

Appendix F

Bicycle and Pedestrian Element

Bicycle and Pedestrian Element Appendix

Introduction

Based on the vision of *Horizon 2040*, the goal of expanding opportunities for residents to bike and walk to their destinations should be integrated into the development of the GPATS region's transportation network over the coming years.

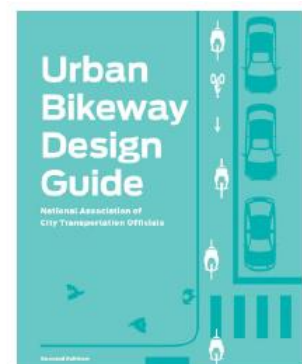
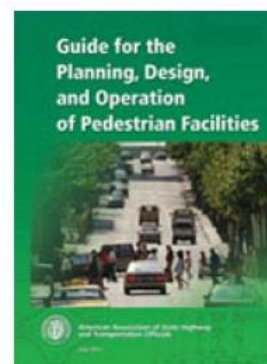
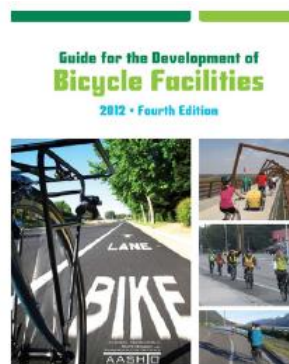
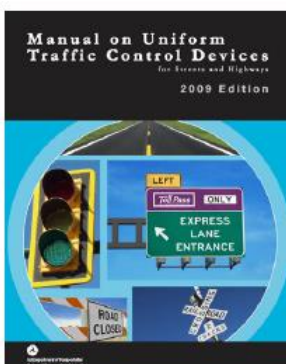
Bicycle and Pedestrian Facility Design

The proper design of bicycle and pedestrian facilities is an essential component of a safe, efficient, active transportation network.

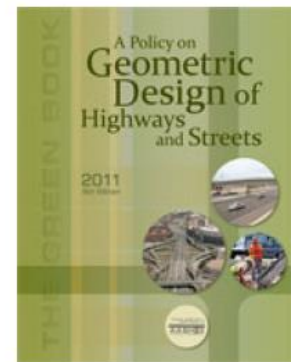
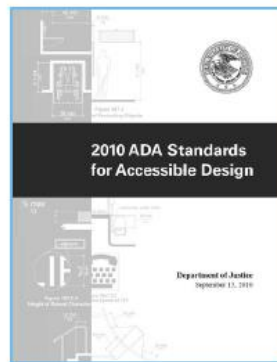
Bicycle and Pedestrian Design Resources

There are a number of state and national design resources that provide more detailed information on the design of the facilities recommended in this Plan. An overview of these is presented below:

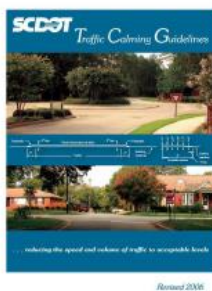
- **Manual on Uniform Traffic Control Devices (MUTCD):** defines the standards used by road managers nationwide to install and maintain traffic control devices on all public streets, highways, bikeways, and private roads open to public traffic. The MUTCD is the primary source for guidance on lane striping requirements, signal warrants, and recommended signage and pavement markings.
- **American Association of State Highway and Transportation Officials (AASHTO) *Guide for the Development of Bicycle Facilities*,** updated in June 2012 provides guidance on dimensions, use, and layout of specific bicycle facilities. The standards and guidelines presented by AASHTO provide basic information, such as minimum sidewalk widths, bicycle lane dimensions, detailed striping requirements and recommended signage and pavement markings.
- **The National Association of City Transportation Officials' (NACTO) 2012 *Urban Bikeway Design Guide*** is the newest publication of nationally recognized bicycle-specific design guidelines, and offers guidance on the current state of the practice designs. The NACTO *Urban Bikeway Design Guide* is based on current practices in the best cycling cities in the world. The intent of the guide is to offer substantive guidance for cities seeking to improve bicycle transportation in places where competing demands for the use of the right of way present unique challenges. All of the NACTO *Urban Bikeway Design Guide* treatments are in use in many cities around the US and internationally.



- The 2004 AASHTO *Guide for the Planning, Design and Operation of Pedestrian Facilities* provides comprehensive guidance on planning and designing for people on foot.
- The United States Access Board’s proposed *Public Rights-of-Way Accessibility Guidelines (PROWAG)* and the *2010 ADA Standards for Accessible Design (2010 Standards)* contain standards and guidance for the construction of accessible facilities. This includes requirements for sidewalk curb ramps, slope requirements, and pedestrian railings along stairs. Meeting the requirements of the Americans with Disabilities Act (ADA) is an important part of any bicycle and pedestrian facility project.
- The 2011 AASHTO: *A Policy on Geometric Design of Highways and Streets* commonly referred to as the “Green Book,” contains the current design research and practices for highway and street geometric design.



- The FHWA *Small Town and Rural Multimodal Networks Guide*. The guide translates existing street design guidance and facility types for bicycle and pedestrian safety and comfort for the smaller scale communities not addressed in guides such as the NACTO *Street Design Guide* and ITE Walkable Urban Thoroughfares report. The guide provides clear examples of how to interpret and apply design flexibility to improve bicycling and walking conditions in small town and rural environments.
- The South Carolina Department of Transportation has published a variety of additional resources for designing bicycle and pedestrian facilities. These include the SCDOT *Highway Design Manual*, SCDOT *Traffic Calming Design Guidelines*, SCDOT *Traffic Signal Design Guidelines* and SCDOT *Access and Roadside Management Standards*. In recent years, SCDOT has also issued several Traffic Engineering Guidelines and Engineering Directive Memorandums for such treatments as pedestrian hybrid beacons, shared lane markings, rumble strips and other complete streets treatments.



Design for Pedestrians

The GPATS regional transportation network should accommodate pedestrians with a variety of needs, abilities, and possible impairments. Age is one major factor that affects pedestrians' physical characteristics, walking speed, and environmental perception.

- Children have low eye height and walk at slower speeds than adults. They also perceive the environment differently at various stages of their cognitive development.
- Older adults walk more slowly and may require assistive devices for walking stability, sight, and hearing.

The *Manual of Uniform Traffic Control Devices* (MUTCD) recommends a **normal walking speed of three and a half feet per second** when calculating the pedestrian clearance interval at traffic signals. Typical **walking speeds can drop to three feet per second in areas with older populations and persons with mobility impairments.**

While the type and degree of mobility impairment varies greatly across the population, the transportation system should accommodate these users to the greatest reasonable extent.

Sidewalks

Sidewalks are the most fundamental element of the walking network, as they provide an area for pedestrian travel that is separated from vehicle traffic. **In urbanized areas, sidewalks should be provided on both sides of major roadways; on at least one side of collectors and minor arterials and residential streets with at least 3 dwelling units per acre.** Sidewalks are typically constructed of concrete and are separated from the roadway by a curb and gutter and preferably a landscaped planting strip area. Sidewalks are a common application in both urban and suburban environments. Attributes of well-designed sidewalks include the following:

- **Accessibility:** A network of sidewalks should be accessible to all users. Roadway crossing distances and distances between crossings should be minimized to accommodate and encourage pedestrian travel.
- **Adequate width:** Two people should be able to walk side-by-side. Different walking speeds should be possible. In areas of intense pedestrian use, sidewalks should accommodate the high volume of walkers.
- **Safety:** Design features of the sidewalk should allow pedestrians to have a sense of security and predictability. Sidewalk users should not feel they are at risk due to the presence of adjacent traffic.
- **Continuity:** Walking routes should be obvious and should not require pedestrians to travel out of their way unnecessarily.
- **Lighting:** Good lighting is an important aspect of visibility, safety, and accessibility.
- **Landscaping:** Plantings and street trees contribute to the overall psychological experience and comfort of sidewalk users, and should be designed in a manner that contribute to the safety of people and provide shade.
- **Drainage:** Sidewalks and curb ramps should be designed so that standing water is minimized.
- **Social space:** There should be places for standing, visiting, and sitting. The sidewalk area should be a place where adults and children can safely participate in public life.
- **Quality of place:** Sidewalks should contribute to the character of neighborhoods and business districts.

Sidewalk Zones

The sidewalk area can be broken down into four distinct zones as seen in the figure below. The concept of sidewalk zones should be strictly followed for a sidewalk to function properly and provide safe passage for all users. This is especially important for users with visual or physical impairments to be able to effectively navigate the corridor.

Other considerations such as sidewalk obstructions, driveways, width and access through construction areas are important to consider as well. The following figure includes important considerations for sidewalk design.

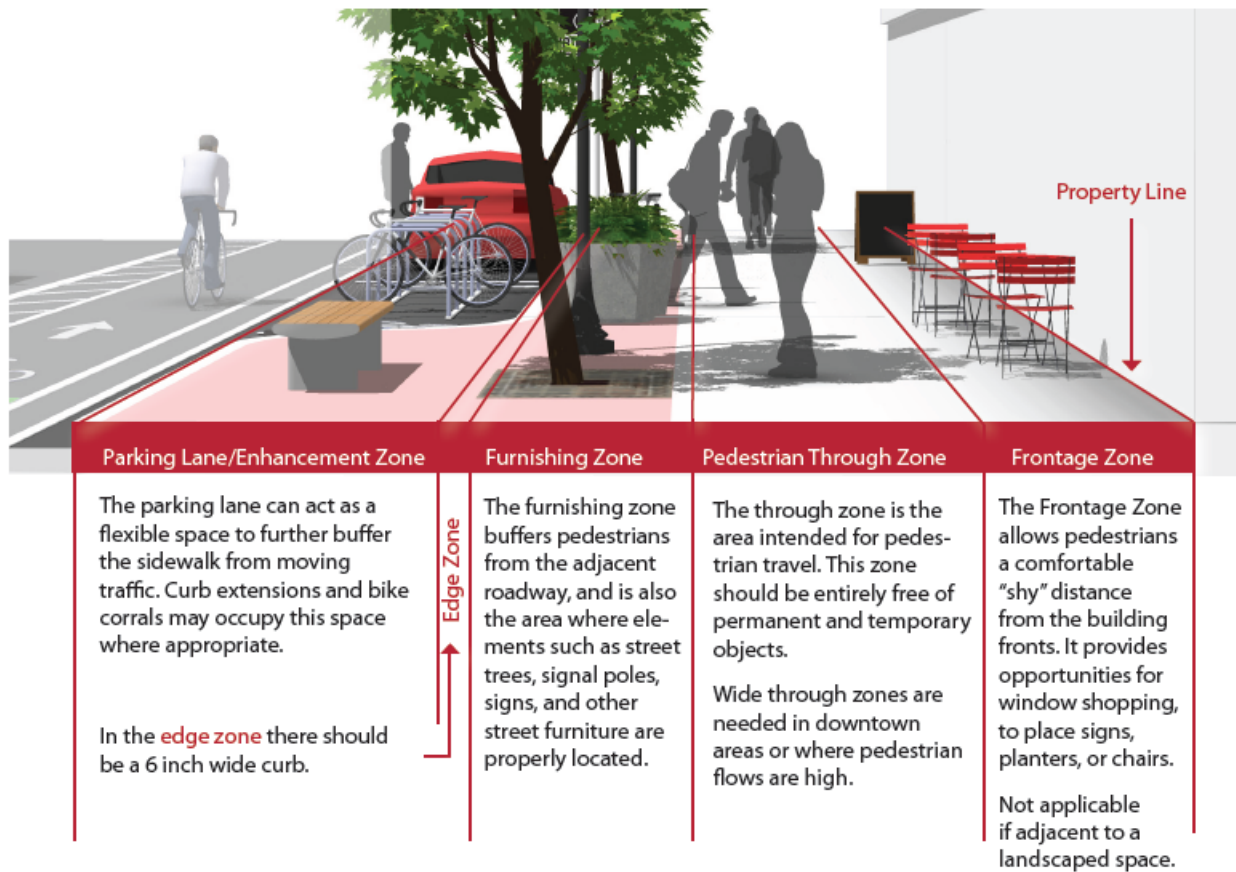


Figure 1 Pedestrian Zones (source: Alta Planning + Design)

Street Classification	Parking Lane/Enhancement Zone	Furnishing/Green Zone	Pedestrian Through Zone	Frontage Zone	Total Sidewalk Area
Local Streets	7 feet	4-8 feet	5-6 feet	N/A	9-12 feet
Commercial Areas	8-10 feet	6-8 feet	6-12 feet	2-8 feet	14-28 feet
Arterials and Collectors	8-10 feet	6-8 feet	4-12 feet	2-4 feet	12-24 feet
Notes			Six feet enables two pedestrians (including		Total sidewalk area excludes

			wheelchair users) to walk side-by-side, or to pass each other comfortably		parking area
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Intersections

Intersections are also an important piece of the pedestrian realm. Attributes of pedestrian-friendly intersection design include:

- **Clear Space:** Corners should be clear of obstructions. They should also have enough room for curb ramps, for transit stops where appropriate, and for street conversations where pedestrians might congregate.
- **Visibility:** It is critical that pedestrians on the corner have a good view of vehicle travel lanes and that motorists in the travel lanes can easily see waiting pedestrians.
- **Legibility:** Symbols, markings, and signs used at corners should clearly indicate what actions the pedestrian should take.
- **Accessibility:** All corner features, such as curb ramps, landings, call buttons, signs, symbols, markings, and textures, should meet accessibility standards and follow universal design principles.
- **Separation from Traffic:** Corner design and construction should be effective in discouraging turning vehicles from driving over the pedestrian area. Crossing distances should be minimized.
- **Lighting:** Good lighting is an important aspect of visibility, legibility, and accessibility.

These attributes will vary with context but should be considered in all design processes. For example, more remote intersections may have limited or no signing. However, legibility regarding appropriate pedestrian movements should still be taken into account during design.

Design for Bicyclists

Bicyclists, by nature, are much more affected by poor facility design, construction and maintenance practices than motor vehicle drivers. Bicyclists lack the protection from the elements and roadway hazards provided by an automobile’s structure and safety features. By understanding the unique characteristics and needs of bicyclists, a facility designer can provide quality facilities and minimize user risk.

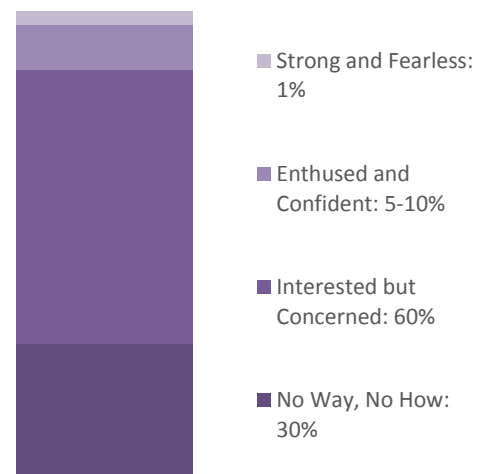
Similar to motorists and motor vehicles, bicyclists and their bicycles exist in a variety of sizes and configurations. These variations occur in the types of vehicle (such as a conventional bicycle, a recumbent bicycle or a tricycle), and behavioral characteristics (such as the comfort level of the bicyclist). The design of a bikeway should consider reasonably expected bicycle types on the facility and utilize the appropriate dimensions.

It is important to consider bicyclists of all skill levels when creating an active transportation or complete street plan or project. Bicyclist skill level greatly influences expected speeds and behavior, both in separated bikeways and on shared roadways. **Bicycle infrastructure should accommodate as many user types as possible**, with decisions for separate or parallel facilities based on providing a comfortable experience for the greatest number of people.

The planning and engineering professions currently use several systems to classify the cycling population, which can assist in understanding the characteristics and infrastructure preferences of different bicyclists. The most conventional framework classifies the “design cyclist” as Advanced, Basic, or Child. A more detailed understanding of the US population as a whole is illustrated in the following figure. Developed by planners in Portland, Oregon and supported by data collected nationally since 2005, this classification provides the following alternative categories to address varying attitudes towards bicycling in the US:

- **Strong and Fearless (approximately 1% of population)** – Characterized by bicyclists that will typically ride anywhere regardless of roadway conditions or weather. These bicyclists can ride faster than other user types, prefer direct routes and will typically choose roadway connections - even if shared with vehicles - over separate bicycle facilities such as shared use paths.
- **Enthusied and Confident (5-10% of population)** - This user group encompasses bicyclists who are fairly comfortable riding on all types of bikeways but usually choose low traffic streets or shared use paths when available. These bicyclists may deviate from a more direct route in favor of a preferred facility type. This group includes all kinds of bicyclists such as commuters, recreationalists, racers and utilitarian bicyclists.
- **Interested but Concerned (approximately 60% of population)** – This user type comprises the bulk of

TYPICAL DISTRIBUTION OF BICYCLISTS



the cycling population and represents bicyclists who typically only ride a bicycle on low traffic streets or multi-use trails under favorable weather conditions. These bicyclists perceive significant barriers to their increased use of cycling, specifically traffic and other safety issues. These people may become "Enthusied & Confident" with encouragement, education and experience and higher-level facilities, such as buffered and protected bike lanes.

- **No Way, No How (approximately 30% of population)** – Persons in this category are not bicyclists, and perceive severe safety issues with riding in traffic. Some people in this group may eventually become regular cyclists with time and education. A significant portion of these people will not ride a bicycle under any circumstances.

Bicycle Facility Types

Consistent with bicycle facility classifications throughout the nation, the facility types presented in the LRTP recommendations identify classes of facilities by degree of separation from motor vehicle traffic. In general, **the wider the roadway, the higher the traffic volume, and the greater the traffic speed, the more bikeway separation is necessary** to provide safe and comfortable riding conditions for bicyclists. The recommendations in this plan are based on corridor context and roadway conditions/recommendations; regional demand and public input; and feasibility. The exact type of bicycle or pedestrian facility in a given corridor will be determined at the corridor planning/design level based on feasibility, corridor context, and public input at the time of project funding for planning or design.

Horizon 2040 recommends the following facility types for implementation in the GPATS region. Recommended types of **on-street facilities** include the following: bike routes; on-street markings; paved shoulders; bike lanes, buffered bike lanes; and separated bike lanes/cycle tracks. **Off-street facilities** are shared-use paths that can be used by cyclists and pedestrians alike. Shared Use Paths can exist in a roadway corridor or on an independent alignment.

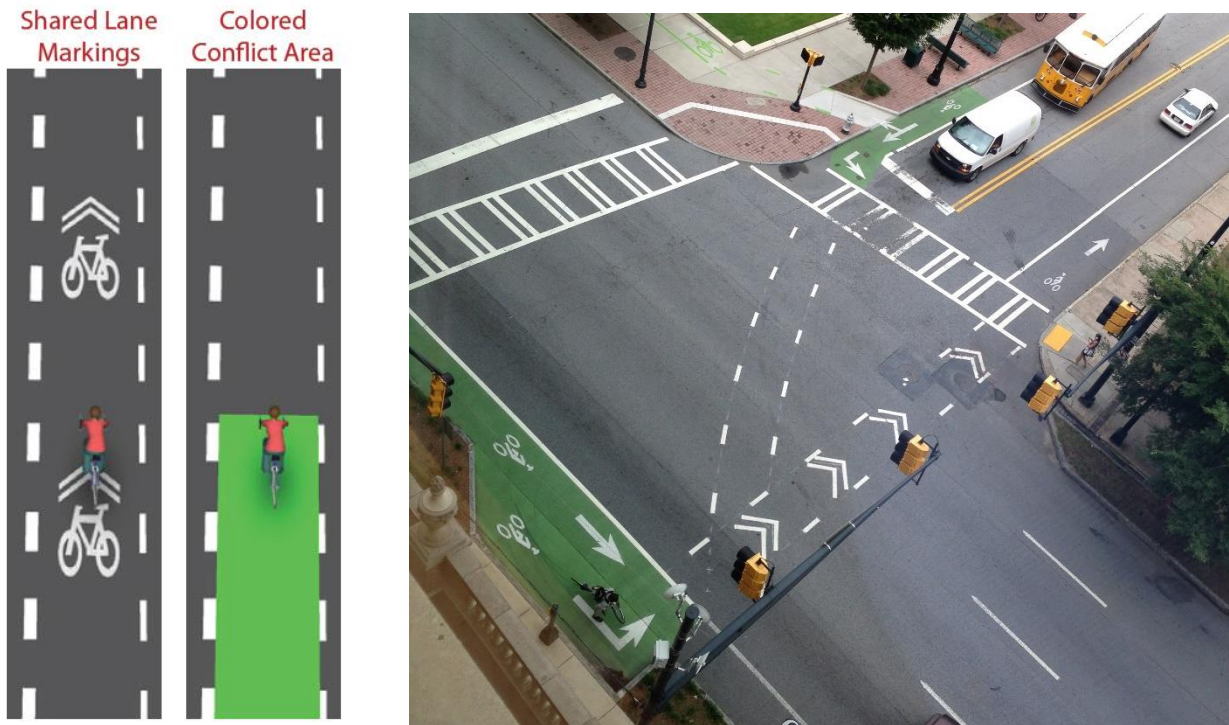
Intersections

Intersections are also an important piece of the cycling network and they can either be facilitators of or barriers to bicycle transportation. If a potential bicyclist knows that they have to cross an uncomfortable intersection to get to their destination, they will be less apt to choose to bicycle there even if there are safe and comfortable on-street bicycle facilities along the route. The following considerations should be made when addressing the specific intersections recommended for improvement:

- **Visibility:** It is critical that bicyclists have a good view of vehicle travel lanes and that motorists in the travel lanes can easily see bicyclists. Roadways should be designed to intersect at a 90-degree angle as much as possible to improve visibility.
- **Legibility:** Symbols, markings, and signs used at corners should clearly indicate what actions the bicyclist should take through the intersection. Pavement markings should also heighten the driver's awareness of potential conflicts with bicyclists or pedestrians.
- **Speed:** Intersections where regular bicycle or pedestrian traffic is expected should be designed to minimize the speed of vehicles driving or turning through the intersection. This can be accomplished through improvements such as curb extensions, turning radii reductions, and pavement markings.

- **Separation from Traffic:** Intersection designs should strive to segregate bicycle and vehicular traffic as much as possible. Designs that allow bicyclists to locate at the front of the intersection when traffic is stopped are preferred.
- **Lighting:** Good lighting is an important aspect of visibility, legibility, and accessibility.

These attributes will vary with context but should be considered in all design processes. For example, more remote intersections may have limited or no signing. However, legibility regarding appropriate bicycle movements should still be taken into account during design.



Examples of different pavement markings and signals for bicyclists at intersections (Photo: W. Peachtree St., Atlanta; image source: Alta Planning + Design)

Bicycle and Pedestrian Program Recommendations

Bicycle and walking education, encouragement, and enforcement programs are a key part of building support for infrastructure recommendations. These programs educate residents on how to use bicycle and pedestrian facilities, communicate why they are important to the success of the community, and ensure that all users of the transportation network are safe and feel comfortable whether they are walking, biking, or driving.

While there are almost a countless number of programs that could be implemented to support walking and bicycling, a few are very well-established and have proven successful in communities throughout Upstate South Carolina and the country. A number of resources and funding sources exist for nationally-recognized programs such as Safe Routes to School, Bike to School Day/Week, National Bike Month, and the Bicycle and Walk-Friendly Community Programs.

Safe Routes to School

Safe Routes to School programs use a “5 E’s” approach (Engineering, Education, Encouragement, Enforcement, and Evaluation) to improve safety and encourage children to walk and bicycle to school. The programs are usually run by a partnership of municipal government, school and school district officials and teachers, parents and students, and neighbors.

For example, in a **Park and Walk campaign**, children are dropped off at a pre-determined location (such as a park) near the school, and then walk with parent volunteers and/or school staff the remaining distance to school. The Parks & Recreation Department of Columbia, South Carolina currently promotes its parks as Park and Walk locations for the first day of school and the City grants employees two-hours off work on the first day of school to encourage parent participation. Park and Walk campaigns can reduce congestion and improve traffic safety near schools while increasing youth physical activity. Teachers also report that children who walk to school arrive awake and “ready to learn.” Likewise, a **Safe Routes to Bus Stops** program can help children safely access bus transportation by walking.

International Walk to School Day in October can be an excellent annual event that offers all families and children the opportunity to participate in healthy school transportation. Spartanburg County, South Carolina has one of the highest Walk to School Day participation rates in the state and offers a local “Golden Shoe Award” for schools that create a model Walk to School Day event that promotes year-round physical activity. The campaign is led by an ongoing partnership between a public health nonprofit, school districts, PTAs, and other agencies.

Youth bicycle and pedestrian safety education can be taught in schools or as after-school programs. One South Carolina resource is the Palmetto Cycling Coalition, which can provide recommendations for League-Certified Instructors (LCIs), who can offer the League of American Bicyclists Kids I and Kids II training courses.

National Bike Month

National Bike Month is a program established by the League of American Bicyclists and recognized in towns and cities across the US. It takes place yearly in May and includes Bike to Work Week, which encourages employees to commute, or partially commute, to work by bike, as well as Bike to School Day.

Bicycle and Walk Friendly Community Programs

The League of American Bicyclists started the Bicycle Friendly Community (BFC) program to encourage American cities to incorporate the “Five E’s” of bicycle planning within their jurisdictions: engineering, education, encouragement, evaluation, and enforcement. The process of completing the application can be a useful benchmarking tool, while obtaining the designation separates a town from rivals, earns media attention, and can be used in town branding materials to attract visitors and residents.

The Walk Friendly Communities (WFC) program is a separate program sponsored by FedEx and the FHWA. Similar to the BFC program, WFC-designated communities make efforts to increase the ease and enjoyment of moving through a city or town on foot. Each program rates communities from Bronze through Diamond levels.

Bicycling and Walking Maps

Biking and walking maps introduce users to comfortable bikeways and walkways that they may not otherwise know about. Partnering with local groups to distribute print versions of the maps is usually effective, as is posting the map online.

Active Older Adults Walking Programs

Group walks for older adults should leave and arrive at the same location such as near senior living centers. The walks should occur routinely so senior citizens can build relationships with other participants and organizers.

Bicycle and Pedestrian Advisory Committees

Bicycle and pedestrian advisory committees are made up of advocates and local bike/walking enthusiasts as well as government officials and employees. The committees meet on a set schedule and discuss upcoming infrastructure and non-infrastructure initiatives. These groups can function as a sounding board, an advisory group, and as a way to bridge connections between government and residents. Such a committee can also help spread the word about upcoming and current projects and organize events.

Project Prioritization

The highest priority regional projects in the LRTP have been prioritized based on existing local or regional planning documents as well as connectivity, distance & cost, community and regional impact and SCDOT Guideshare eligibility, as detailed in Chapter 5.

Sidewalk projects and other bicycle/pedestrian projects that are not local priorities or regional in scope, or that are not on the regional roadway network, were generally not ranked for this regional plan. However, it is assumed that all planned "Incidental Improvement Projects" (Corridor Improvement roadway projects – see Chapter 4 – and/or projects where complete street facilities are proposed or are appropriate based on transportation/land use context) will include pedestrian and bicycle projects based on the design guidance in this plan and specific corridor design goals. The exact facility types will be determined through corridor project planning and design.

Prioritization/ranking from existing local plans are also assumed to still be valid and are reflected in the highest priority recommendations where consistent with regional goals and priorities.

Summary of Highest Priority Projects Prioritization

A summary of high-priority projects is provided below.

Projects that connect more than one community are categorized as "Regional" projects. Projects that are primarily within a single community are noted as "Community" projects.

The highest priority projects were generally ranked on the following criteria:

1. Projects of regional impact (multiple jurisdictions connected)
2. Highest scoring on SCDOT guideshare criteria
3. Regional distribution (1 top project per community, generally)
4. Serve pedestrian and bicycle transportation and can be implemented independent of a roadway project. (The highest ranked priority projects are primarily shared use path projects that serve pedestrians and cyclists and can be built in independent rights-of-way and/or independent of roadway projects.)
Greenville's Augusta Road Bike Boulevard is the only bike-only project in the first tier of funding.

A table follows that includes all high priority regional projects.

Horizon Years	Facility	Impact: Community/Regional	Type	Road Name	Guideshare Points	Project Cost	Anticipated Year of Expenditure Costs	Remaining Balance
2024-2030	Mauldin Golden Strip Greenway (Swamp Rabbit Trail Extension)	Regional (Mauldin-Greenville)	SUP	US 276 Corridor, SC 417 Corridor	7	\$3,308,753	\$4,446,700	\$8,207,900
	Clemson-Central Green Crescent Connector	Regional (Clemson-Central)	SUP	SC 93 Corridor	7	\$2,676,913	\$3,597,500	\$4,610,400
	Augusta Street Area Bike Network	Community (Greenville)	BL, BR, SLM	parallel street network	7	\$361,379	\$485,700	\$4,124,700
2031-2040	Greer-Taylor's Greenway	Regional (Greenville County, Greer)	SUP	US 29 Corridor	7	\$3,474,611	\$5,915,300	\$12,162,700
	Travelers Rest Area Bike/Ped Network Expansion	Community (Travelers Rest)	SUP, BL, BR	US 276 Corridor, Poinsett Hwy, McElhaney Rd	6	\$1,733,809	\$2,951,700	\$9,211,000
	City of Easley Doodle Trail Extension	Community (Easley)	SUP	Fleetwood Dr Corridor	6	\$682,983	\$1,162,700	\$8,048,300
	Palmetto Area Bike/Ped Network Expansion	Regional (Williamston, West Pelzer, Pelzer)	SUP, BL, SLM	SC 20, SC 8, Rail Corridor	6	\$2,263,830	\$3,854,000	\$4,194,300
	Simpsonville Golden Strip Greenway (Swamp Rabbit Trail Extension)	Regional (Simpsonville-Mauldin)	SUP	SC 14 Corridor	7	\$2,008,699	\$3,419,700	\$774,600
Unfunded	Fountain Inn Golden Strip Greenway (Swamp Rabbit Trail Extension)	Regional (Fountain Inn-Simpsonville)	SUP	SC 14 Corridor	7	\$3,160,191	\$6,424,000	
	Clemson-Pendleton Green Crescent Connector	Regional (Clemson-Pendleton)	SUP, BL	S Mechanic St, Eighteenmile Creek Corridor	7	\$964,510	\$1,642,000	
	Washington Street Separated Bike Lane	Community (Greenville)	SBL	Washington St	7	\$1,406,927	\$2,395,200	
	City of Easley Brushy Creek Greenway (Doodle Trail Extension)	Community (Easley)	SUP	Pearson Rd, Pope Field Rd, Brushy Creek Corridor	7	\$2,516,492	\$4,284,200	
	Central-SWU Green Crescent Connector	Community (Central)	SUP	SC 93, Wesleyan Dr, Mill Ave, Clayton St	7	\$1,290,751	\$2,197,400	
	City of Clemson Shared Use Path	Community (Clemson)	SUP	Eighteenmile Creek Corridor	6	\$571,557	\$973,000	
	West Greenville Separated Bike Lane	Community (Greenville)	SBL	Pendleton St	7	\$795,774	\$1,354,800	
	Richardson Street Separated Bike Lane	Community (Greenville)	SBL	Richardson St	6	\$817,314	\$1,391,400	
	Rutherford Road Bike Lane	Community (Greenville)	BL	Rutherford Rd, Rutherford St	7	\$375,584	\$639,400	
	City of Easley School Sidewalk Connector	Community (Easley)	Sidewalk	Pope Field Rd	6	\$439,111	\$747,600	

* BR= Bike Route; BL = Bike Lane; SLM = Shared Lane Marking; SBL = Separated Bike Lane; SUP = Shared Use Path;