrical transmission lines and prevent limbs from overhanging potentially sensitive structures such as flat roofs. In commercial areas where the visibility of façade-mounted signs is a concern, choose species whose mature canopy allows for visibility, with the lowest branches at a height of 12 to 14 feet or more above the ground. Select trees with non-aggressive root systems to avoid damaging paving and sidewalks.
- **Start with good nursery stock and train it well.** When installing plant material, choose plants that have complete single leaders and are in good "form," and check that boxed trees are not root bound. Proper watering and pruning every three to four years will allow trees to mature and thrive for many years of service.
- **Do not subject plants to concentrated levels of pollutants.** Trees and other plants should be integrated within stormwater management practices whenever possible, but filtering of pollutants from "first flush" rain falls and street runoff will extend the life of trees and prevent toxic buildup of street pollutants in tree wells.

Guidelines

Climate and Soil

Selecting trees that are adapted to a site's climate and local rain cycles can create a more sustainable urban forest. The urban environment is harsh for many plants. Often plants native to an area are best adapted to that area's climate. Select plants that can tolerate the environmental elements, such as radiant heat from the sidewalk or street surface or 50 to 60 mph winds from passing traffic.

Urban soils have became highly compacted through construction activities and the passage of vehicle and even foot traffic. Compaction reduces the soil's capacity to hold and absorb water. Plants need healthy soil, air, and water to thrive.

Using planters in the urban forest can increase the biomass and canopy cover, but these plants and trees are still compromised and confined. At its bottom and sides, a barrier will exist as the prepared area meets the surrounding compacted soils. Covering the soil surface with some form of mulch can help as the shade, cooling, and retained moisture that mulch provides help support the biological activities close to the soil's surface. These activities open the pore structure of the soil over time, help keep it open, and cushion the impact of foot traffic. This process works better if the mulch material is organic, as opposed to stones. If planters have limited resources for soil preparation, they should have an extensive covering of mulch.

The generalized soil types map for a town can be used as a starting point when planning projects, but then the basic soil classifications should be identified on-site, especially when confronted by planting sites at the extreme ends of the spectrum: very fast-draining, nutrient-poor sands, and dense, often nutrient-rich, but oxygen-starved poorly drained clays.

Planting Sites

Traditionally, trees have been squeezed into whatever limited space is easily found, but this does not work well for either the tree or the street. The following guidelines provide recommended planting areas:

- Establish and maintain 6 to 8-foot wide sidewalk furniture zones, where possible. Many large trees need up to 12 feet in width, and are not suitable for placement in narrower furniture zones. In residential areas, sidewalk furniture zones within the root zone should be unpaved and planted/surfaced with low groundcover, mulch, or stabilized decomposed granite where these can be maintained. Where maintenance of such extensive sidewalk furniture zones is not feasible, provide 12-foot long tree wells with true permeable pavers (standard interlocking pavers are not permeable).
- If the above conditions are not feasible, provide for the tree's root system an adequate volume of uncompacted soil or structural or gap-graded soil (angular rock with soil-filled gaps) to a depth of 3 feet under the entire sidewalk (in the furniture, frontage, and pedestrian sidewalk zones).
- Spacing between trees will vary with species and site conditions. The spacing should be 10 percent less than the mature canopy spread. Closer spacing of large canopy trees is encouraged to create a lacing of canopy, as trees in groups or groves can create a more favorable microclimate for tree growth than is experienced by isolated trees exposed to heat and desiccation from all sides. On residential streets where lots are 40 or 50 feet wide, plant one tree minimum per lot between driveways. Where constraints prevent an even spacing of trees, it is preferable to place a tree slightly off the desired rhythm than to leave a gap in the pattern.
- Planting sites should be graded, but not overly compact, so that the soil surface slopes downward toward the center, forming a shallow swale to collect water. The crown of the tree should remain 2 inches above finished grade and not be in the center of a

swale, but off to the side. The finished soil elevation after planting is held below that of the surrounding paving so 2 to 3 inches of mulch can be added. The mulch layer must be replenished as needed to maintain a nearly continuous level surface adjacent to paving.

- Generally tree grates and guards are best used along streets with heavy pedestrian traffic. Along streets without heavy foot traffic and in less urban environments, use mulch in lieu of tree grates.

Species Selection

- Select trees with non-aggressive root systems to avoid damaging paving and sidewalks.
- In general, street trees should be species that will achieve a height and spread of 50 feet on residential streets and 40 feet on commercial streets within 10 years of planting to provide reasonable benefits. Typically, trees on commercial streets will not achieve the same scale as they will on residential streets where greater effective root zone volumes may be achieved. On commercial streets with existing multi-story buildings and narrow sidewalks, select trees with a narrower canopy than can be accommodated on the limited sidewalk width.
- Cities and towns should establish a list of recommended tree species for use in the public street rights-of-way. On commercial streets with ground-floor retail, deciduous trees with a strong central leader, such as Ginkos and London Planes, are desirable as they grow rapidly above the ground floor business signs. A town's list of recommended tree species should specify minimum planting site widths for each and which trees may be planted below utility lines. Where there are overhead power lines that are less than 50 feet above grade, braided insulated electrical wire should be used so that trees do not have to be pruned to avoid the electrical lines. If braided insulated electrical wire cannot be provided, appropriate trees that will not grow tall enough to reach the power lines should be specified and planted.
- Consistent use of a single species helps reinforce the character of a street or district, but a diversity of species may help the urban canopy resist disease or insect infestations. New plantings added to streets with existing trees should be selected with the aim of meeting the same watering requirements and creating visual harmony with existing trees and plantings. Native species should be considered for inclusion whenever possible, but consideration should be first given to a species' adaptability to urban conditions.
- Consider evergreen species where it is desirable to maintain foliage through the winter months.
- Consider deciduous species where their ability to allow sunlight to penetrate into otherwise shaded areas (such as south facing windows of adjoining buildings) during the winter months will be a plus.

Tree Spacing and Other Considerations

- Most jurisdictions have spacing requirements between trees and street lights (typically about 30 feet high), which typically vary from 10 to 20 feet. The smaller setback provides greater flexibility in tree spacing and allows for a more complete tree canopy.
- Pedestrian lights, which are about 12 feet tall, generally do not conflict with the tree canopy, so spacing is less rigid. Some jurisdictions still require wide clearance for their convenience in maintaining the lights, but this wide spacing greatly reduces tree canopy and is therefore discouraged. Spacing of 10 feet away from trees is generally adequate.
- An 8-foot minimum clearance must be maintained between accessible parking spaces and trees.
- Adequate clear space should be provided between trees and awnings, canopies, balconies, and signs so they will not come into conflict through normal growth or require excessive pruning to remediate such conflicts.

- Trees may be planted in medians that are 4 feet or wider, but must have an adequate clear height between the surface of the median and the lowest branches so that pedestrians can be seen. Where trees hang over the street, the clear height should be 14 feet.

Understory Landscaping

Understory landscaping refers to landscape elements beneath the tree canopy in areas within the public right-of-way not required for vehicular or pedestrian movement, including

- Medians
- Curb extensions
- Furniture and frontage zones

Benefits of Understory Landscaping

- Complements and supports street trees, in particular by providing uncompacted, permeable areas that accommodate roots and provide air, water, and nutrients
- Reduces impervious area and surface runoff
- Treats stormwater, improving water quality
- Provides infiltration and groundwater recharge
- Provides habitat
- Reduces the perceived width of the street by breaking up wide expanses of paving, particularly when the understory is in medians and sidewalk furniture zones
- Contributes to traffic calming
- Provides a buffer between the walkway zone and the street, contributing to pedestrian comfort
- Improves the curb appeal of properties along the street, potentially increasing their value
- Enhances the visual quality of the community

Principles

- Trees take precedence: the understory landscape should support them. It should not compete with them.
- Only pave where necessary: keep as much of the right-of-way unpaved and planted as possible to maximize benefits
- Design understory areas to infiltrate water
- The entire understory area does not have to be covered with plants—composted mulch is a good groundcover (top of mulch should be below adjoining hardscape so that runoff will flow into planting areas)
- Make the understory sustainable: use drought-tolerant plants
- Replenish the soil with compost
- Design the understory to contribute to the sense of place

Guidelines

Soil

Provide good quality, uncompacted, permeable soil. Soil analyses should address the concentration of elements that may affect plant growth, such as pH, salinity, infiltration rate, etc. Remove and replace or amend soil as needed. Good preparation saves money in the long run because it reduces the need to replace plants, lowers water consumption, and reduces fertilizer applications.

Design

Generally, understory landscaped areas should be as wide as possible where there are trees: when feasible, at least 6 to 9 feet wide for parkways and 8 to 12 feet wide for medians. However, many existing parkways and medians are less wide. Narrower parkways can support understory plants and some tree species. A path or multiple paths should be added as needed across a parkway as a means of access from the curb to the

sidewalk. For example, where there are striped curbside parking spaces, a path across the parkway should be provided at every one or two parking spaces.

Install plant species that:

- Do not require mowing more frequently than once every few months
- Are drought tolerant and can survive with minimal irrigation upon establishment
- Do not exceed a height of 2 feet within 5 feet of a driveway/curb cut and within 20 feet of a crosswalk, and, excluding trees, 3 feet elsewhere
- Do not have thorns or sharp edges adjacent to any walkway or curb
- Are located at least 4 feet from any tree trunk

Appendix 3: Adoption Resolution

The Town of Coats, North Carolina

Resolution Adopting a Healthy Living Assessment Plan for the Town of Coats
Town of Coats, Harnett County, North Carolina

WHEREAS, the 2013 America's Health Rankings listed NC as 35th in overall health; and

WHEREAS, NC ranks poorly on other health indicators including health outcomes, health behaviors, access to care and socioeconomic measures; and

WHEREAS, prevention and wellness can save lives, reduce disability, improve quality of life, improve productivity and may decrease health care costs; and

WHEREAS, improving modifiable behaviors can improve health outcomes; and

WHEREAS, the Town Board of Commissioners established a committee to address Healthy Living in Coats North Carolina.

WHEREAS, the Prevention Action Plan includes goals and implementing strategies in four different focus areas relating to health and wellness in Coats. The four goals have been identified as Active Transportation, Recreational Opportunities, Healthy Eating and Health in all Policies.

BE IT THEREFORE RESOLVED, the Town Board of Commissioners endorses improving health for Coats North Carolina and adopts the Healthy Living Assessment Plan dated, October 2014, by Holland Consulting Planners.

ADOPTED this the 13th day of November 2014.

Walter Weeks, Mayor

ATTEST:

Cortney Zwirn, Town Clerk

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