

Appendix A: Summary of Public Input

The Zebulon and Wendell Open Space and Greenways Plan workshops were well-attended and productive. More than twenty people attended the first workshop held Tuesday, August 4, 2001, from 10:00 am to 2:00 pm at the American Legion Picnic Grounds. The second public meeting was to be held on Saturday, October 4, 2001, from 2:00 pm to 6:00 pm, at the during the Bright Leaf Folk Arts Festival, however this workshop was cut short due to increment weather. The town planners from Zebulon and Wendell held small informal workshops with neighborhood residents, government officials, environmentalists, developers, and other interested groups. These smaller meetings allowed the various groups to express and contribute their knowledge of the study area in Zebulon and Wendell, and to learn more about regional efforts to preserve Wake County open space. At the workshops, participants were encouraged to make notations and draw potential trail routes directly on a map of the Zebulon and Wendell study area produced for the workshops (see figure A-1). Comment forms were also available for people to leave written comments and answer questions about their open space and passive recreation area needs. Also, Zebulon and Wendell staff and Greenways Incorporated personnel were on-hand to answer questions and listen to citizen comments.

Attention focused on the four main stream corridors: Marks Creek, Buffalo Creek, Little River, and Moccasin Creek. The streams provide connections to the north, south, west, and east and are the primary source of wildlife habitat for Zebulon and Wendell. In addition, participants were interested in the establishment of a central park, development of smaller area parks, establishing equestrian areas, and preserving open space. Establishing greenways that would provide public access to the new parks and open spaces and connectivity to neighboring communities was also a focus. Public input received at the first workshop was incorporated graphically into the working map for the second workshop and smaller meetings that followed.

Workshop Overview





Figure A-2: Public workshop comments from October 9, 2001

Zebulon & Wendell Open Space

The Newsletter of the Zebulon & Wendell Open Space Plan

Summer 2001

Plan for Open Space Underway

Wendell & Zebulon are small town communities that are poised to take advantage of land development opportunities that will occur in the next ten years. In the coming decade the Little River Reservoir will be built to accommodate the new houses, office parks, shopping centers and transportation systems that will be constructed to support new residents in the Wendell & Zebulon areas. The land use of these two communities will continue to change. Now is the time for residents of these two communities to identify which lands should be preserved, before development occurs, in order to maintain a high quality of life, clean water, healthy environment and the small town heritage and character you are proud of today.

The towns of Wendell and Zebulon have teamed together to begin a year long study to identify valuable landscapes that need to be protected. The study will evaluate the natural, historic and cultural landscapes of these two communities to determine those resources that are in need of protection and preservation. The study will conclude with recommendations for protecting and preserving selected landscapes, provide guidelines for establishing an integrated greenway system and determine the sources of funding for implementing the program.

The Consultant hired to complete the Study (see back) will conduct a thorough process to identify priority landscapes throughout the communities to be protected based on ecological, historical and water quality considerations. Recommended recreational uses for these lands will also be determined. Public meetings will then be held to gather input from Wendell & Zebulon residents on the Study recommendations. The location and dates of these meetings will be available in the next edition of this newsletter. If you have any questions about the Study, please contact Mike Frangos, Planning Director Town of Zebulon, at 269-7455, and Teresa Piner, Planning Director Town of Wendell, at 365-4444.

What is Open Space?

Open Space has been defined for the purposes of this study to include:

- Landscapes not Converted to Residential, Commercial or Industrial Uses;
- Parks, Greenways, Wetlands, Meadows, Forests, Lakes and Streams;
- Ecologically or Historically Significant Areas.



The Open Space Plan will focus on evaluating the opportunity to preserve and protect the valued natural, historic and cultural landscapes of Wendell and Zebulon areas.

What's So Great About Open Space?

Preserving Open Space will benefit everyone who lives, works, and enjoys recreation activities in the Wendell & Zebulon areas by:

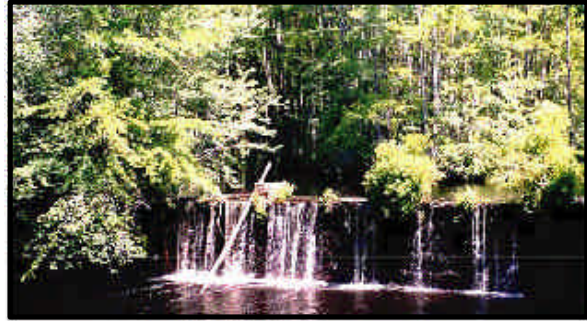
- Improving Water Quality - Natural areas (especially those adjacent to waterways) act as filters for rainwater, removing sediment and pollutants before water reaches our streams, rivers, lakes, groundwater and water supply reservoirs.
- Providing Opportunities for Outdoor Recreation - Public Open Space can be used for many types of outdoor recreation, including hiking, biking, horseback riding, dog walking, boating, fishing and birdwatching. Additionally, these close-to-home recreation opportunities will encourage residents to spend recreation dollars in their own communities and Eastern Wake County.
- Reducing Flooding Losses- Natural, vegetated land stores rainwater better than impervious surfaces (rooftops, parking lots, roads), so it reduces the amount and velocity of rainwater, helping to reduce downstream flooding and the loss of property associated with it.
- Enhancing Property Values - Open Space has been proven to increase the value of adjacent lands because residents place a premium on living or working near parks, greenways and natural areas.

(Continued on Back)

Figure A-3: Newsletter, first public meeting

Improving Quality of Life - The preservation of naturally and historically significant landscapes will improve quality of life for residents and encourage businesses and individuals to remain in Eastern Wake County and the Triangle Region.

Protecting Wildlife - Protecting natural areas also preserves habitat for wildlife, migration corridors for plant and animal species, and genetic diversity in rare ecosystems.



Protecting open space will improve the quality of waterways for drinking water, as well as aquatic habitat, boating, fishing, hiking and swimming in the Wendell & Zebulon areas

A Word About Property Rights...

The Open Space Plan to be completed will in no way infringe upon the rights of property owners. The Plan will stress the voluntary participation of landowners in the Wendell & Zebulon and Eastern Wake County, appropriate compensation for property (or an interest in property) when there is a willing seller, and appropriate management strategies for public lands. The Plan will also help inform landowners about the benefits of preserving open space, including income tax benefits and increased property values.

Consultant Selected for Study

Wendell & Zebulon & has selected a nationally-recognized firm to complete the Open Space Plan. Greenways Incorporated, a Durham-based firm that specializes in the planning, design, development and management of greenways and open space, will complete the plan for the community. This nationally respected firm has provided services to more than 100 communities and 27 states across the country, including the completion of open space plans for Wake County, Durham and High Point, NC. Greenways Incorporated has also completed comprehensive greenway plans for more than a dozen North Carolina communities.

Zebulon & Wendell Open Space Plan Newsletter

**For more information contact Mike Frangos,
at (919) 269-7455 ext. 244 or Teresa Piner at 365- 4444**

~ PLEASE SHARE THIS NEWSLETTER ~

*Town of Zebulon
Planning Department
100 N. Arendell Avenue
Zebulon, NC 27597*

*Town of Wendell
Planning Department
P.O. Box 828
Wendell, NC 27591*

*POSTMASTER:
Address correction requested*



Zebulon & Wendell

Open Space and Greenway Plan

Saturday, August 4
American Legion Picnic Grounds
Business 64
Drop by between 10:00am and 2:00pm

An Invitation to Participate



What do you think Wendell & Zebulon should look like in ten years? Twenty years?

What is important about the areas that should be preserved?

What types of improvements should be made to the current system?



Participants will be asked for input regarding the Open Space needs and priorities of Wendell & Zebulon to help develop a whole community vision, attainable goals, and objectives for this project.

Greenways Incorporated will be asking local residents to answer these and other questions at a public workshop on Saturday August 4.



Residents are urged to stop by the workshop and bring their families to learn about the Zebulon & Wendell Open Space and Greenway Plan.



Residents are encouraged to bring comments regarding:

- The opportunities and constraints for Open Space in Wendell & Zebulon
- Passive outdoor recreation needs (hiking, biking, walking, etc.)
- Open Space needs that address quality of life issues (water quality, viewsheds, etc.)
- Wildlife populations and habitat protection.
- Historical or culturally important community sites.
- Important ecological communities and natural physical features.

Open Space

Figure A-4, Flyer posted for first public meeting

Zebulon & Wendell Open Space

Plan for Open Space Underway

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The Consultant hired to complete the Study (see back) will conduct a thorough process to identify priority landscapes throughout the communities to be protected based on ecological, historical and water quality considerations. Recommended recreational uses for these lands will also be determined. The first of three Public meetings was held August 4th to gather input from Wendell & Zebulon residents on the Study recommendations. The second meeting will build on the first by focusing on continued public input and Study recommendations. The third meeting will contain the final recommendations and be held in the early spring of 2002. The location and date of the last meeting will be available in the next edition of this newsletter. If you have any questions about the Study, please contact Mike Frangos, Planning Director Town of Zebulon, at 269-7455, and Teresa Piner, Planning Director Town of Wendell, at 365-4444.

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- Enhancing Property Values - Open Space has been proven to increase the value of adjacent lands because residents place a premium on living or working near parks, greenways and natural areas.

(Continued on Back)

Figure A-5, Newsletter, second public meeting

Improving Quality of Life - The preservation of naturally and historically significant landscapes will improve quality of life for residents and encourage businesses and individuals to remain in Eastern Wake County and the Triangle Region.

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Zebulon & Wendell



Open Space and Greenway Plan

Saturday, October 6, 2001

Bright Leaf Folk Arts Festival

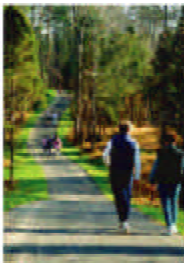
Drop-by between 2:00pm to 6:00pm



An Invitation to Participate



Greenways Incorporated will be asking local residents of both towns to answer questions about the future vision of the areas around Zebulon & Wendell, and other questions at a public workshop on Saturday, October 6 at the Bright Leaf Folk Arts Festival.



Residents are urged to stop-by our booth and to bring their families to learn about the Zebulon & Wendell Open Space Plan through displays, and answers to your questions.

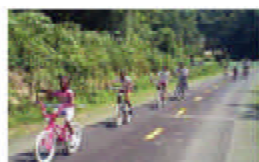
Participants will be asked for input regarding the Open Space needs and priorities of Zebulon & Wendell to help develop a whole community vision, attainable goals, and objectives for this project.



What do you think Zebulon & Wendell should look like in ten years? Twenty years?

What is important about the areas that should be preserved?

What types of improvements should be made to the current system?



Residents are encouraged to Bring comments regarding:

- The opportunities and Constraints for Open Space In Zebulon & Wendell.
- Passive outdoor recreation needs (hiking, biking, walking, etc.)
- Open Space needs that address the quality of life issues (water quality, viewsheds, etc.)
- Wildlife and habitat protection.
- Historical and/or culturally important community sites.
- Important ecological communities and natural physical features.

Come join us at the Bright Leaf Festival and learn about what you can do to help conserve Open Space.

Open Space

Figure A-6, Flyer for second public meeting

Public Opinion Survey

These comment forms were designed to encourage workshop participation and allow people to comment privately, if they chose to do so. The figures below represent the results from the returned forms.

What should be accomplished by Open Space preservation?

- 50% Acquire more land for public uses
- 68% Clean the water that flows in the stream corridors
- 64% Link neighborhoods to the existing park systems
- 55% Interpret the unique history of the landscapes of Wendell & Zebulon
- 59% Acquire more land for improving water quality of the area streams
- 64% Build a trail system along stream corridors
- 64% Improve access to surrounding urban, suburban, and rural areas

What activities are you most likely to do in a Greenway?

- 95% Walk along a stream corridor
- 59% Ride a bike for fitness and fun
- 36% Ride a horse on a trail
- 64% Picnic with friends or family
- 50% Volunteer to plant native trees and other vegetation in the stream buffers
- 14% Volunteer to help with clean up of public lands along the corridor
- 45% Learn about the environment and history of the stream corridor from interpretive signs

Who should manage and care for Open Space and Greenways?

- 41% The communities of Zebulon and Wendell
- 23% Wake County
- 14% The State of North Carolina
- 27% A Partnership of Public and Private Organizations
- 14% Private Sector Organizations and Landowners
- 9% No response

Do you support using public funds for the preservation of Open Space?

- 91% Yes
- 5% No
- 0% Not certain at this time
- 5% No response

Additional comments were included on some of the forms. A representative sample of the comments are printed below:

- Provide a link to area Schools.
- Improve there overall appearance of the communities
- Some improved, easy access, do not turn everything into a park.
- We still need natural open wild areas.
- Habitat Preservation!
- Preserve Farmland, and wildlife habitat
- Pet parks, no leashes, require rules and pick-up after your pet!
- Educate public not to litter, and to take pride in our communities.
- What about dogs and people walking areas?
- Mountain bike trail riding
- Organized educational fieldtrips, workshops for school groups, youths groups and adults
- Exercise trail training
- Safety officer patrolling trails/greenway
- Need to focus on Wendell and Zebulon communities first (locally) and then on more regional area for greenways and open space.
- Landowners should have responsibility of open space, however, greenways and public issues must be worked out
- Long continuous trails of varied topography, shaded areas-even if man-made for large open spaces
- Paved areas for handicap access
- Emergency phones
- Plant and animal identification

Design Guidelines

The design development guidelines featured in this Appendix have been tailored to meet the specific facility development needs of the Wendell and Zebulon Open Space and Greenway System. The purpose of these guidelines is to assist Wendell and Zebulon and partnering organizations in developing open space and greenway facilities.

These guidelines provide a variety of trail facility and ecological system restoration concepts and ideas. These guidelines are not a substitute for a more thorough examination and detailed landscape architectural and engineering evaluation of each project segment. These guidelines serve as minimum standards for greenway facility development. Wendell and Zebulon disclaim any liability for the use, appropriateness and accuracy of these guidelines as they apply to a specific project. They are not to be used for construction.

The following resource materials have been used in the preparation of these guidelines:

- Adherence to national design standards for off-road trails and green way facilities, as defined by the American Association of State Highway Transportation Officials (AASHTO), the Americans with Disabilities Act, Designing Sidewalks and Trails for Access: Part 2 and the Manual on Uniform Traffic Control Devices.

For more in-depth information and design development standards, the following publications should be consulted:

Greenways: A Guide to Planning, Design and Development

Published by Island Press, 1993

Authors: Charles A. Flink and Robert Searns

For more information visit www.greenways.com

Trails for the Twenty-First Century

Published by Island Press, 2001

Authors: Charles A. Flink, Robert Searns and Kristine Olka

For more information visit www.greenways.com

Description

Resources

Additional Resources

Guide to the Development of Bicycle Facilities

Updated in 2000 by the American Association of State Highway Transportation Officials (AASHTO). Available from FHWA or AASHTO. www.aashto.org/bookstore/abs.html

Manual on Uniform Traffic Control Devices (MUTCD)

Published by the U. S. Department of Transportation, Washington, DC

Universal Access to Outdoor Recreation: A Design Guide

Published by PLAE, Inc., Berkeley, CA, 1993

Designing Sidewalks and Trails for Access: Part Two - Best Practices Design Guide

Published by U.S. Department of Transportation, Washington, DC, 2001

In all cases, the recommended guidelines in this report meet or exceed national standards. Should these national standards be revised in the future and result in discrepancies with this chapter, the national standards should prevail for all design decisions.

Other useful web sites for information include:

Rails-to-Trails Conservancy - www.railtrails.org

National Park Service - www.nps.org

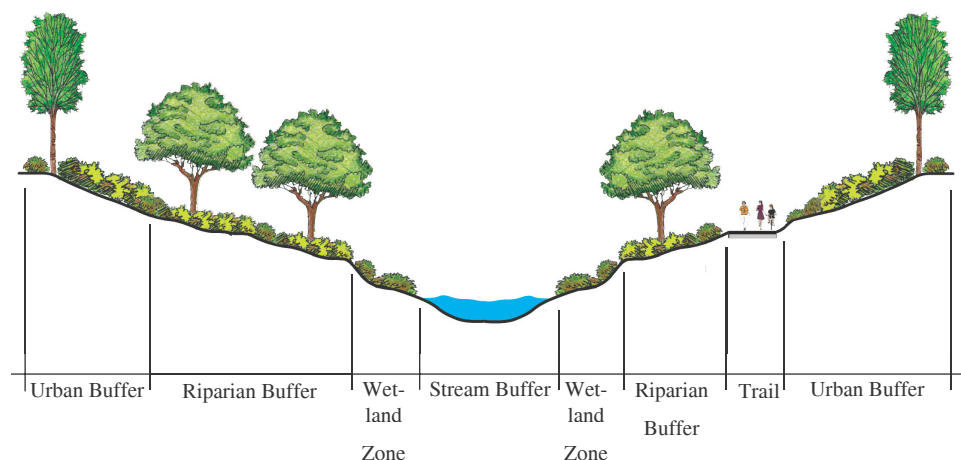
U.S. Department of Transportation - www.walkinginfo.org and www.bicyclinginfo.org

Trails and Greenways Clearinghouse - www.trailsandgreenways.org

National Bicycle and Pedestrian Clearinghouse - www.bikefed.org/clear.htm

Greenways Incorporated - www.greenways.com

Stream Corridor Buffer



Riparian buffers serve many functions. They filter stormwater pollutants, help moderate stream flow, stabilize streambanks, moderate stream temperature, and provide aquatic and terrestrial habitat. The Neuse Nutrient Sensitive Waters (NSW) rules require that new developments maintain an existing 50-foot vegetated buffer on both sides of all intermittent and perennial streams, lakes and ponds within the Neuse River Basin. For the purpose of the rules, a waterbody exists if the feature is present on either the most recent version of the soil map or 7.5 minute quadrangle topographic map prepared by USGS. The required buffers consist of two zones: a 30-foot undisturbed zone adjacent to each side of the waterbody, and a vegetated zone that extends from the outer edge of the 30 foot zone for a distance of at least 20-feet.

Buffers are required in water supply watersheds throughout the state as part of the Water Supply Watershed Management Program. The Division of Water Quality manages the program through oversight of local ordinances and monitoring of land use activities. Local water supply watershed programs must be approved by the NC Environmental Management Commission (EMC). The program requires local governments to adopt land use controls that include buffer protection. For low-density development, 30-foot buffers are required along perennial streams, and 100-foot buffers are required for high-density development. There are five major water supply watersheds within Wake County: Falls Lake, Jordan Lake, Wake Forest Reservoir, Swift Creek, and Little River. In addition, a small portion of the County near Fuquay-Varina drains to the Cape Fear River, which is used as a water supply by Lillington.

Corridors

Stream buffers within Wendell and Zebulon should be established to protect water quality and animal habitat. For the purpose of greenway facility development, a minimum of 50-feet wide buffer (150-feet preferred) as measured from the top of streambank is required in order to mitigate the damaging effects of flooding from storms, filter pollutants from overland flow and develop appropriately sized greenway trail facilities.

Wendell and Zebulon have applied the Neuse River Basin 50-foot buffer throughout the county. (Please see the attached Neuse River Buffer Rules.) Some of the municipalities within the county (Garner, Apex, Cary and Morrisville) have placed additional buffers up to 100-feet on their streams, according to their order.

Instead of using this conventional method of prescriptive buffers, stream buffers should be a varied width according to ecological features of the watershed. Each buffer width will be site specific, depending on the following characteristics of the stream, riparian buffer and watershed:

- Slope
- Soil
- Hydrology
- Vegetation
- Water Quality
- Impervious Surface

The appropriate width for a variety of characteristic combinations will be discussed more in depth in the Wendell and Zebulon Open Space and Greenways Plan.

Corridor Planting

Some basic guides for planting in corridors is as follows:

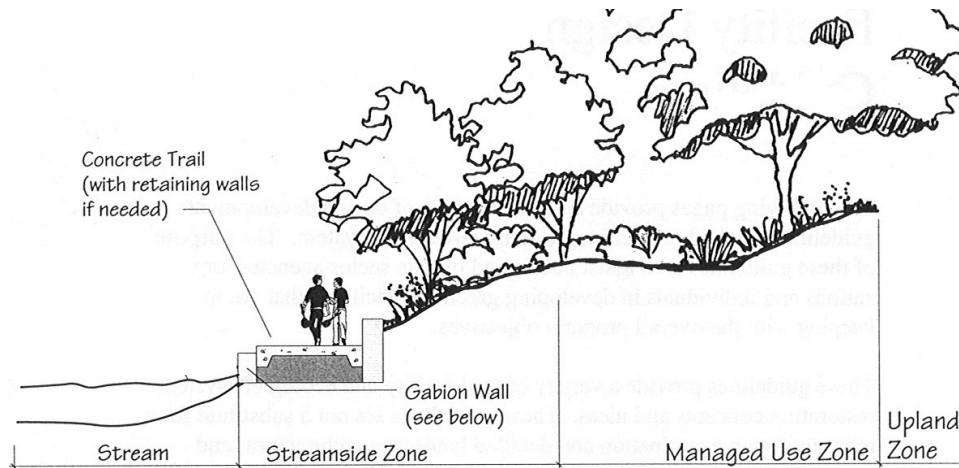
- Efforts should be made to eliminate non-native invasive species, such as privet, from corridors.
- Native overstory and understory trees/shrubs should be replanted where vegetation is removed or harmed due to construction of parks, trails, etc. in greenway corridors or open space.
- Fallen trees should not be removed unless they obstruct trails or present danger. Otherwise, they should be left to decay naturally.
- Evergreens, conifers (pines) and deciduous trees should all be used proportionally.
- Mast producing trees and shrubs with berries should be utilized for wildlife food whenever possible.
- Flowering trees and shrubs can be used to draw attention to important intersections and entrances.
- Evergreen shade trees are needed near seating areas and picnic tables.
- Evergreen shrubs, such as wax myrtle, can help separate public areas from private residences.

Types of Trail Treads

One of the following types of trail treads should be used when designing greenway trails and sidewalks. The appropriate trail type will depend on the specific site conditions of the trail segment. Some of the characteristics of the trail corridor to consider are soil type, vegetation cover, flooding, slope and wildlife habitat sensitivity, among others.

Creekside Trail Tread

Creekside trails are located only in urban areas, where right-of-way constraints and channelized streams restrict trail development to the floodway. Creekside trails are designed to accommodate walkers, bicyclists, rollerbladers, and joggers. These multi-use trails are typically positioned directly adjacent to the stream channel and are therefore subject to frequent flooding. These trails require hard-paved surfaces of concrete to withstand high-velocity stream flows. Retaining walls or other structural elements may also be required for stable construction and to protect the trail from erosion and flood damage.



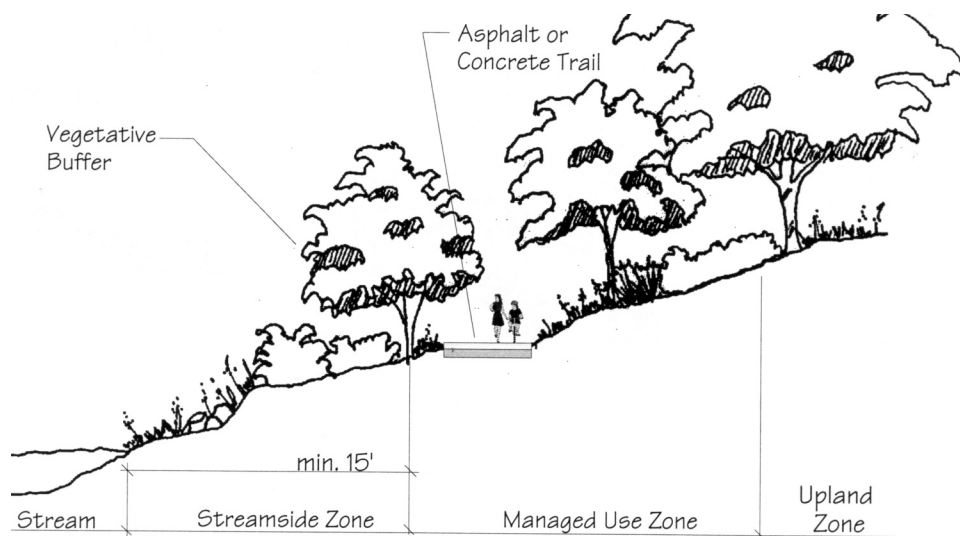
Typical Multi-Use Creekside Trail Cross Section

Creekside trails should be a minimum of 10'-wide for multi-use trails. The installation of railings, benches, signage, and trash receptacles that could obstruct flow during storm events, should be carefully considered. Creekside trails must be designed and installed in a manner that minimizes their effect on flood waters and protects the amenities from flood damage. The use of retaining walls as seat walls is one way in which non-obtrusive amenities can be included on this type of trail facility. Special consideration should be paid to mitigating the impacts of trail construction on the natural environment.

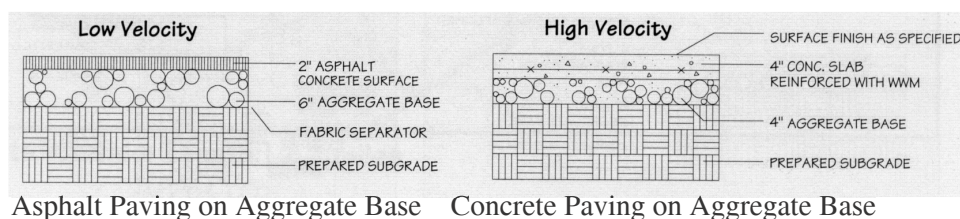
Floodway Trail Tread

Multi-use trails within the floodway are designed to accommodate a variety of users including walkers, joggers, cyclists, and rollerbladers. These multi-use trails are typically positioned within the floodway but not directly adjacent to streams. Some vegetative buffer between the stream and trail should be left intact. Like the streamside trails, trails within the floodway are subject to periodic flooding, however, not as frequently. These trails require paved surfaces of either asphalt or concrete depending on frequency of flooding and expected velocity of flow. A proper trail foundation is important and will increase the longevity of the trail. No soft shoulder should be constructed due to flood considerations. Special consideration should be given to the mitigation of negative impacts from trail development on the natural stream environment.

Multi-use trails within the floodway should be built with a minimum width of 10 feet. All elements of the trail including the trail tread, railings, benches, and trash receptacles will be periodically flooded. The design and materials for these trails should be carefully selected accordingly.



**Typical Multi-Use Trail Cross Section
(Within the Floodway)**



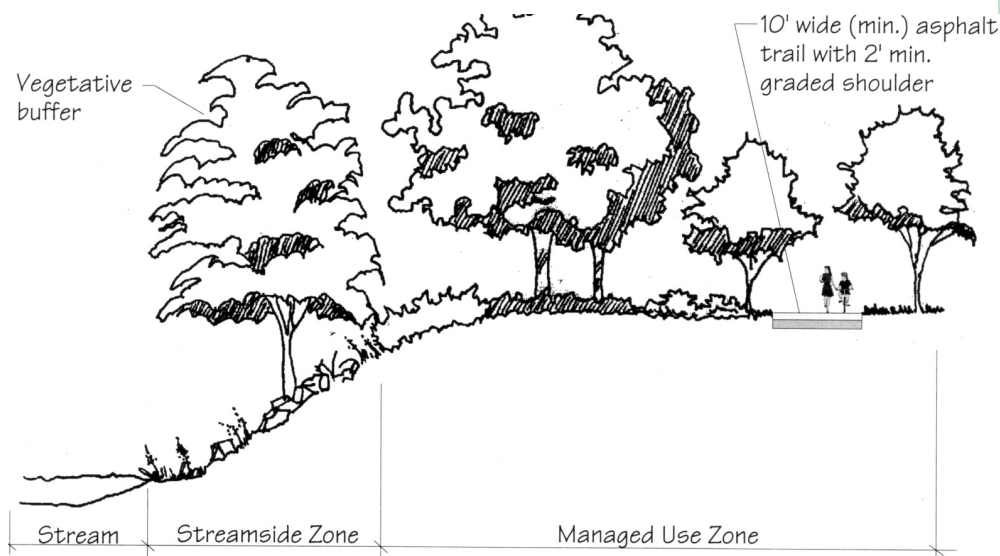
Asphalt Paving on Aggregate Base Concrete Paving on Aggregate Base

Paving Cross Section

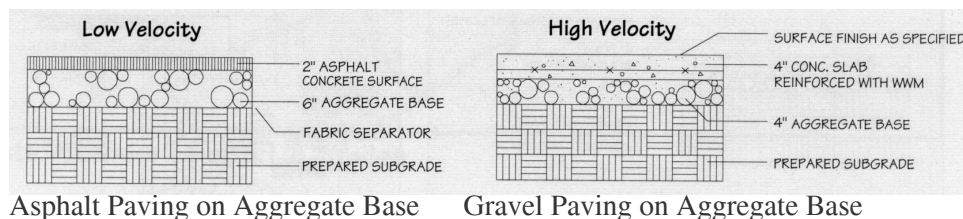
Floodplain Trail Tread

Multi-use trails within the floodplain are designed to accommodate a variety of users including walkers, joggers, cyclists, and in-line skaters. These multi-use trails are typically positioned outside the floodway but within the floodplain. Significant vegetative buffers between the stream and trail should be left in tact. Multi-use trails within the floodplain are subject to occasional flooding during large storm events. It is recommended that these trails be built with paved asphalt, however an aggregate stone surface may be adequate in some locations.

Multi-use trails within the floodplain should be built to a minimum width of 10', although 12' to 14' is preferred. The graphics below illustrate two suitable pavement cross sections that can be used to build multi-use trails within the floodplain.



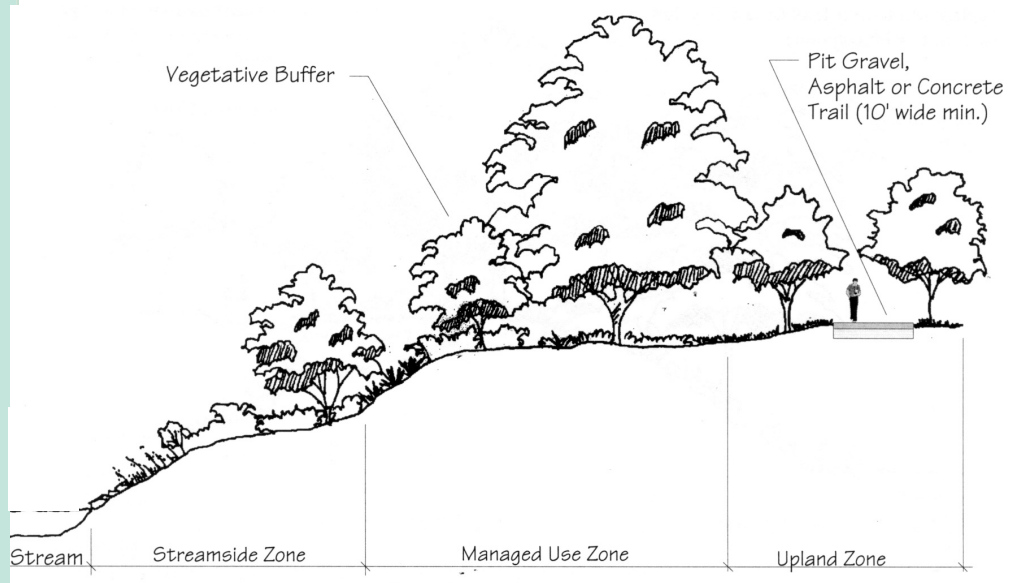
**Typical Multi-Use Trail Cross Section
(Within the Floodplain)**



Paving Cross Section

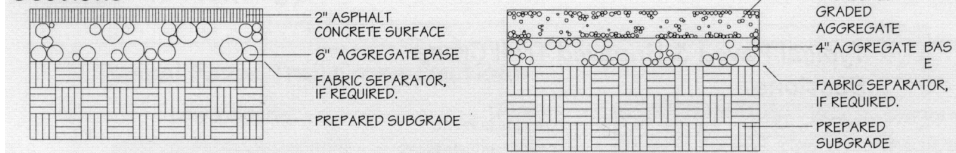
Upland Trail Tread

Upland multi-use trails are designed to accommodate a variety of users including walkers, joggers, cyclists and in-line skaters. These upland multi-use trails are typically positioned completely outside designated floodplains. Significant vegetative buffer between any streams and the trail should be left in tact. It is recommended that these trails be built with paved asphalt or aggregate stone, depending on the preference of local user groups. Upland multi-use trails should be built to a minimum width of 10', though 12' is preferred.



Upland Trail Cross Section

Sections



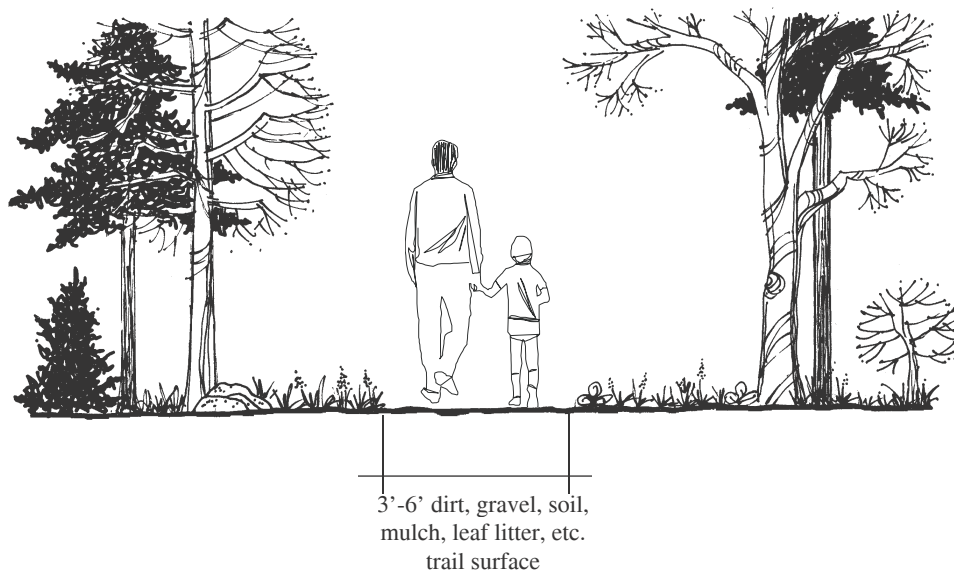
Asphalt Paving on Aggregate Base

Gravel Paving on Aggregate Base

Paving Cross Section

Footpath/Hiking Trail

Footpaths or hiking trails are designed to accommodate pedestrians and are not intended for cyclists or other wheeled users. These natural surface trails typically make use of dirt, rock, soil, forest litter, pine mulch and other native materials for the trail surface. Preparation varies from machine-worked surfaces to those worn only by usage. This is the most appropriate surface for ecologically sensitive areas.

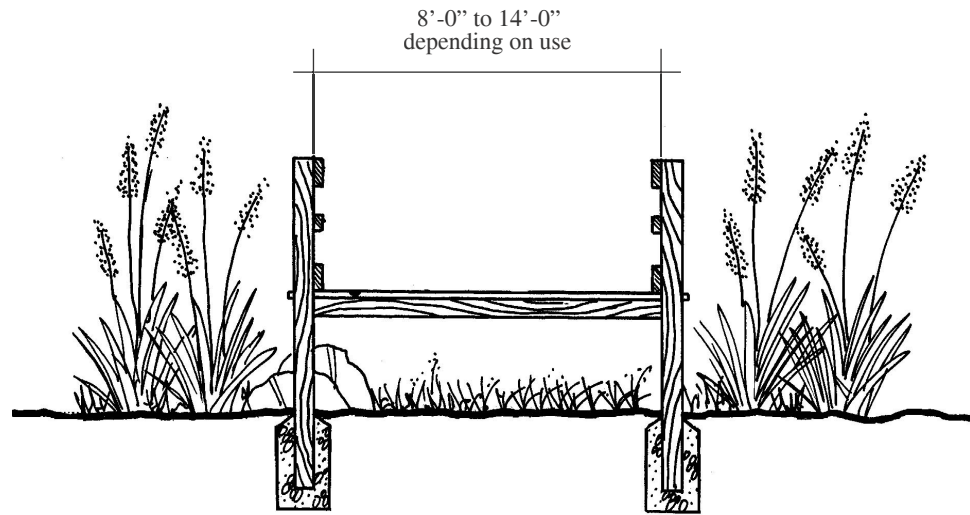


Footpath Cross Section

These pathways, often very narrow, sometimes follow strenuous routes and may limit access to all but skilled users. Construction of these trails mainly consists of providing positive drainage for the trail tread and should not involve extensive removal of existing vegetation. Timbers may be used for steps along steep slopes. These trails vary in width from 3 feet to 6 feet and vertical clearance should be maintained at 9 feet. These trails are most commonly found within the streamside zone.

Boardwalk Trail Tread

Boardwalks, or wood surface trails, are typically required when crossing wetlands or poorly-drained areas. While boardwalks can be considered multi-use trails, the surface tends to be slippery when wet and not best suited for wheeled users. Boardwalks intended for use by bikes, pedestrians, in-line skaters and others should be a minimum of 14 feet wide. However, boardwalk trails limited to pedestrian use can be as narrow as 8 feet. If maintenance vehicles use the boardwalk for maintenance access, it should be a minimum of 14 feet.



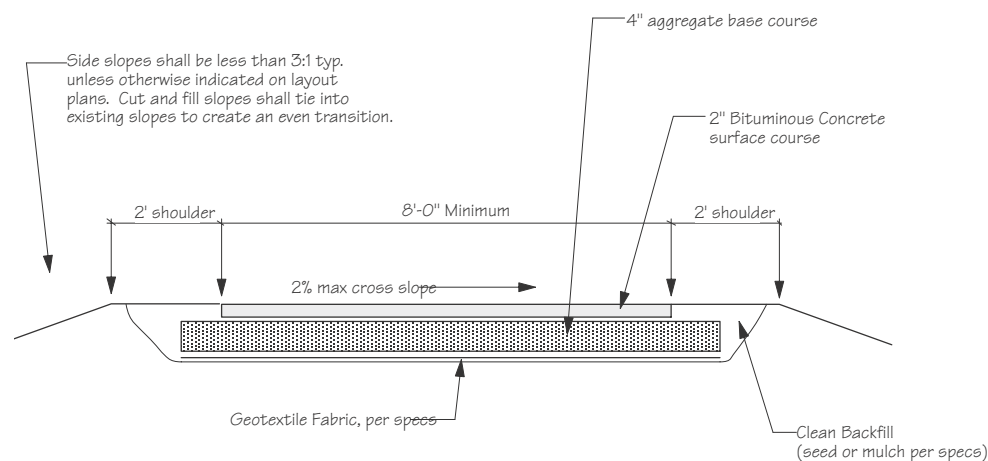
Boardwalk Cross Section

Wood surfaced trails are usually composed of sawn wooden planks or lumber that forms the top layer of a bridge, boardwalk or deck. The most commonly used woods for trail surfacing are exposure- and decay- resistant species such as pine, redwood, fir, larch, cedar, hemlock and spruce. Wood is a preferred surface type for special applications because of its strength and comparative weight, its aesthetic appeal and its versatility. Synthetic wood, manufactured from recycled plastics, is now available for use as a substitute in conventional outdoor wood construction. While these products are more expensive than wood lumber, recycled plastic lumber lasts much longer, does not splinter or warp and will not discolor.

Paved Multi-Use Trail

Typical pavement design for paved, off-road, multi-use trails should be based upon the specific loading and soil conditions for each project. These trails, typically composed of asphalt or concrete, should be designed to withstand the loading requirements of occasional maintenance and emergency vehicles. In areas prone to frequent flooding, it is recommended that concrete be used because of its excellent durability.

One important concern for asphalt, multi-use trails is the deterioration of trail edges. Installation of a geotextile fabric beneath a layer of aggregate base course (ABC) can help to maintain the edge of a trail. It is important to provide a 2'-wide graded shoulder to prevent trail edges from crumbling.



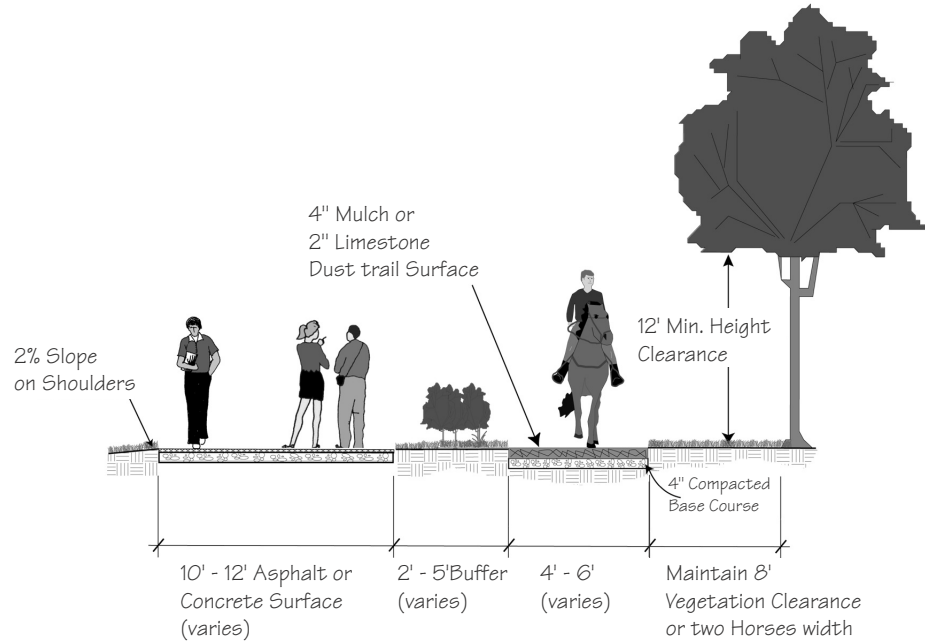
Multi-Use Trail Cross Section

The minimum width for two-directional trails is 10', however 12'-14' widths are preferred where heavy traffic is expected. Centerline stripes should be considered for paths that generate substantial amounts of pedestrian traffic. Possible conflicts between user groups must be considered during the design phase, as cyclists often travel at a faster speed than other users. Radii minimums should also be considered depending on the different user groups.

Asphalt is a hard surface material that is popular for a variety of rural, suburban and urban trails. It is composed of asphalt cement and graded aggregate stone. It is a flexible pavement and can be installed on virtually any slope.

Concrete surfaces are capable of withstanding the most powerful environmental forces. They hold up well against the erosive action of water, root intrusion and subgrade deficiencies such as soft soils. Most often, concrete is used for intensive urban applications. Of all surface types, it is the strongest and has the lowest maintenance requirement, if it is properly installed.

Dual Trail Tread



Typical Equestrian and Pedestrian Trail Cross Section

Dual tread trails are suggested on multi-use trail systems where different users travel at different speeds, such as equestrians and walkers. If hard surfacing is being used on the multi-use trail, a softer, 5-foot-wide tread for horses should be considered. Mulch, dirt, stabilized dirt or limestone dust can be used. Hard surfaces, such as concrete and asphalt are undesirable for equestrians because they can injure horses' hooves. Granular stone may also present problems because it can get stuck in horse hooves.

Vertical clearance for equestrians should be at least 12 feet, with a horizontal clearance of at least 5 feet. Low-hanging tree limbs should be cut flush with the trunk. Leaves, branches and other protrusions that could injure the horse, rider or gear should be removed. Within the tread, stumps, large rocks and other debris should be cleared. Sight distances for equestrians, who usually travel between 4 and 6 miles per hour, should be at least 100'.

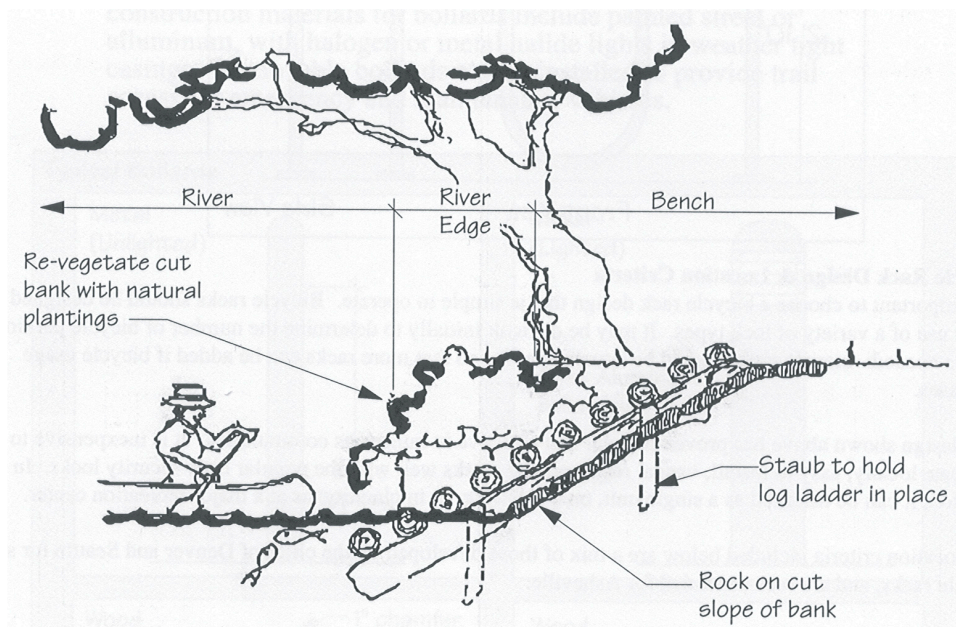
Dual treads may also be required for mountain biking trails.

Water Based Trail

This designation applies to those rivers and streams that can successfully accommodate and/or which are designated to support canoeing, kayaking and boating. Water based trails can be designated with features and facilities that make this activity more enjoyable for residents, including signage systems, improved rapids, safety systems, and access points. Rental outfits could be established at put in/take out points.



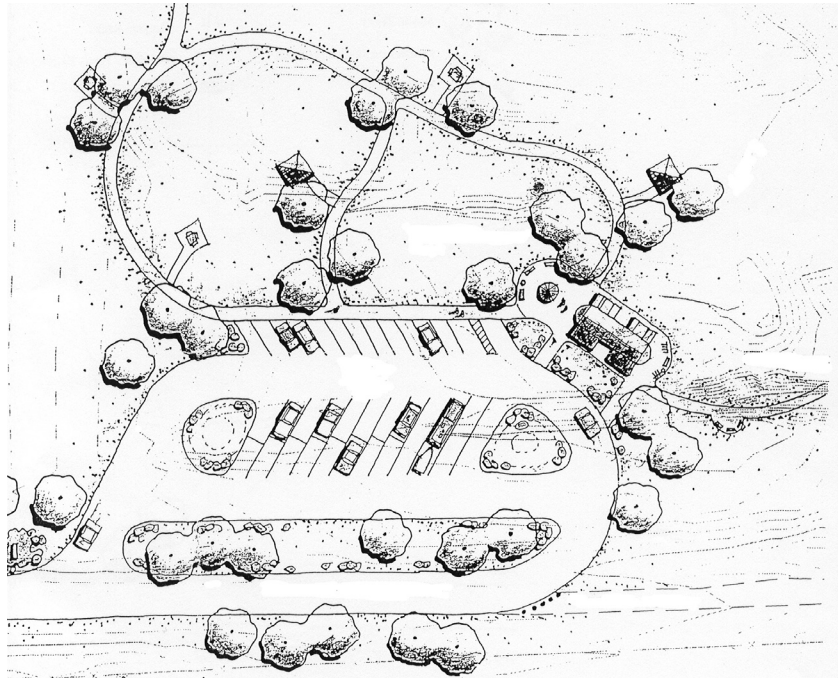
Example of a Water Based Trail in Use



Small Boat Access

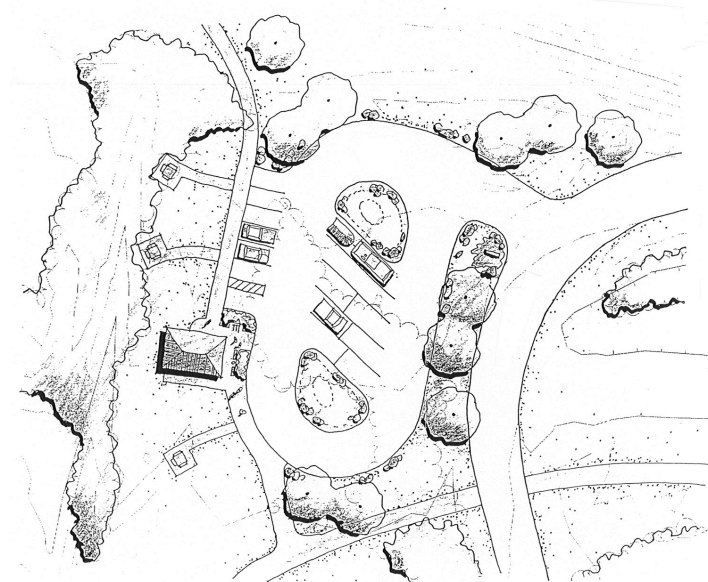
Trailheads

Major and Minor Trailheads



Typical Major Trailhead Plan View

Trail heads should be installed throughout the greenway system to give the public access. A “trail head” is a point of formal public entry into the greenway system that may provide certain related public facilities such as parking, restrooms, drinking fountains, trail signage, etc. Major trail heads and minor trail heads are suggested. Major trail heads should be located in significant areas. An exhibition building or an interpretive exhibit may be incorporated, along with restrooms, water fountains, picnic tables, parking, signage, etc. Minor trail heads can be used to connect a smaller number of people to surrounding trails, open space, parks, etc.



Typical Minor Trailhead Plan View

Off Road Facilities

Restrooms

Public amenities, such as phones, restrooms, etc., shall be located and concentrated at the confluence of vehicular and pedestrian traffic. ADA accessible restrooms should be placed at major trail access points in order to accommodate trail users. Where possible, other uses should be incorporated into the structure, such as storage for maintenance equipment. These structures should be located adjacent to thoroughfares for security, maintenance and access to utility hookups. They should also make use of natural light and ventilation as much as possible.



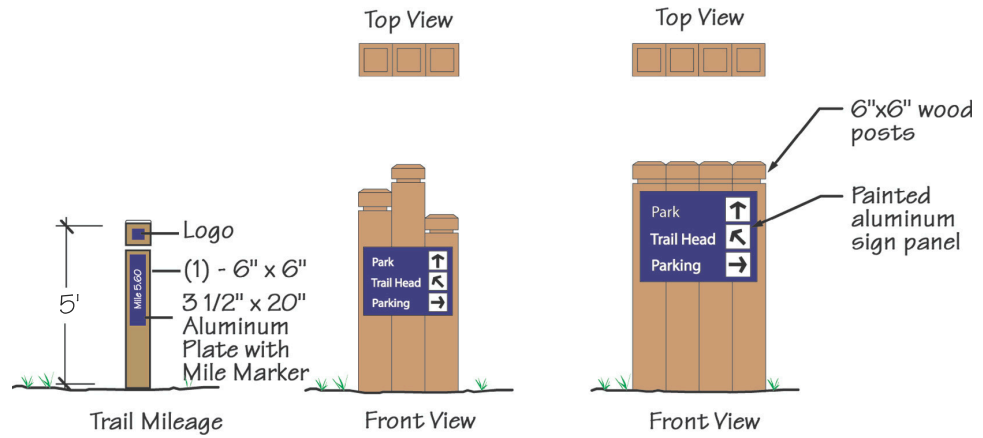
Typical Restrooms



Waterless Restroom Option

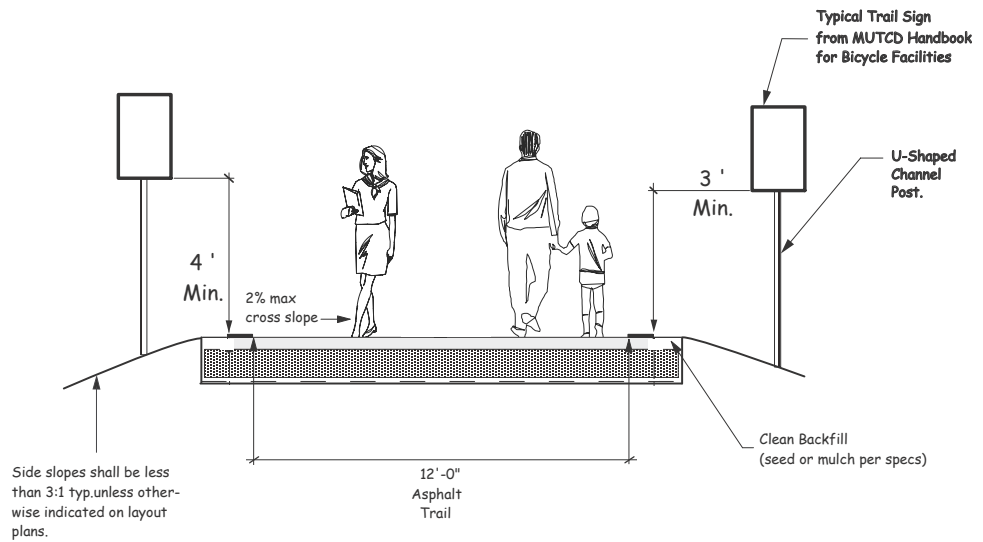
Signage Details

Directional Signage



Signage Examples

Typical Trail Signage Location

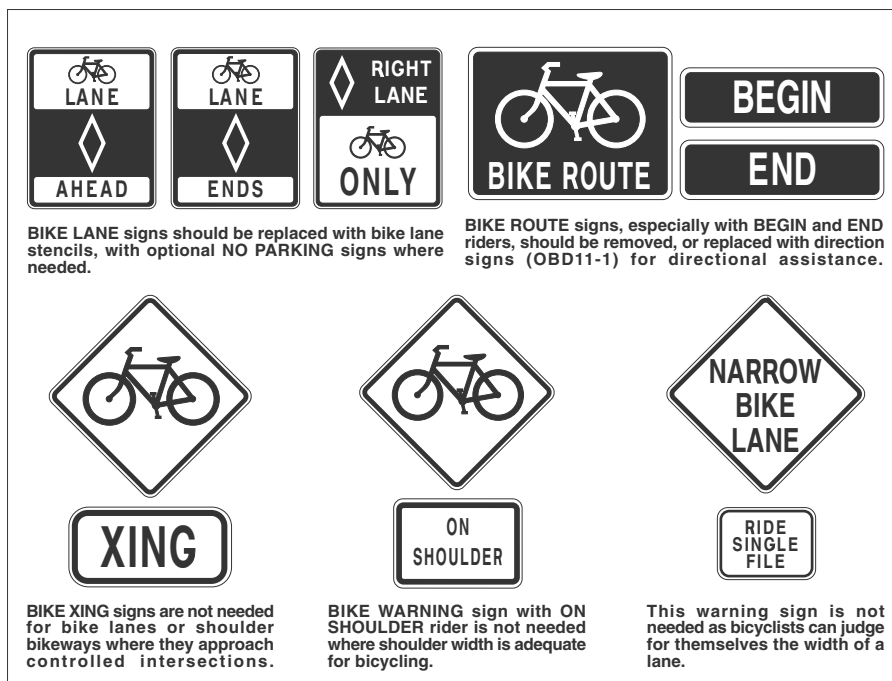


Typical Signage Location

DOT Bike Signage

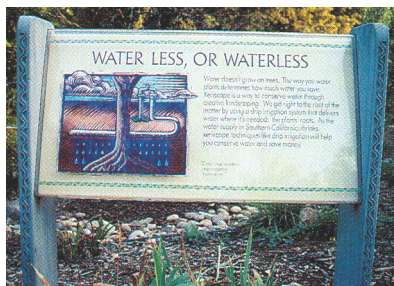
The MUTCD specifies standard signage for bicycle lanes. According to section 9B-8, the R3-16 sign should be used in advance of the beginning of a designated bicycle lane to call attention to the lane and to the possible presence of bicycles. The MCTUD requires that the diamond lane symbol be used with both the R3-16 and R3-17 signs.

According to Section 9B-11 of the MUTCD, the R7-9 R7-9a signs can be used along streets where motorists are likely to park or frequently pull into the bike lane.



Signage Examples

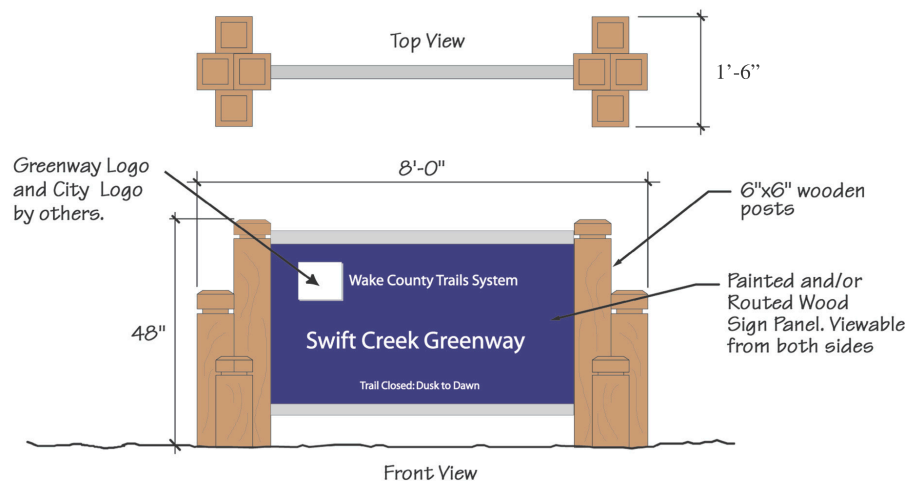
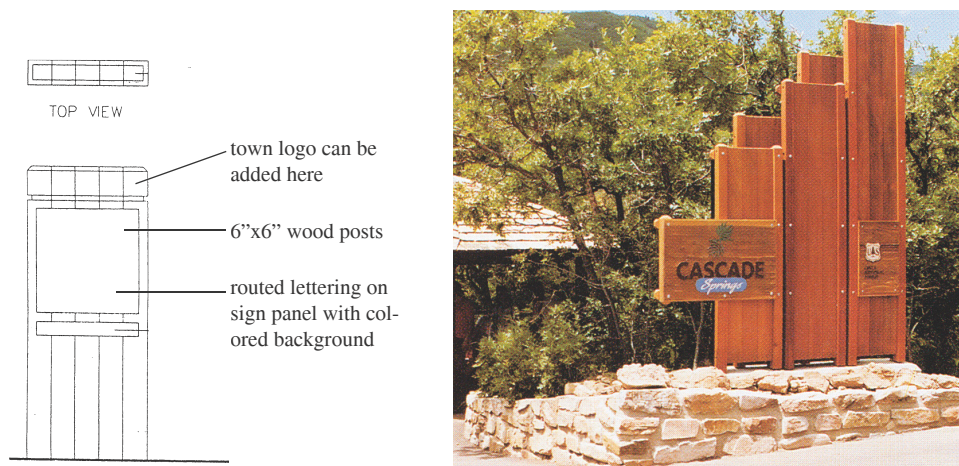
Interpretive Signage



Signage Examples

Entry Signage

Proper trail identification at trail terminal point and major intersections is important in the development of a comprehensive trail network. A system of signage is important throughout Wendell and Zebulon to ensure that information is provided to trail users regarding the safe and appropriate use of all facilities. Greenway entry signage may also include mileage to provide users with a reference as to how far he or she has traveled, and the remaining distance to specific destinations.

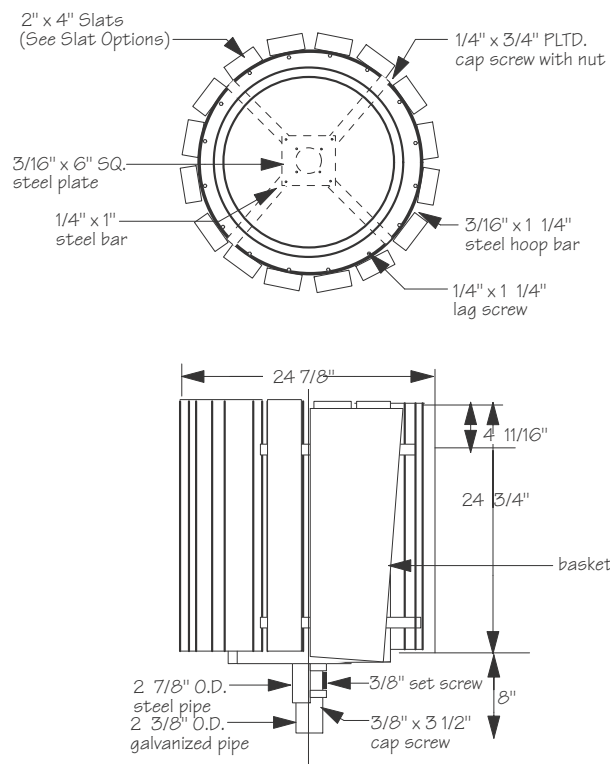


Entry Signage Examples

Site Furnishings Details

Trash Receptacles

Trash containers are necessary along all trails. They can be attractive as well as functional and should be selected based on the amount of trash expected, overall maintenance program of the trail, and types of users. Trash cans need to be accessible to both trail users and maintenance personnel. At a minimum, 22-gallon or 32-gallon containers should be located at each entranceway and at each bench seating area. They should be set back three feet from the edge of the trail. The location of additional trash cans will depend upon the location of concessions, facilities adjacent to the trail and areas where trail users tend to congregate.

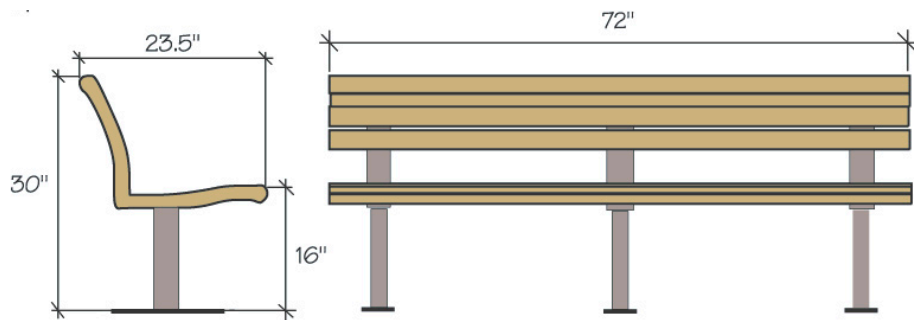


Typical Trash Receptacle Detail

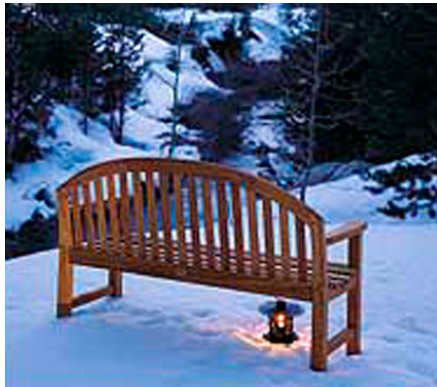
Benches

Benches along trails allow users to rest, congregate or contemplate. Trail benches should comfortably accommodate the average adult. They should be located at the primary and secondary entrances to the trail and at regular intervals, and should be set back three feet from the trail edge.

The graphics below illustrate a bench that can be manufactured using recycled plastic lumber or conventional treated wood lumber. The prefabricated plastic lumber units cost more initially but last longer and require little or no maintenance.

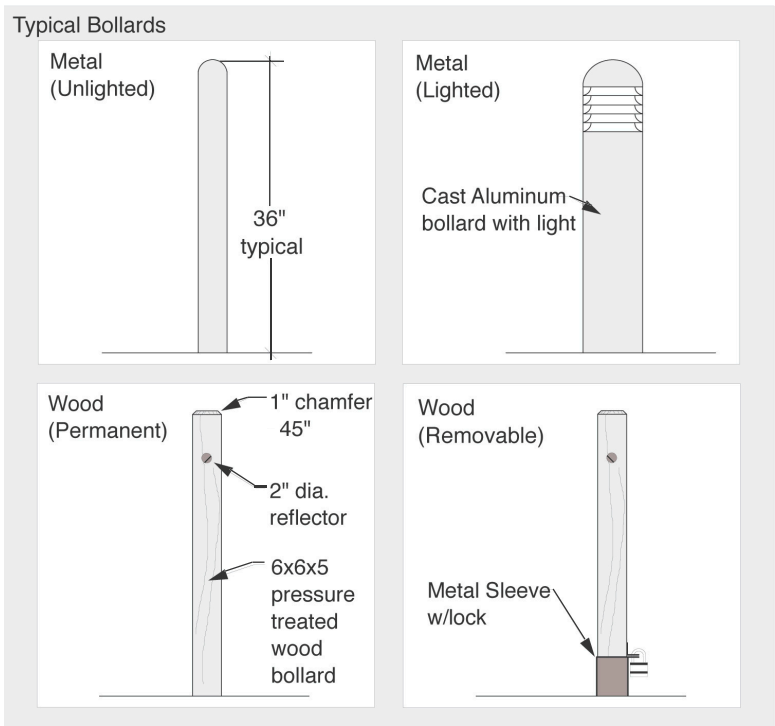


Typical Bench Detail



Bollards

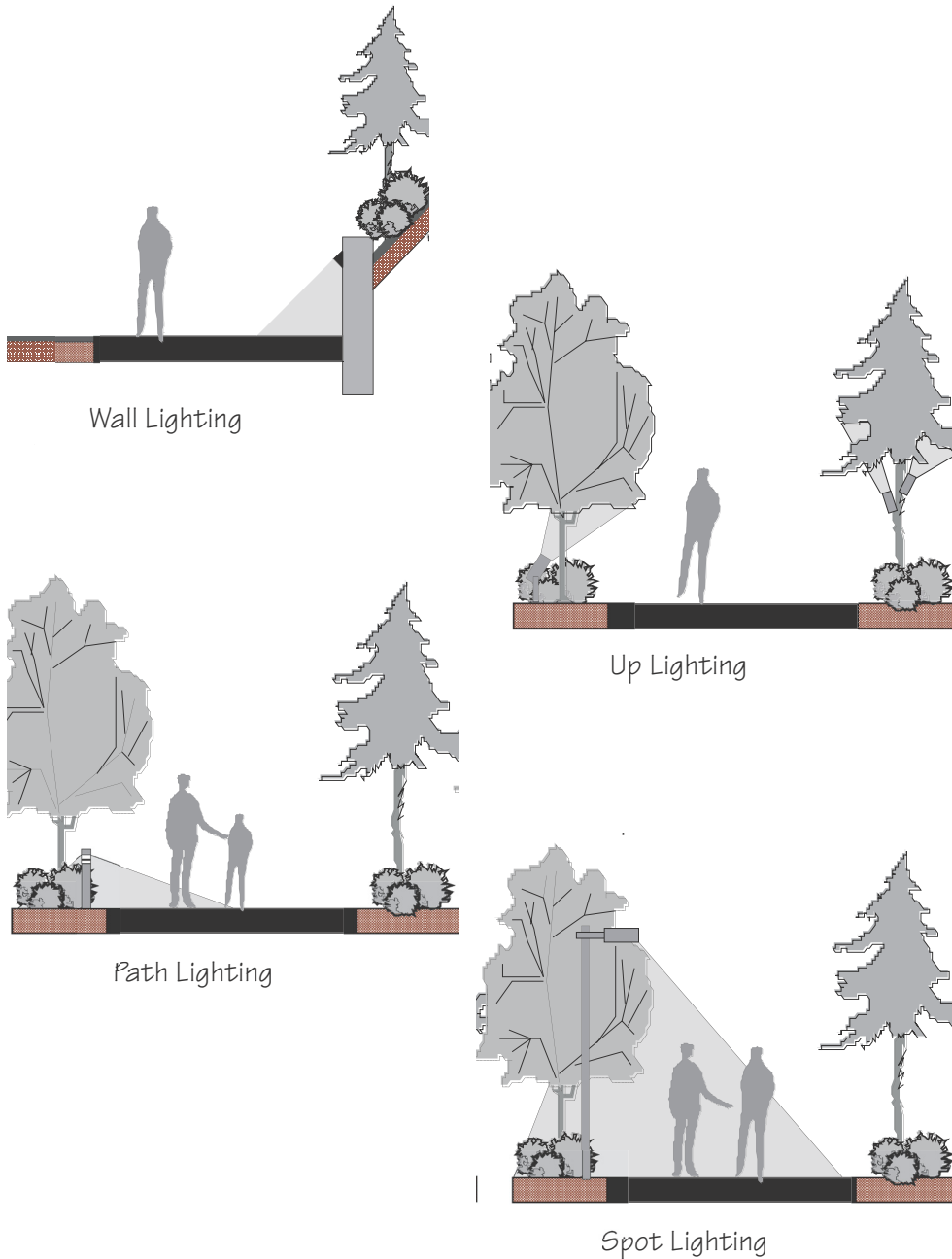
Bollards are intended to provide separation between vehicles and trail users. They are available in a variety of shapes, sizes, and colors and come with a variety of features. Lighted bollards are intended to provide visitors with minimum levels of safety and security along trails which are open after dark. Bollards should be chosen according to the specific needs of the site and should be similar in style to the surrounding elements. Typical construction materials for bollards include painted steel or aluminum, with halogen or metal halide lights in weather tight casings. Removable bollards can be installed to provide trail access for emergency and maintenance vehicles. The graphic below illustrates several typical bollard examples.



Typical Bollard Details

Trail Lighting

Particularly during winter months when trips to and from work are made in the dark, adequate lighting can make the difference in a person's choice to bicycle or walk. However, due to liability and security concerns, many off-road bicycle paths are closed at night, and therefore unlit. Lighting for multi-use trails should be considered on a case-by-case basis in areas where 24-hour activity is expected (such as college campuses or downtown areas), with full consideration of the maintenance commitment lighting requires.

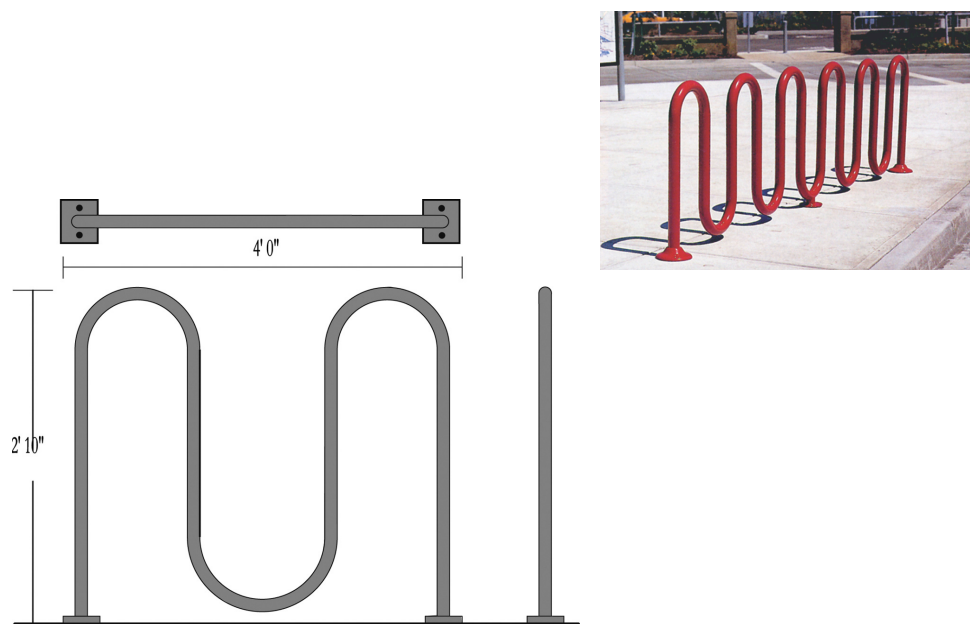


Various Lighting Types

Bike Rack

It is important to choose a bicycle rack design that is simple for cyclists to operate. Bicycle racks should be designed to allow use of a variety of lock types. It may be difficult initially to determine the number of bicycle parking spaces needed. Therefore, bike racks should be situated on-site so that more can be added if bicycle usage increases.

The design shown below has proven popular and effective in numerous communities. It is inexpensive to fabricate locally, easy to install, vandal resistant and works well with popular high-security locks. In addition, it can be installed as a single unit, on a sidewalk, or in quantity, at major recreation nodes.



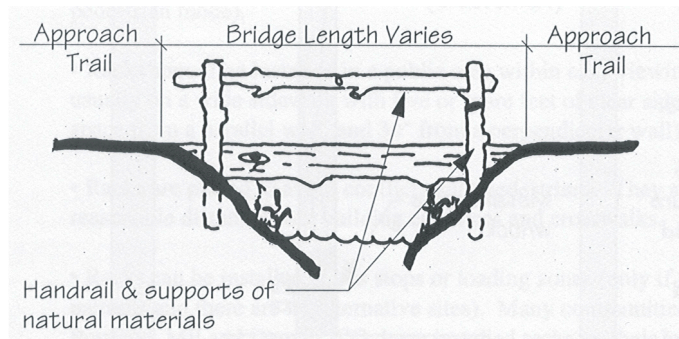
Typical Bike Rack

Location Criteria:

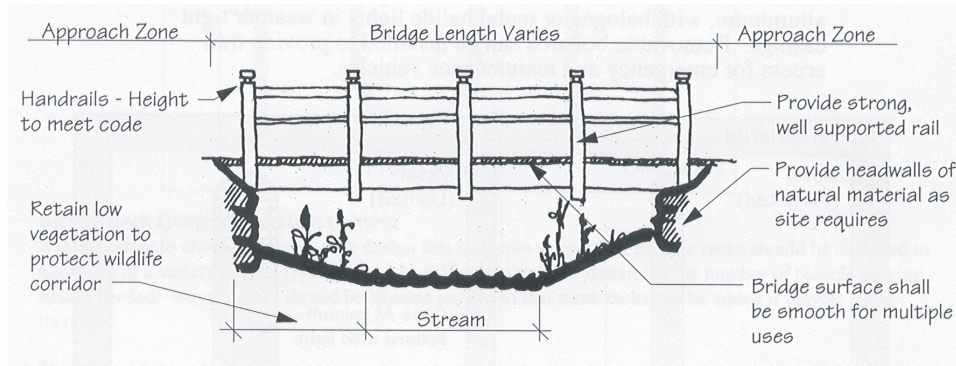
- Racks should be located within 50' of building entrances (where bicyclists would naturally transition into pedestrian mode).
- Racks should be installed in a public area within easy viewing distance from a main pedestrian walkway, usually on a wide sidewalk with five or more feet of clear sidewalk space remaining (a minimum of 24" clear space from a parallel wall and 30" from a perpendicular wall).
- Racks are placed to avoid conflicts with pedestrians. They are usually installed near the curb and at a reasonable distance from the building entrances and crosswalks.
- Racks can be installed at bus stops or at loading zones (only if they do not interfere with boarding or loading patterns and there are no alternatives). Bike racks on busses also facilitate bike-on-transit travel.

Bridges

Bridges are an important element of almost any trail project. The type and size of bridges can vary widely depending on the trail type and specific site requirements. Some bridges often used for multi-use trails include suspension bridges, prefabricated span bridges and simple log bridges. When determining a bridge design for multi-use trails, it is important to consider emergency and maintenance vehicle access. Bridges intended for occasional vehicular use must be designed to handle up to 10,000 pound loads safely and at least 14'-wide to allow for vehicle passage.



Foot Bridge



Urban Trail Bridge



Span Bridge

Note: Prefabricated span bridges are ordered directly from the manufacturer. Approximate cost is \$100/foot. For examples and quotes, see www.steadfastbridge.com.

On Road Facilities

Underpass

Trail underpasses and overpasses can be used to avoid undesirable at-grade intersections of trails and freeways or high volume arterial highways . Neither should be used frequently in suburban, fringe or rural areas. Underpasses typically utilize existing overhead roadway bridges adjacent to a stream or culverts under the roadway that are large enough to accommodate trail users. There are several key issues that must be addressed in the design of the roadway underpass:

1. The vertical clearance of the underpass must be at least 10 feet
2. The width of the underpass must be at least 12 feet
3. Proper drainage must be established to avoid pooling of stormwater inside the underpass
4. It is recommended that underpasses be lighted for safety

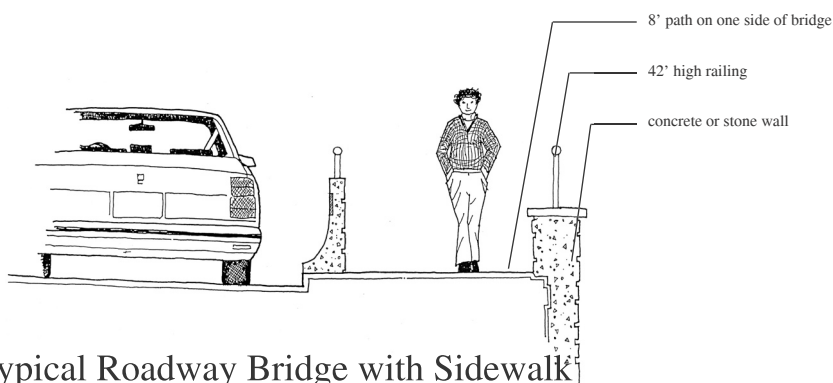


Roadway underpasses that utilize box culverts can sometimes be installed as part of a roadway improvement or construction project at a greatly reduced cost.

Overpass

Trail overpasses can be used in high traffic volume areas where underpasses are not possible. Overpass options include sidewalks on bridges, freestanding pedestrian/bike bridges or lanes attached to an existing bridge. AASHTO requires that bridges be a minimum of 36 inches, but prefers that they are at least as wide as the trail. Forty-two inch high railing is also required. A fenced cover, as shown below, provides a safer environment over highways and busy streets. The NCDOT should be referenced for height requirements, which vary depending on the type of road. ADA should also be referenced for ramp requirements.

It is important to remember that pedestrians and cyclists will opt not to use an overpass or an underpass if it takes more than twice the time as crossing the street at-grade. For this reason, at-grade fencing should be considered in some instances



Typical Roadway Bridge with Sidewalk

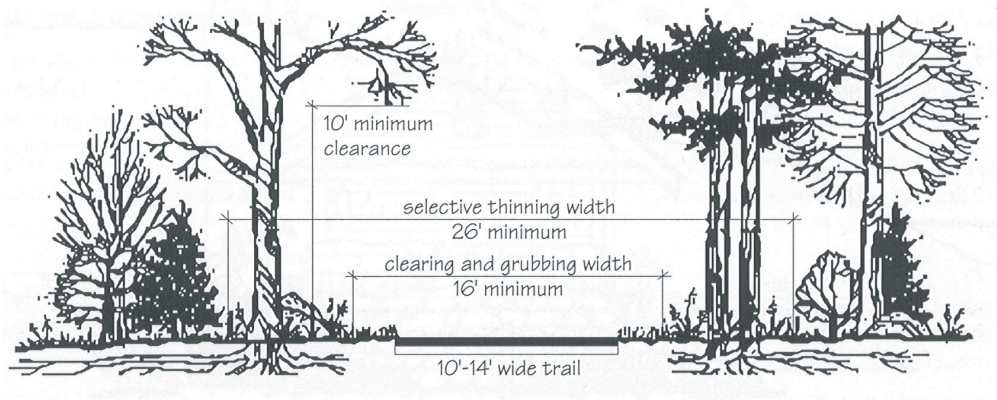


Miscellaneous Trail Details

Vegetative Clearing

Vegetative clearing refers to the amount of vegetation removal that is required for various levels of trail development. The amount of vegetative clearing required for any one trail will depend on the type of trail being developed. While footpaths or hiking trails require little or no vegetation removal, paved pathways may require significantly more.

Single-tread, multi-use trails are the most common trail type in the nation. These trails vary in width, can accommodate a wide variety of users and are especially popular in urban areas. While the vegetative clearing needed for these trails varies with the width of the trail, the graphic below outlines typical requirements.

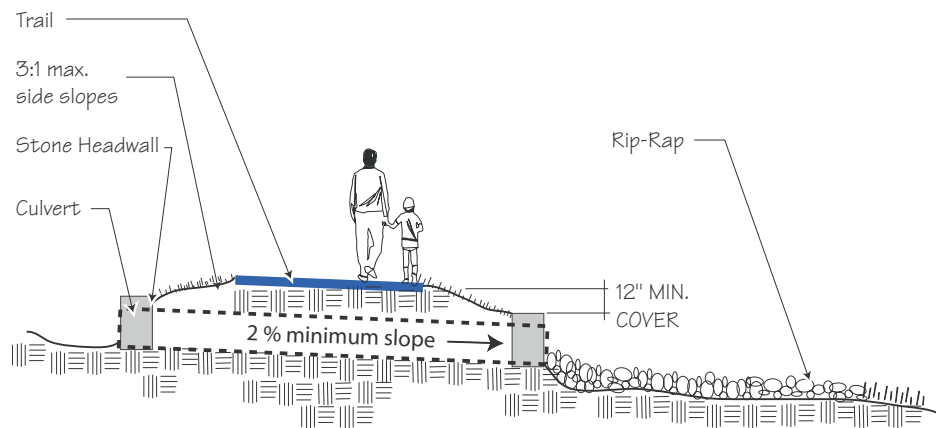


Typical Tree Trimming Distances

Clearing and grubbing consists of tree, shrub and stump removal. The minimum width for clearing and grubbing of a 14'-wide trail is 16 feet (2'-wide shoulders). Selective thinning includes removal of underbrush and limbs to create open pockets within a forest canopy. Selective thinning increases sight lines and distances and enhances the safety of the trail user. Selective thinning does not include the removal of the forest canopy.

Trail Culvert

Proper installation of trail culverts is important to ensure proper stormwater runoff drainage, trail user safety and longevity of the trail surface. Pipe length, diameter and material specifications will vary depending on specific site needs. Two materials typically used for trail culverts are reinforced concrete pipe (typically required when the trail is within NCDOT Right of Way), and High Density Polyethylene (HDPE) recycled plastic pipe. Plastic pipes are typically less expensive on a per foot basis. Outlet protection varies per site needs and in some cases a flow spreader may be required at the outlet location. Rock check dams can be placed after the outlet to slow and filter drainage. The graphic below outlines proper installation parameters for greenway trail culverts.

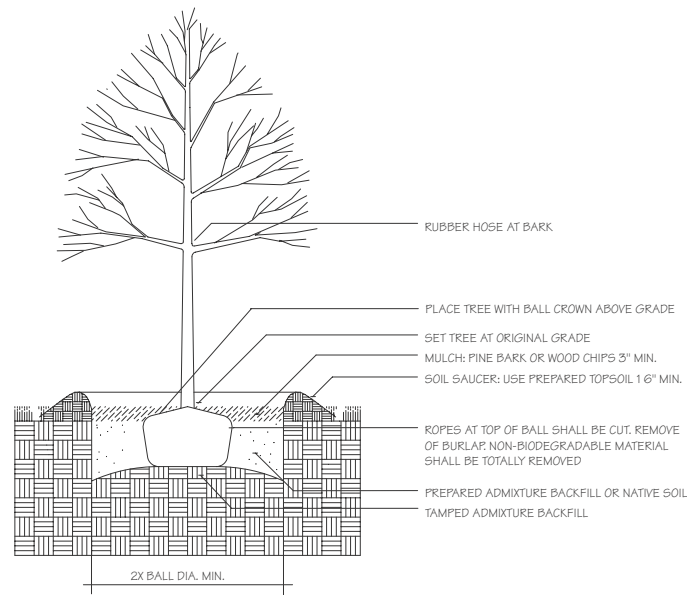


Culvert Placement Cross Section

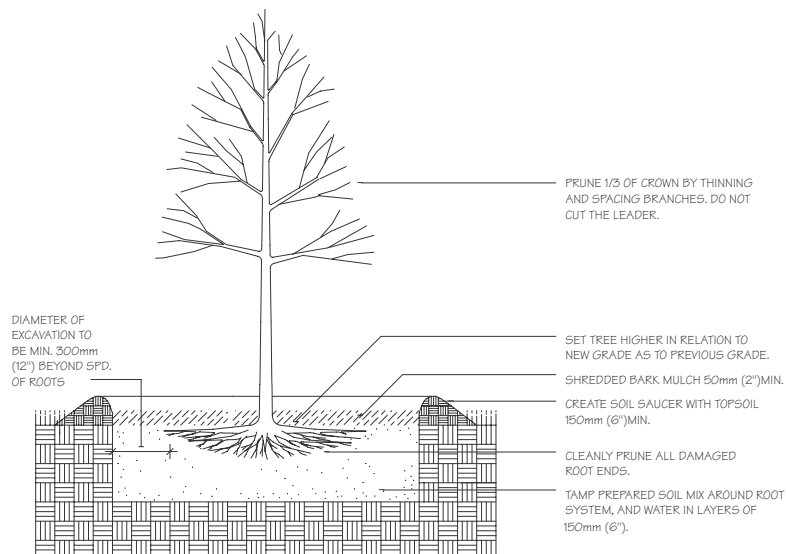
Planting Details

Tree Plantings

Trees are important to greenways and trails for both aesthetic and environmental reasons. Not only do they contribute to the appearance of a trail, their shade cools the environment for trail users and provides habitat for birds and wildlife. Trees also help keep streams healthy by providing shade (which regulates the temperature), filtering pollutants in storm runoff and adding leaf litter to feed small insects and fish. When choosing trees and shrubs for greenway corridors, it is recommended that indigenous and well-adapted species be used. This will reduce the need for chemical and water applications as a part of long term maintenance. The following graphics represent common installation practices used for several different types of plant material.



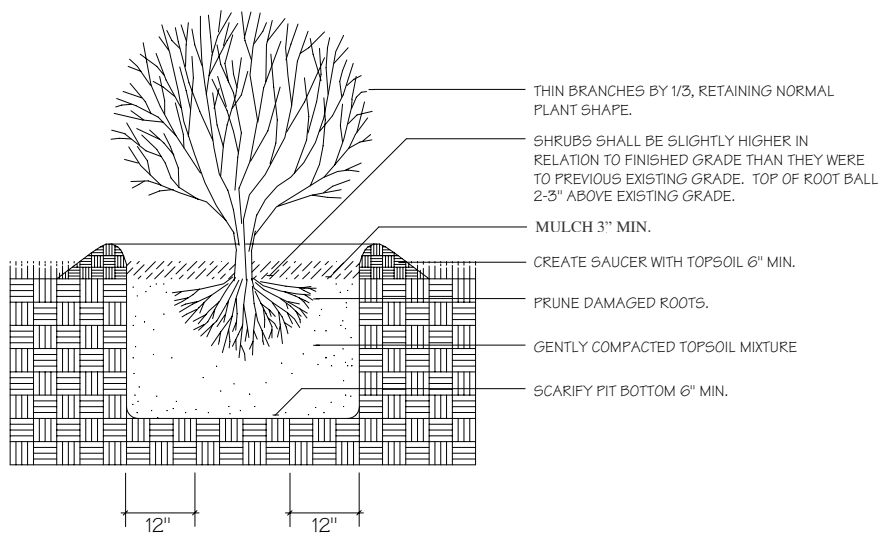
Ball and Burlap Tree Planting Detail



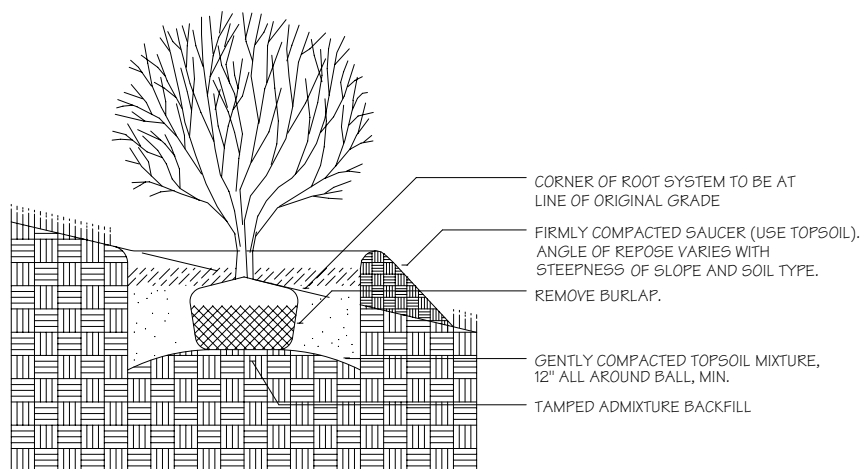
Bare Root Tree Planting Detail

Shrub Plantings

The amount of planting needed will vary depending on the project. While some projects will require little or no planting, other projects may require it for vegetative screening, habitat restoration, erosion control or aesthetics. The graphics below illustrate planting techniques for two types of shrub material (ball & burlap and bare root) which can be used.



Shrub Planting Detail



Ball and Burlap Shrub Planting Detail

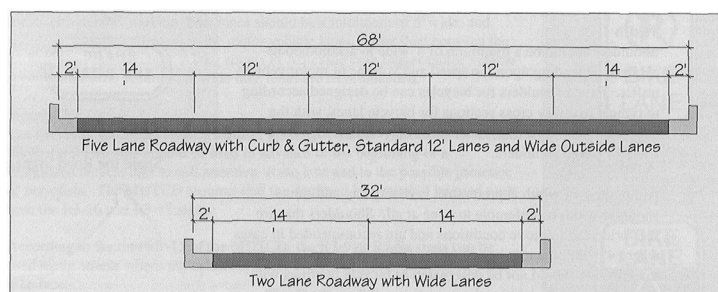
Bike Considerations

Bike Considerations - Wide Curb Lanes

There are three types of on-road bicycle facilities: wide curb lanes, bike lanes and paved shoulders. Wide curb lanes, or outside lanes, are wider than the standard 12' travel lane and can provide more space for cyclists and easier passing for motorists. Under most conditions, automobiles and bicycles can coexist in a 14' wide curb lane, without the need for the motorist to move into the next adjacent lane.

Location and Width

Wide curb lanes best accommodate advanced cyclists, as these riders are more comfortable operating directly in traffic. The wide curb lane is always the furthest right-hand lane, and should optimally be 14'-16' wide, not including the gutter pan (curb lanes that are wider than 16' are not recommended). Wide curb lanes are not required to have curb and gutter. In order to achieve the extra space needed for a 14' wide outside lane, the roadway may either be physically widened or restriped to reduce the lane width of inner lanes and increase the width of outer lanes. Restriping proposals should be reviewed by a transportation engineer to ensure adequate safety for the motorists as well as bicyclists.



Signage

There is no special “wide curb lane” sign, however, on high volume urban arterials, the designer may choose to install “Share the Road” warning signs (standard bicycle warning plate with a subplate stating SHARE THE ROAD).

Intersection Design

When the curb lanes approach intersections with turning lanes, the 14' wide lane should continue through the intersection as the outside through-lane.

Design Issues

Acceptance: Bicycle programs in numerous communities have found that less experienced bicyclists seldom see a difference when wide curb lanes are provided. Therefore, if the desired outcome is greater numbers of bicyclists or a visible “pro bicycle” statement, this option will not satisfy the need.

Traffic: Wider curb travel lanes may tend to increase motorist speeds. Whether a marginal increase in speeds is important in a particular situation should be a subject for analysis.

Bike Considerations - Bike Lanes

Bicycle lanes in Wendell and Zebulon should conform to the standards in AAS-HTO's Guide for the Development of Bicycle Facilities (2000). Bicycle lanes are an on-road type of facility. They should not be separated from other motor vehicle lanes by curbs, parking lanes, or other obstructions. General standards for width, striping, and intersections are provided below.

Location and Use

Bicycle lanes serve the needs of experienced and inexperienced bicyclists in urban and suburban areas, providing them with their own travel lane. Bicycle lanes are always located on both sides of the road (except when they are constructed on one-way streets). By this design, cyclists are encouraged to follow the rules of the road, which require them to travel in the same direction as adjacent motor vehicle traffic.

Width

The minimum width of bike lanes should be 4', exclusive of the gutter pan. On roads with parallel parking, bike lanes should be a minimum of 5' wide, and should be installed adjacent to the motor vehicle lanes, rather than between the parking lane and the curb. Along streets in Wendell and Zebulon with higher motor vehicle speeds and traffic volumes, 6' wide bike lanes are recommended.

Signage

The MUTCD specifies standard signage for bicycle lanes. According to section 9B-8, the R3-16 sign should be used in advance of the beginning of a designated bicycle lane to call attention to the lane and to the possible presence of bicyclists. The MUTCD requires that the diamond lane symbol be used with both the R3-16 and R3-17 signs. (See page xx for signage examples.)

According to Section 9B-11 of the MUTCD, the R7-9 or R7-9a signs can be used along streets where motorists are likely to park or frequently pull into the bike lane.

Striping

Bicycle lane stripes should be solid, 6"-wide white lines. Care should be taken to use pavement striping that is skid resistant. Bicycle-shaped pavement symbols and directional arrows should be placed in the bicycle lane to clarify its use. pavement letters that spell "ONLY BIKE" are also highly recommended. Symbols should be installed at regular intervals, immediately after intersections, and at areas where bicycle lanes begin.

Bike lane striping at intersections is challenging. Traffic has a tendency to mix at intersections: motorists who are turning right must cross paths with cyclists who wish to continue straight, and cyclists who wish to turn left must cross into left-hand turn lanes. Several intersection striping patterns are provided by AAS-HTO's Guide for the Development of Bicycle Facilities (2000) and the MUTCD.

Bike Route

A bicycle route is a “suggested way” for a cyclist to get from a point of origin to a destination. Bike routes do not necessarily require physical improvements in order to accommodate bicyclists, given that they meet minimum safety criteria in their present condition (see below). Bike routes can be preferable for a number of reasons including directness, scenery, less congestion and lower speed limits.

Location and Use

Bicycle routes may be used by all types of cyclists. In urban areas bike routes are most often designated on residential streets with low traffic volumes, and are typically used to direct cyclists to a destination within the community, or to provide a through-route for bicyclists. In rural areas, bike routes are most often designated on roadways that are popular touring routes for recreational cyclists, or long-distance commuting routes for advanced cyclists.

Safety Criteria

A street does not necessary have to be physically widened in order to be designated as a bicycle route. A road with standard 12' wide lanes can be designated as a bike route with the appropriate signage, given that each condition below is met:

- In its present state (or with planned improvements), the roadway sufficiently accommodates cyclists. The evaluation should take into account roadway width and traffic volumes. Candidate bike routes should have good sight distances and adequate pavement conditions. In addition, traffic should not regularly exceed posted speed limits.
- All bicycle hazards have been removed from the roadway or otherwise remedied, including unsafe drainage grates and angled railroad crossings.
- The bicycle route is designated as one segment within an interconnected system of bicycle facilities.

Bicycle route signage should be used according to the standards in the MUTCD, which provides several choices in styles. Bicycle route signs should be placed at all areas where new traffic enters the roadway. The distance between signs should not be greater than two miles. In urban areas, it is helpful to include directional arrows and captions that indicate nearby destinations, particularly at intersections.

Bike Pavement

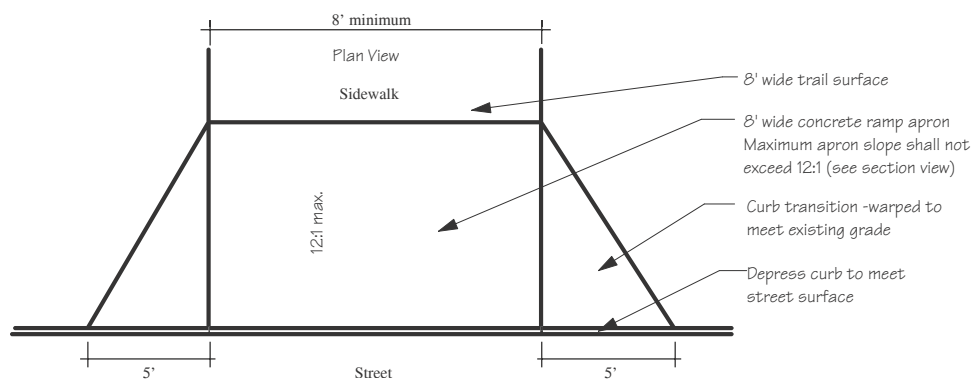
Bike lane pavement and sub-base should always have the same depth and quality as the adjacent roadway. Bike lanes are not required to have a curb and gutter.

Every effort should be made to provide a smooth and even surface for bicycles, particularly for designated bicycle routes and lanes. Bicycles are much more vulnerable to surface irregularities than motor vehicles, because they rely on very narrow, highly pressurized wheel with no suspension. A simple pothole that might cause a slight jarring to the passengers of a car can cause a serious crash for a cyclist.

Potholes aren't the only surface hazard for cyclist. Bumps, corrugations, seams, rumble strips, unraveled pavement and bridge expansion joints can cause bicyclists to lose their balance. In addition, temporary roadway construction zones often include surface hazards such as milled pavements and sudden pavement changes. Temporary signage can be used to warn bicyclist of upcoming irregularities.

When paved shoulders or bicycle lanes are added to the edge of the existing roadway, a resulting seam between the two can be hazardous to bicyclists. One solution is to install 10' wide strips of asphalt, partially overlapping the existing motor vehicles lanes.

Pavement with large aggregates can also put additional stress on the mechanical parts of road bikes, especially for distance riders. Smooth pavement is preferred to avoid accidents due to the loss and/or looseness of bike parts.

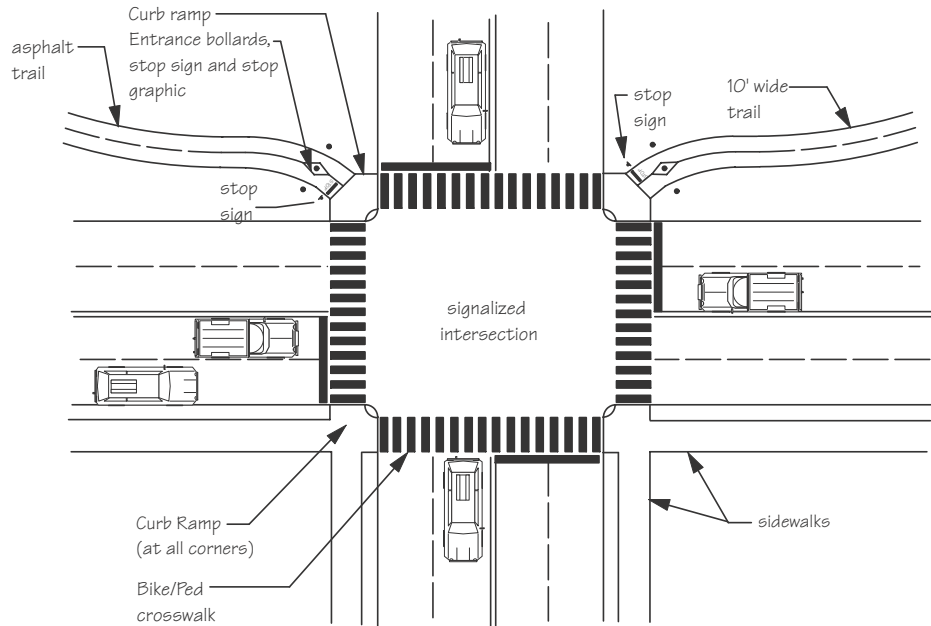


Bike Curb Ramp Plan View

Bike Intersections

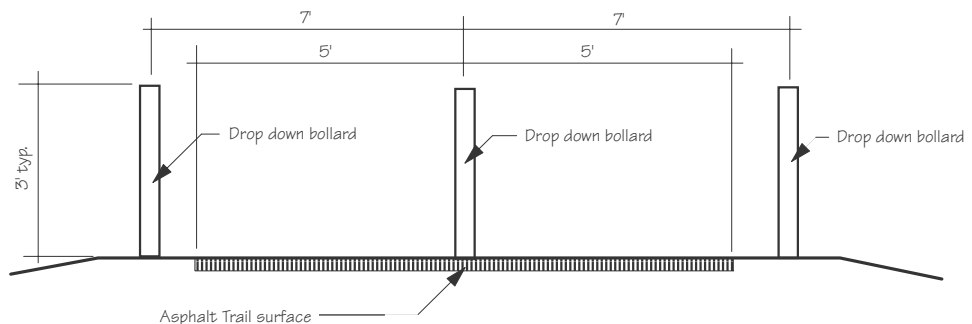
Trail/Roadway intersections can become dangerous conflict areas if not carefully designed. For at-grade intersections, there are usually several design objectives:

1. Site the crossing area at a logical and visible location.
2. Warn motorists of the upcoming crossing.
3. Maintain visibility between trail users and motorists.
4. Inform trail users of the upcoming intersection.



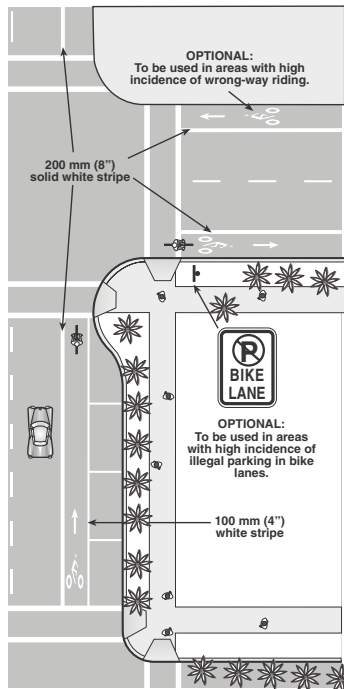
Typical Signalized Intersection Plan View

Intersections and approaches should be on relatively flat grades. In particular, the bicyclist should not be required to stop at the bottom of the hill. If the intersection is more than 75 feet from the curb to curb, it is preferable to provide a center median refuge area, per ADA (Americans with Disabilities Act) or ANSI (American National Standards Institute) standards. If crossing traffic is expected to be heavy, it may be necessary to provide a traffic signal that responds to bicycles and/or can be pedestrian activated.

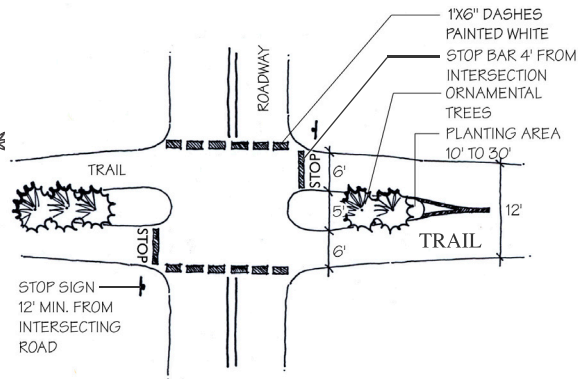


Typical Bollard Placement

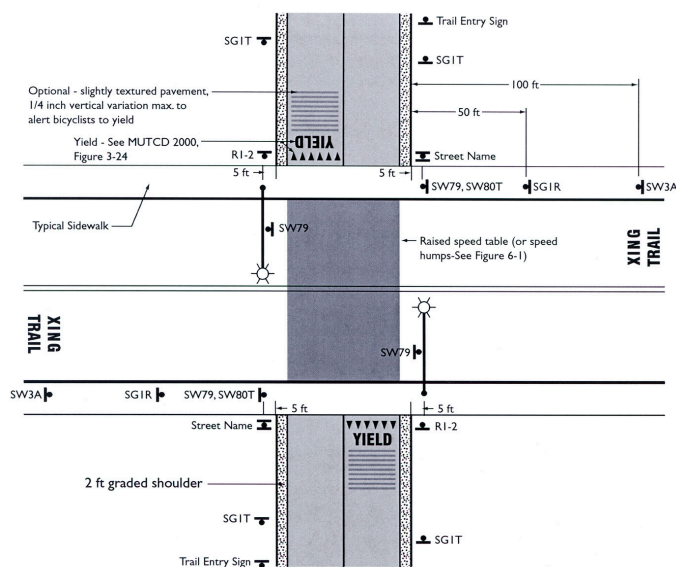
Bike Intersections



Typical Intersection Signage Layout Plan View



Typical Perpendicular Trail and Road Intersection



Typical Trail Crossing at Local Street (from Contra Costa County Trail Design Guidelines)

Sidewalk Considerations

Sidewalk Considerations

Sidewalks are a critical component of this Open Space and Greenways Plan. They not only encourage walking, but they also improve the safety of pedestrians. An individual's decision to walk is as much a factor of convenience as it is the perceived quality of the experience. Pedestrian facilities should be designed with the following factors in mind:

Sufficient width

Sidewalks should accommodate anticipated volumes based on adjacent land uses, and should at a minimum allow for two adults to walk abreast (min. 5 feet, prefer 6 feet).

Protection from traffic

High volume and/or high speed (greater than 35 mph) motor vehicle traffic creates dangerous and uncomfortable conditions for pedestrians. Physical (and perceptual) separation can be achieved through a combination of methods: a grassy planting strip with trees, a raised planter, bicycle lanes, on-street parallel parking, etc.

Street trees

Street trees are an essential element in a high quality pedestrian environment. Not only do they provide shade, they also give a sense of enclosure to the sidewalk environment which enhances the pedestrian's sense of a protected environment.

Pedestrian-scaled design

Large highway-scale signage reinforces the general notion that pedestrians are out of place. Signage should be designed to be seen by the pedestrian. Street lighting should likewise be scaled to the level of the pedestrian (14 feet tall), rather than providing light poles that are more appropriate on high-speed freeways.

Continuity

Pedestrian facilities are often discontinuous, particularly when private developers are not encouraged to link on-site pedestrian facilities to adjacent developments and nearby sidewalks or street corners. New development should be designed to encourage pedestrian access from nearby streets. Existing gaps in the system should be placed on a prioritized list for new sidewalk construction.

Clearances

Vertical clearance above sidewalks for landscaping, trees, signs and similar obstructions should be at least 10 feet. In commercial areas and the downtown, the vertical clearance for awnings should be 10 feet. The vertical clearance for building overhangs which cover the majority of the sidewalk should be 12 feet.

Conformance with national standards

Sidewalk design should be consistent with Americans with Disabilities Act requirements and/or ANSI requirements. Specific guidance is provided by the Architectural and Transportation Barriers Compliance Board's American's with Disabilities Act Accessibility Guidelines.

Sidewalk Obstacles

Street furniture and utility poles create obstacles to pedestrian travel when located directly on the sidewalk. At a minimum, there should be 36 inches of sidewalk width to allow wheelchairs to pass. Where possible, utilities should be relocated so as not to block the sidewalk. Benches should not be sited directly on the sidewalk, but set back at least 3 feet. The design of new intersections or re-design of existing intersections presents an opportunity to improve pedestrian circulation. Street furniture located near intersections can block sight lines. In general, the designer should consider the impact on sight distance for all features located in the vicinity of roadway intersections.

Sidewalk pavement design

Sidewalks and roadside pathways should be constructed of a solid, debris-free surface. Regardless of the type of surface chosen, it must be designed to withstand adequate load requirements. Pavement depth should reflect site specific soil conditions but never be less than 4.5 inches. Brick and concrete pavers are popular materials for more decorative sidewalks. The use of stylized surfaces is encouraged, however they must be installed properly or they will deteriorate more rapidly.

Sidewalk width and setback guidelines

It is important to note that there are some areas that warrant wider sidewalks . For example, sidewalks in and around local universities and colleges must accommodate a much higher volume of pedestrians and, therefore, warrant additional width. The recommendations below are based upon standards used by other pedestrian-friendly communities in the U.S. Following the recommendations below ensures that basic needs of pedestrians are addressed in developing areas. In existing residential and commercial areas that lack sidewalks, new sidewalk construction (independent of new development) should occur first in locations that demonstrate the most need.

Sidewalks on local streets in residential areas:

Five-foot wide sidewalks are recommended on at least one side of the street, with a 5 foot wide planting strip. The planting strip may need to be slightly wider to accommodate the roots of street trees, if they are included in the design. Sidewalks are not necessary on cul-de-sacs that are less than 500 feet in length.

Sidewalks on collector streets in residential and commercial areas:

Five-foot wide sidewalks are recommended on both sides of the street. However, one option may be to install a 6 foot wide sidewalk on the side

of the street that generates the most activity. A 7 foot wide planting strip is recommended.

Sidewalks on arterial streets in residential and commercial areas:

Six foot sidewalks are recommended on both sides of the street, with an 8' wide planting strip.

Sidewalks on streets within 2000' of schools:

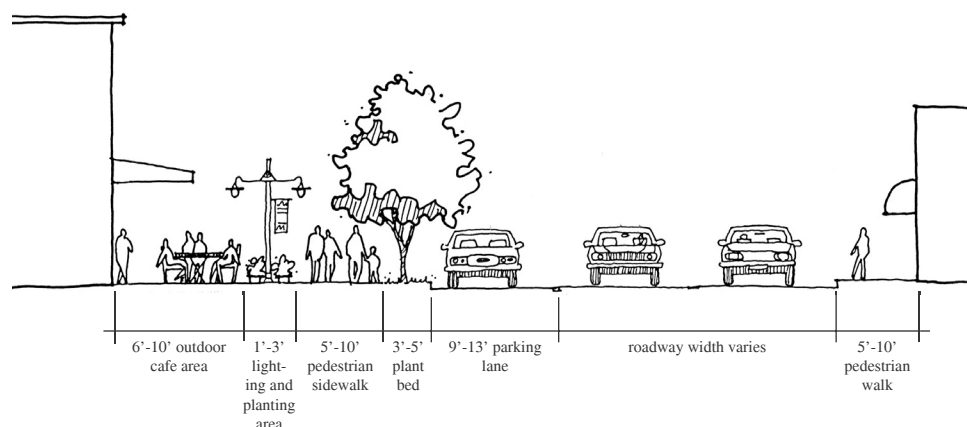
Width and setback should be based on the specific roadway type as described above. For all roadway types, however, sidewalks should be installed on both sides of the road, and should include well-marked crosswalks and school crossing signs.

Sidewalks on streets with no curb and gutter

Sidewalks located immediately adjacent to "ribbon pavement" (pavement with no curb and gutter) are not recommended. However, if no other solution is possible, sidewalks adjacent to ribbon pavement have a much greater setback requirement, depending on roadway conditions. Engineers should consult the AASHTO Policy on Geometric Design of Highways and Streets for more specific guidelines.

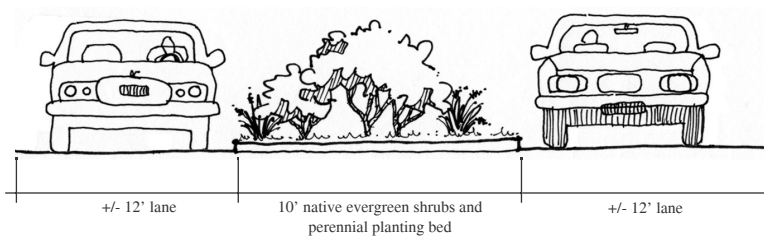
Sidewalks in rural areas

In most rural areas, the low volume of pedestrians does not warrant sidewalk construction. In most cases, 4'-6' wide paved shoulders can provide an adequate area for pedestrians to walk on rural roadways, while also serving the needs of bicyclists. Exceptions should be made in areas where isolated developments such as schools, ballparks or housing communities create more pedestrian use. For example, motorists might regularly park along a rural road to access a nearby ballpark. A sidewalk may be warranted in this circumstance so that the pedestrians can walk separately from traffic. Sidewalks in rural areas should be provided at a width based on anticipated or real volume of pedestrians, with 5' being the minimum width.

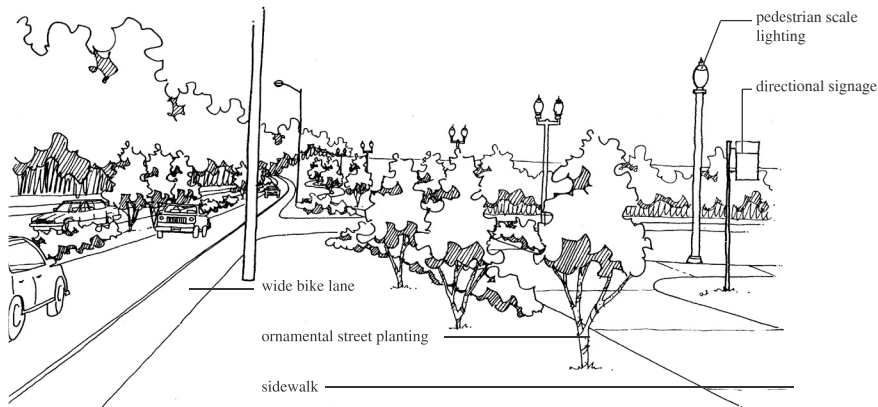


Typical Street Section

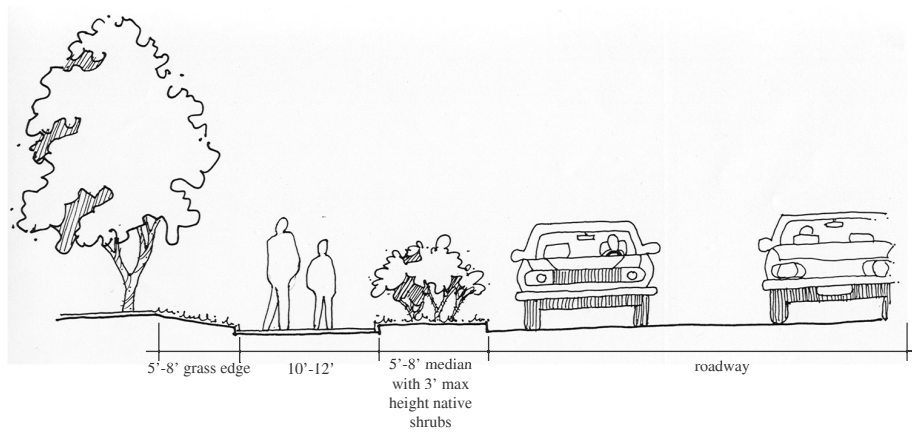
Roadside Treatments



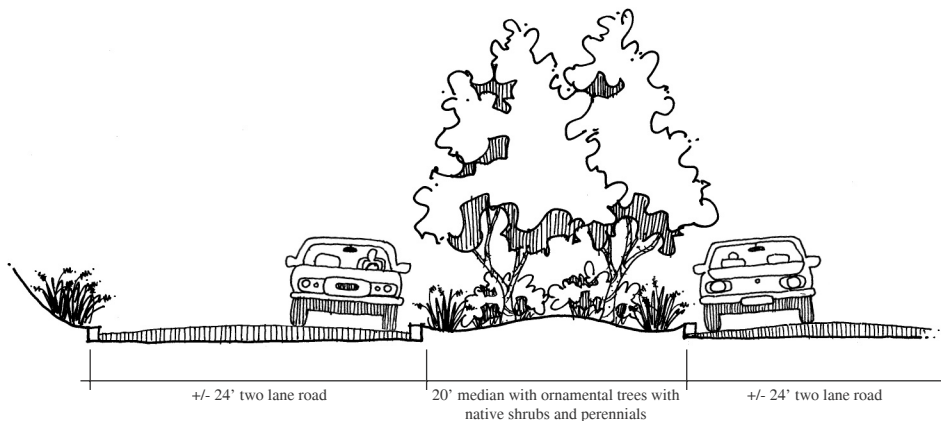
Typical Median Shrub Planting



Typical Scenic Road Corridor



Typical Road with Adjacent Sidewalk



Typical Median Planting

Roadside Treatments

Appendix C: Estimated Costs

Cost Estimates

Costs are based on greenway trail development. Costs associated with parcel acquisition through easements and/or parks are not part of this document. Those costs are based on individual case-by-case basis and should be determined as parcels are targeted or become available. Itemized below are some rough cost estimates that could be associated with trail development for the Wendell and Zebulon greenway system. These costs are divided into major elements of the project. These prices are based on North Carolina greenway averages for similar projects currently in operation throughout the state and assume that the Town will employ professional contractors appropriate to build the project. Greenways Incorporated offers these estimates as a guide to future decision making and cannot guarantee their accuracy.

Because the greenways can be built using a variety of different trail widths, materials, and surfaces, the costs for installation can vary widely. Volunteer labor and donations of materials can help to significantly lower the price of trail installation. A representative sample of costs (in 2002 dollars) associated with trail types follows.

Greenways with No Facility Development (Type 1):

<u>Vegetation</u>	<u>Unit cost</u>
Trees (3" caliper)	\$350 each
Shrubs (3 gallon)	\$25 each

*Costs include plant and installation.

Streambank Stabilization (Bioengineering)

Typical	\$25 - 75 / lin. foot
Average	\$45 - 60 / lin. foot

Greenways with Limited Facility Development (Type 2):

<u>Trail Treads</u>	<u>Unit cost</u>
4-foot Bare Earth Hiking/Mtn. Bike Trail	\$2 / lin. foot
10-foot Wood Deck/Boardwalk Trail	\$150 / lin. foot

*Costs include site preparation, clearing, grading, and mobilization.

Signage (varies on length of continuous trail segment)

Information Signs	\$250 each
Direction Signs	\$250 each

Warning Signs	\$250 each
Mile Markers	\$50 each

Greenways with Multi-Use Unpaved Trail Facility Development (Type 3):

<u>Trail Treads</u>	<u>Unit cost</u>
10-foot Aggregate/Stone Trail	\$12 / lin. foot
10-foot Wood Deck/Boardwalk Trail	\$150 / lin. foot

Signage (varies on length of continuous trail segment)

Information Signs	\$250each
Direction Signs	\$250each
Warning Signs	\$250each
Mile Markers	\$50each

Furniture/Furnishings (varies on length of continuous trail segment)

Benches	\$600 each
Trash Receptacles	\$200 each
Security Bollards	\$250 each
Bicycle Racks	\$550 each
Fencing (Board-on-Board)	\$20 / lin. foot
Gates	\$750 each
911 Emergency Phones (w/ infrastructure)	\$800 each
911 Emergency Phones (w/o infrastructure)	\$3,500 each
Pre-fabricated Steel Bridges	\$1,000 / lin. foot

Greenways with Multi-Use Paved Trail Facility Development (Type 4):

<u>Trail Treads</u>	<u>Unit cost</u>
10-foot Asphalt Multi-Purpose Trail	\$50 / lin. foot
10-foot Concrete Multi-Purpose Trail	\$75 / lin. foot
10-foot Wood Deck/Boardwalk Trail	\$150 / lin. foot

Signage (varies on length of continuous trail segment)

Information Signs	\$250 each
Direction Signs	\$250 each
Warning Signs	\$250 each
Mile Markers	\$50 each

Furniture/Furnishings (varies on length of continuous trail segment)

Benches	\$600 each
Trash Receptacles	\$200 each
Security Bollards	\$250 each
Bicycle Racks	\$550 each
Fencing (Board-on-Board)	\$20 / lin. foot
Gates	\$750 each
911 Emergency Phones (w/ infrastructure)	\$800 each
911 Emergency Phones (w/o infrastructure)	\$3,500 each
Pre-fabricated Steel Bridges (w/o footings)	\$ 1,000 / lin. foot

The following estimate for developing the Wendell and Zebulon Greenway trail

system has been prepared based on the itemized costs above.

On-road trail construction estimates consist of establishing sidewalks in the Wendell and Zebulon business districts and as connectors between off-road trails and existing sidewalk systems.

Phase I - IX (as delineated on the Wendell and Zebulon Open Space and Greenways Map) trails are estimated to take 2-10 years to complete. These include nine corridors that will make up the greenway system as delineated in the Master Plan. The Totals for the complete system are approximately 38.6 miles of off-road trail, and 11.7 miles of on-road trail/bike routes. It is estimated that one half to two-thirds of the off-road trail will require an asphalt or concrete surface.

• Paved asphalt trail (203,762 linear ft. @ \$50.00 per /ft.)	\$10,188,100
• On-road trail (61,909 linear ft. @ \$25.00 per /ft.)	\$1,547,725
• Signage allowance (1 sign per 1,000 linear ft. @ \$250 each)	\$66,417
• Furniture allowance (\$2,000 per mile of trail off-road only)	\$77,200
• Design fees and Construction Documentation (@ 15% of Total Cost)	<u>\$1,781,916</u>
• Total Cost	\$13,661,358

The following maintenance costs are provided as a guide to establishing a budget for the operation, maintenance and management of each trail segment within the greenway system. These costs are derived from national industry averages and have not been adjusted to reflect unique labor, material and cost issues specific to Wendell and Zebulon.

It may be possible to lower the cost of maintaining one mile of paved trail through the development of an Adopt-a-Greenway Program. Volunteers have been proven effective in performing some of the routine maintenance activities that are listed below. Savings of 50% of the estimated cost per mile defined below are possible through a coordinated and well-run Adopt-a-Greenway Program, and some of these costs are already being covered along highways, roads and parks and other areas.

Typical Maintenance Costs (for a 1-mile paved trail)

Drainage and storm channel maintenance (4 x / year)	\$500
Sweeping/blowing debris off trail tread (20 x / year)	\$1,200
Pick-up and removal of trash (20 x./ year)	\$1,200
Weed control and vegetation management (10 x / year)	\$1,000
Mowing of 3-ft grass safe zone along trail (20 x / year)	\$1,200
Minor repairs to trail furniture / safety features	\$500
Maintenance supplies for work crews	\$300
Equipment fuel and repairs	<u>\$600</u>
Total Maintenance Costs per Mile of Paved Trail	\$6,500

Re-surfacing of paved trail tread (20-year cycle)	\$50 / lin. foot
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Appendix D: Funding Sources

Some Federal programs offer financial aid for projects that aim to improve community infrastructure, transportation, housing and recreation. Some of the Federal programs that could be used to support the development of Wendell & Zebulon open space and greenways include:

The Intermodal Surface Transportation Efficiency Act (ISTEA)

The primary source of federal funding for greenways is through the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). This money is targeted at greenway projects that serve a transportation purpose, and is administered through the state Department of Transportation. All funded projects must meet certain design standards set forth by the state, which may add to the cost of the project. Therefore, this funding source should be investigated carefully before an application is completed. There are many sections of the Act that support the development of bicycle and pedestrian transportation corridors. Those sections that may be of particular interest to Wendell & Zebulon include:

•Section 1302: Symms National Recreational Trails Fund Act (NRTFA)

A component of ISTEA, the NRTFA is a funding source that assists with the development of non-motorized and motorized trails. The Act uses Highway Trust Fund fees from non-highway recreation fuel used by off-road vehicles and camping equipment. States can grant funds to private and public sector organizations. NRTFA projects are 80 percent federally funded, grant recipients must provide a 20 percent match. Projects funded must be consistent with the State-wide Comprehensive Outdoor Recreation Plan.

Surface Transportation Program (STP) Funds

These funds can be used for bicycle and pedestrian facility construction or non-construction projects such as brochures, public service announcements, and route maps related to bicycle safety. The projects must involve bicycle and pedestrian transportation and must be part of the Long Range Transportation Plan.

•STP Transportation Enhancements Program

Ten percent of North Carolina's annual STP funds are available for transportation enhancements, which include projects such as scenic byways, historic transportation preservation, landscaping and the development of bicycle and pedestrian facilities. These funds are available to all cities and counties in the state. There are several key requirements that projects must meet in order to receive these funds. Contact the State Bicycle and Pedestrian Coordinator for more information.

Federal Government Funding Sources

Community Development Block Grant Program

The U.S. Department of Housing and Urban Development (HUD) offers financial grants to communities for neighborhood revitalization, economic development, and improvements to community facilities and services, especially in low and moderate-income areas. Several communities have used HUD funds to develop greenways, including the Boscobel Heights' "Safe Walk" Greenway in Nashville, TN.

Land and Water Conservation Fund (LWCF) Grants

This Federal funding source was established in 1965 to provide "close-to-home" parks and recreation opportunities to residents throughout the United States. Money for the fund comes from the sale or lease of nonrenewable resources, primarily federal offshore oil and gas leases along with surplus federal land sales. LWCF grants can be used by communities to build a variety of park and recreation facilities, including trails and greenways.

LWCF funds are distributed by the National Park Service to the states annually. Communities must match LWCF grants with 50 percent of the local project costs through in-kind services or cash. All projects funded by LWCF grants must be used exclusively for recreation purposes, in perpetuity.

Watershed Protection and Flood Prevention (Small Watersheds) Grants

The USDA Natural Resource Conservation Service (NRCS) provides funding to state and local agencies or nonprofit organizations authorized to carry out, maintain and operate watershed improvements involving less than 250,000 acres. The NRCS provides financial and technical assistance to eligible projects to improve watershed protection, flood prevention, sedimentation control, public water-based fish and wildlife enhancements and recreation planning. The NRCS requires a 50 percent local match for public recreation, and fish and wildlife projects.

Urban and Community Forestry Assistance Program

The USDA provides small grants of up to \$10,000 to communities for the purchase of trees to plant along city streets, greenways and parks. To qualify for this program, a community must pledge to develop a street-tree inventory; a municipal tree ordinance; a tree commission, committee or department; and an urban forestry-management plan.

Small Business Tree Planting Program

The Small Business Administration provides small grants of up to \$10,000 to purchase trees for planting along streets and within parks or greenways. Grants are used to develop contracts with local businesses for the planting.

Design Arts Program

The National Endowment for the Arts provides grants to states and local agencies, individuals and nonprofit organizations for projects that incorporate urban design, historic preservation, planning, architecture, landscape architecture and other community improvement activities, including greenway development. Grants to organizations and agencies must be matched by a 50 percent local contribution. Agencies can receive up to \$50,000.

State Funding Sources

North Carolina Department of Transportation (NCDOT)

NCDOT is the state agency that administers federal funding from the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991. Along with the federal requirements for this money, NCDOT has application policies and procedures. Contact the state Bicycle and Pedestrian Coordinator for more details.

North Carolina Division of Parks and Recreation

The state Division of Parks and Recreation currently offers limited funding for greenway projects. The Adopt-a-Trail program provides funding (approximately \$135,000 annually) to trail projects, with priority given to volunteer groups. There is also a state trails program that offers technical assistance in the planning, design and maintenance of trails.

North Carolina Wildlife Resources Commission

The Commission, through small grants, annually funds projects that increase wildlife habitat or improve public access and education related to wildlife. This money can be used for interpretive signage on local wildlife habitat along greenways.

North Carolina Department of Corrections

Low security prison labor can be used to construct and maintain greenways. Amenities such as picnic tables, signs and benches can be constructed using prison labor. An example of where this has been successful is in Guilford County, where prisoners regularly maintain the Bicentennial Greenway.

North Carolina Division of Water Resources

Greenway projects involving stream restoration or recreation can receive money from the Water Resources Development Grant Program, administered by the Division of Water Resources.

• PL 566—Watershed Protection and Flood Prevention Act

Local communities can receive funding for greenway projects that incorporate flood prevention and watershed protection through this Act.

Local Private-Sector Funding

Local industries and private businesses may agree to provide support for development of Wendell & Zebulon Open Space and Greenway Master Plan through:

- donations of cash to a specific greenway segment or open space parcel;
- donations of services by large corporations to reduce the cost of greenway implementation, including equipment and labor to construct and install elements of greenways;
- reductions in the cost of materials purchased from local businesses which support open space preservation/greenway implementation and can supply essential products for facility development.

One example of a successful endeavor of this type is the Swift Creek Recycled Greenway in Cary, NC. A total of \$40,000 in donated construction materials and

Local Funding Sources

labor made this trail an award-winning demonstration project. This method of raising funds requires a great deal of staff coordination. (Note: Some materials used in the “recycled trail” were considered waste materials by local industries!)

Greenway Sponsors

A sponsorship program for greenway amenities allows for smaller donations to be received both from individuals and businesses. The program must be well planned and organized, with design standards and associated costs established for each amenity. Project elements which may be funded can include wayside exhibits, benches, trash receptacles, entry signage, and picnic areas.

Volunteer Work

Community volunteers may help construct open space or greenway facilities, as well as conduct fund-raisers. Individual volunteers can be recruited, as well as those from local organizations such as church groups, civic groups, scout troops, and environmental groups.

A case in point is Cheyenne, Wyoming’s volunteer greenway program. The Greater Cheyenne Greenway has motivated an impressive amount of community support and volunteer work. The program had to insist that volunteers wait to begin landscaping the trail until construction is completed. A manual for greenway volunteers was developed in 1994 to guide and regulate volunteer work. The manual includes a description of appropriate volunteer efforts, request forms, waiver and release forms, and a completion form (that asks volunteers to summarize their accomplishments). Written guidelines are also provided for volunteer work in 100-year floodplains.

To better organize volunteer activity, Cheyenne developed an “Adopt-a-Spot” program. Participants who adopt a segment of trail are responsible for periodic trash pickup, but can also install landscaping, prune trail-side vegetation, develop wildlife enhancement projects, and install site amenities. All improvements must be consistent with the Greenway Development Plan and must be approved by the local Greenway Coordinator. Adopt-a-Spot volunteers are allowed to display their names on a small sign along the adopted section of greenway.

“Buy-a-Foot” Programs

“Buy-a-Foot” programs have been successful in raising funds and awareness for trail and greenway projects within North Carolina. Under local initiatives, citizens are encouraged to purchase one linear foot of the greenway by donating the cost of construction. An excellent example of a successful endeavor is the High Point Greenway “Buy-a-Foot” campaign, in which linear greenway “feet” were sold at a cost of \$25/foot. Those who donated were given a greenway T-shirt and a certificate. This project provided over \$5,000 in funds.

Many communities have solicited funding from a variety of private foundations and other conservation-minded benefactors.

Walking Magazine Trail Restoration Fund

Walking Magazine, hoping to encourage more volunteer efforts among trail users, established this fund for the restoration of urban, suburban or rural walking trails. The magazine provides small grants, generally from \$200 to \$500, to help walking clubs and other groups purchase trail maintenance equipment or supplies.

Coors Pure Water 2000 Grants

Coors Brewing Company and its affiliated distributors provide funding and in-kind services to grassroots organizations that are working to solve local, regional and national water-related problems. Coors provides grants, ranging from a few hundred dollars to \$50,000, for projects such as river cleanups, aquatic habitat improvements, water quality monitoring, wetlands protection, pollution prevention, water education efforts, groundwater protection, water conservation and fisheries.

World Wildlife Fund Innovative Grants Program

This organization awards small grants to local, regional and statewide nonprofit organizations to help implement innovative strategies for the conservation of natural resources. Grants are offered to support projects which:

1. Conserve wetlands;
2. Protect endangered species;
3. Preserve migratory birds;
4. Conserve coastal resources; and
5. Establish and sustain protected natural areas.

Innovation grants can help pay for the administrative costs for projects including planning, technical assistance, legal and other costs to facilitate the acquisition of critical lands; retaining consultants and other experts; and preparing visual presentations and brochures or other conservation activities. The maximum award for a single grant is \$10,000.

Appendix E: Operations, Maintenance and Management

Operating, maintaining and managing a system of open space and greenways in Wendell & Zebulon will require a coordinated effort among all Town departments, private sector organizations and individuals. The following text defines key aspects of Open Space and Greenway System management, beginning with a discussion of a governance structure for the system, followed by definition of operational policies, facility management, land management, safety and security, trail user rules and regulations, an emergency response plan, and risk management program.

For a successful Open Space and Greenway System to be developed it is critical for the players to understand their role in supporting and managing the system.

Role of Wendell & Zebulon

The Wendell & Zebulon Open Space and Greenway System will be developed and managed by the Town and its departments. Listed below and on the following pages are the key departments and organizations that will play a role in this implementation.

Role of Department of Parks and Recreation

As the primary developer of greenways, the Parks and Recreation Department is the most prominent participant in the Open Space and Greenway Plan. The Department will be responsible for the design, management and maintenance of the greenway system. The Parks and Recreation Department will need to work closely with the planning Department in the siting of greenways.

Role of the Planning Department

The Planning Department should provide support for the Open Space and Greenway Plan and assistance with future implementation of the system. This can be accomplished by defining future greenways within related planning efforts; utilizing the rezoning process to encourage dedication of lands, including sidewalks and bicycle facilities for the Open Space and Greenway System; and planning transportation improvements in coordination with greenways.

Role of Department of Public Utilities

The Department of Public Utilities is an important player in the implementation strategy for the Open Space and Greenway System. The Department manages the system of sanitary and stormwater sewers which offers enormous potential for shared use with greenway development objectives. For the expansion and

Overview

Governance Structure

Role of Private Sector

development of new sanitary sewer lines, the Department should consider the use of a joint-use easement document during right-of-way negotiations to acquire subsurface and surface rights from willing sellers. The Department could function as a greenway developer in partnership with the Parks and Recreation Department. Additionally, stormwater management objectives can be enhanced through the development of the Open Space and Greenway System through the use of funds obtained from federal and state grants.

Role of Department of Police Services

The Department of Police Services should assist the Parks and Recreation Department with patrolling and law enforcement for Open Space and Greenway System lands and facilities.

The private sector throughout Wendell & Zebulon is the primary beneficiary of the Wendell & Zebulon Open Space and Greenway System. As such, private organizations, businesses and individuals can and should play an important role in the development and management of the system. Private sector groups and businesses can sponsor implementation projects for open space and greenways as a partner of the Town. These groups can also help to maintain open space and greenway lands through cooperative management agreements with the Town.

Role of Local Businesses and Corporations

Wendell & Zebulon businesses and corporations might choose to sponsor a segment of greenway for development or maintenance. Businesses and corporations can work with the Parks and Recreation Department to give money, materials, products and labor toward the development of a greenway facility. Businesses can also consider installing facilities, such as bike racks or lockers, benches, and signage that links their operations to the Open Space and Greenway System.

Role of Civic Organizations

Local civic groups and organizations, including the Junior League, Boy Scouts and Girl Scouts, garden clubs, YMCA, Kiwanis and Rotary Clubs, to name a few, can be participants in the Wendell & Zebulon Open Space and Greenway System. These organizations can play a vital role in building sections of greenway trails, maintaining and managing greenway lands and facilities, and co-hosting events that raise money for the Open Space and Greenway System. There are many ways in which civic organizations can participate in the development of the Open Space and Greenway System. The most appropriate involvement can be determined by matching the goals and objectives of each organization to the needs of the greenway program.

Role of Individual Citizens

Local residents who are interested in the development of Wendell & Zebulon's Open Space Greenway System can participate by agreeing to donate their time, labor, and expertise to the Parks and Recreation Department. Residents might choose to partner with a friend or form a local neighborhood group that adopts a section of greenway for maintenance and management purposes. As an adopt-a-greenway organization, individuals might help pick-up trash, plant flowers and

trees, care for newly planted vegetation and serve as additional “eyes and ears” for safety and security on open space and greenway lands. All volunteer efforts would be recognized by the Parks and Recreation Department through a community-wide program.

Over the course of time, Wendell & Zebulon will encounter a variety of issues that are important to the successful management and operation of the Open Space and Greenway System. The following operational policies are defined to assist the Town in responding to typical greenway implementation issues. More specific problems and issues may arise during the long-term development of the system that result in additional policies being considered and adopted.

The protection of stream corridors from urban encroachment is essential in order to permit stream channels and their floodplains to perform natural infrastructure functions. Stream corridors are best protected by first delineating the landscape boundaries of the 100-year (regulatory) floodplain and then by encouraging landowners to engage in land stewardship practices that limit encroachment and preserve the native landscape.

This section of the Plan defines land acquisition procedures that can be used to conserve, protect, and preserve the stream corridors of Wendell & Zebulon. This Plan recommends a voluntary land acquisition program for protecting the streams and floodplains of the Town. The text in this section offers a menu of tools that landowners, land conservation organizations and local government can use to establish the physical boundaries of the Open Space and Greenway System. In the event that certain parcels of land within the floodplain are considered vital to the overall efforts of the Open Space and Greenway System, mechanisms defined herein enable Wendell & Zebulon to purchase or negotiate for the dedication of certain property rights. Dedication should be negotiated in a manner that is consistent with local, state and Federal laws that permit and govern such action.

Management is a method of conserving the resources of a specific greenway parcel through either an established set of policies called Management Plans, or through negotiated agreements or easements with private property owners.

Management Plans

Management plans are prepared for Town-owned greenway lands. Management plans should identify valuable resources; determine compatible uses for the parcel; determine administrative needs of the parcel, such as maintenance, security and funding requirements; and recommend short-term and long-term action plans for the treatment and protection of the resources.

Land management agreements in which Wendell & Zebulon receives less than full interest in a parcel of land in order to protect a valuable resource. The purpose of these agreements is to establish legally binding contracts or a mutual understanding of the specific use, treatment and protection that these greenway lands will receive. Property owners who grant easements retain all rights to the property except those which have been granted by the easement. The property owner is responsible for all taxes associated with the property, less the value of

Open Space and Greenways Operations

Land Acquisition Procedures

Methods for Acquisition of Land Through Management

Easements

the easement granted. Easements are generally restricted to certain portions of property, although in certain cases an easement can be applied to an entire parcel of land. Easements are transferable through title transactions, thus the easement remains in effect in perpetuity. Three types of greenway easements are:

Conservation Easements

This type of easement generally establishes permanent limits on the use and development of land to protect the natural resources of that land. Dedicated conservation easements can qualify for both federal income tax deductions and state tax credits. Tax deductions are allowed by the Federal government for donations of certain conservation easements. The donations may reduce the donor's taxable income.

Preservation Easements

This type of easement is intended to protect the historical integrity of a structure or important elements of the landscape by sound management practices. Preservation easements may qualify for the same federal income tax deductions and state tax credits as conservation easements.

Public Access Easements

Right of public access easements provide the general public with the right to access and use a specific parcel of property. Both conservation easements and preservation easements may contain clauses for the right of public access and still be eligible for tax incentives.

Methods for Acquisition of Greenways Through Regulation

The second method of protecting stream corridor/greenways is through government regulation. Regulation is defined as the government's ability to control the use and development of land through legislative powers. The following types of development ordinances are regulatory tools that can meet the challenges of projected suburban growth and development and, at the same time, conserve and protect greenway resources.

Dedication/Density Transfers

Also known as incentive zoning, this mechanism allows greenways to be dedicated for density transfers on the development of a property. The potential for improving or subdividing part or all of a parcel of real property, as permitted under land use development laws, can be expressed in dwelling unit equivalents or other measures of development density or intensity. Known as density transfers, these dwelling unit equivalents may be relocated to other portions of the same parcel or to contiguous land that is part of a common development plan. Dedicated density transfers can also be conveyed to subsequent holders if properly noted in transfer deeds.

Negotiated Dedications

The Town may ask a landowner to enter into negotiations for certain parcels of land that are deemed beneficial to the protection and preservation of specific stream corridors. The Town may ask for the dedication of land for greenways when landowners subdivide property (a minimum size would be determined).

Such dedications would be proportionate to the relationship between the impact of the subdivision on community services and the percentage of land required for dedication - as defined by the US Supreme Court in *Dolan v Tigar*d.

Fee-in-Lieu

To complement negotiated dedications, a fee-in-lieu program may be necessary to serve as a funding source for other land acquisition pursuits of the Greenway Program. Based on the density of development, this program allows a developer the alternative of paying money for the development/protection of greenways in lieu of dedicating land for greenways. This money is then used to implement greenway management programs or acquire additional greenway lands.

Reservation of Land

A reservation of land does not involve any transfer of property rights but simply constitutes an obligation to keep property free from development for a stated period of time. Reservations are normally subject to a specified period of time, such as 6 or 12 months. At the end of this period, if an agreement has not already been reached to transfer certain property rights, the reservation expires.

Buffer/Transition Zones

This mechanism recognizes the problem of reconciling different, potentially incompatible land uses by preserving greenways that function as buffers or transition zones between uses. Care must be taken to ensure that use of this mechanism is reasonable and will not destroy the value of a property.

Overlay Zones

An overlay zone and its regulations are established in addition to the zoning classification and regulations already in place.

Subdivision Exactions

An exaction is a condition of development approval that requires a developer to provide or contribute to the financing of public facilities at their own expense. For example, a developer may be required to build a greenway on-site as a condition of developing a certain number of units because the development will create need for new parks or will harm existing parks due to overuse. The mechanism can be used to protect or preserve a greenway which is then dedicated to the Town. Consideration should be given to including greenway development in future exaction programs.

The third method of protecting stream corridor/greenways is through the acquisition of property. A variety of methods can be used to acquire property for greenway purposes.

Donation/Tax Incentives

A government body, public agency or qualified conservation organization agrees to receive full title or a conservation easement to a parcel of land at no cost or at a “bargain sale” rate. The donor is eligible to receive a federal tax deduction of up to 30 to 50 percent of their adjusted gross income. Additionally, North Carolina

Methods for Protection of Greenways through Acquisition

offers a tax credit up to 25 percent of the property's fair market value (up to \$5000). Any portion of the fair market value not used for tax credits may be deducted as a charitable contribution. Also, property owners may be able to avoid inheritance taxes, capital gains taxes and recurring property taxes.

Fee Simple Purchase

This is a common method of acquisition where a local government agency or private greenway manager purchases property outright. Fee simple ownership conveys full title to the land and the entire "bundle" of property rights including the right to possess land, to exclude others, to use land and to alienate or sell land.

Easement Purchase

This mechanism is the fee simple purchase of an easement. Full title to the land is not purchased, only those rights granted in the easement agreement. Therefore the easement purchase price is less than full title value.

Purchase/Lease Back

A local government agency or private greenway organization can purchase a piece of land and then lease it back to the seller for a specified period of time. The lease may contain restrictions regarding the use and development of the property.

Bargain Sale

A property owner can sell property at a price less than the appraised fair market value of the land. Sometimes the seller can derive the same benefits as if the property were donated. Bargain Sale is attractive to sellers when the seller wants cash for the property, the seller paid a low cash price and thus is not liable for high capital gains tax, and/or the seller has a fairly high current income and could benefit from a donation of the property as an income tax deduction.

Option/First Right of Refusal

A local government agency or private organization establishes an agreement with a public agency or private property owner to provide the right of first refusal on a parcel of land that is scheduled to be sold. This form of agreement can be used in conjunction with other techniques, such as an easement, to protect the land in the short term. An option would provide the agency with sufficient time to obtain capital to purchase the property or successfully negotiate some other means of conserving the greenway resource.

Purchase of Development Rights

A voluntary Purchase of Development Rights (PDR) involves purchasing the development rights from a private property owner at a fair market value. The landowner retains all ownership rights under current use, but exchanges the rights to develop the property for cash payment.

Condemnation

The practice of condemning private land for use as greenways is viewed as a last resort policy. Using condemnation to acquire property or property rights can be avoided if private and public support for the Greenway Program is present.

Condemnation is seldom used for the purpose of dealing with an unwilling property owner. In most cases, condemnation for greenway purposes has been exercised when there has been absentee property ownership, when title to the property is not clear, or when it becomes apparent that obtaining the consent for purchase will be difficult because there are numerous heirs located in other parts of the United States, or in different countries. The community must exercise caution in using Eminent Domain.

It is recommended that the right of eminent domain for a specific property be exercised by the community only if all of the following conditions exist:

- a) that the property is valued by the community as an environmentally sensitive parcel of land, significant natural resource, or critical parcel of land, and as such has been defined by the community as irreplaceable property;
- b) that written scientific justification for the community's claim that the property possesses such value should be prepared and offered to the property owner;
- c) that all efforts to negotiate with the property owner for the management, regulation and acquisition of the property have been exhausted and that the property owner has been given reasonable and fair offers for compensation and has rejected all offers;
- d) that due to the ownership of the property, the time frame for negotiating the acquisition of the property will be unreasonable, and in the interest of pursuing a cost effective method for acquiring the property, the community has deemed it necessary to exercise the right of eminent domain.

The general public should have access to and use of those greenway lands that support public use (i.e. trail development), and that are owned by Wendell & Zebulon or on land that the Town has secured the right of public access and use. All access and use is governed by existing Town policies and should also be governed by a Greenway Trail Ordinance. The use of all trails is limited to non-motorized uses, including hiking, bicycling, running, jogging, wheelchair use, skateboarding, in-line skating (rollerblading), equestrian use, mountain biking, and other uses that are determined to be compatible with the Town's greenway trails.

Greenways are named for the significant natural features that are found within the corridor. Greenways can also be named after an individual or individuals if these persons are truly distinguished within the community, or if these persons have contributed a gift equal to more than 50% of the value of greenway development within that corridor segment.

Wendell & Zebulon should work with each landowner on an individual basis to determine if fencing and screening is required and appropriate. The Town may agree to fund the installation of a fence or vegetative screen; however, it should be the responsibility of the adjacent property owner to maintain the fence or vegetative screen in perpetuity, including the full replacement of such fence or screen in the event of failure or deterioration due to any circumstances. An Adopt-a-Greenway Program should be established by Wendell & Zebulon to

Right of Public Access and Use of Trail Lands

Naming of Greenways

Fencing and Vegetative Screening

Adopt-a-Greenway Program

encourage community groups, families, businesses, school groups, civic clubs and other organizations to join in managing the Open Space and Greenway System. Wendell & Zebulon should implement this program for every greenway corridor in the system, and work closely with local organizations to ensure that these groups manage and maintain trails in a manner that is consistent with Town objectives. The Town should develop written agreements for each Adopt-a-Greenway entity and keep a current record of this agreement on file. Adopt-a-Greenway entities will be assigned a specific section of the Open Space and Greenway System, defined by location or milepost. The activities of each organization should be monitored by the Town or its designee. Agreements for management can be amended or terminated at any time by either party, giving 30 days written notice.

Management Agreements

Management Agreements will be established between Wendell & Zebulon and specific public or private organizations wishing to assist with the management of designated segments of the Open Space and Greenway System. The objective of these agreements is to define areas of maintenance and management that are compatible with existing land management activities, especially where greenways intersects with public or private properties and/or rights-of-way. Management agreements spell out specific duties, responsibilities and activities of Wendell & Zebulon and public or private organization that wishes to assist with management activities. They can be amended or terminated at any time by either party, giving 30 days written notice.

Cross Access Agreements

Wendell & Zebulon can use cross access agreements to permit private landowners that have property on both sides of a greenway corridor access to and use of a greenway corridor to facilitate operation and land use activities.

Cross access agreements are based on case law of the United States and specific experiences from other greenway trail systems throughout the United States. Adjacent landowners generally have the right to use the access at any time. However, access cannot block the right-of-way for trail users, other than for temporary measures such as permitting livestock to cross, or transporting equipment. Adjacent landowners are responsible for acts or omissions that would cause injury to a third party using the trail. If a landowner must move products, materials, livestock or equipment across the trail on a regular basis, appropriate signage should be installed to warn users of the trail to yield for such activities.

Crossing of abandoned or active rail lines, utility corridors and/or roads and highways will require the execution of agreements with companies, local, state or federal agencies and organizations that own the rights-of-way. These crossings must provide clearly controlled, recognized, and defined intersections in which the user will be warned of the location. In accordance with the American Association of State Highway Transportation Officials (AASHTO) and the Manual on Uniform Traffic Control Devices (MUTCD), the crossing will be signed with appropriate regulatory, warning and information signs.

Greenway facilities shall be maintained in a manner that promotes safe use. All trail facilities should be managed by Wendell & Zebulon or its designee. Trail

maintenance should include the removal of debris, trash, litter, obnoxious and unsafe man-made structures, and other foreign matter so as to be safe for public use. Trailheads, points of public access, rest areas and other activity areas should be maintained in a clean and usable condition at all times. The primary concern regarding maintenance should always be public safety.

All trail surfaces should be maintained in a safe and usable manner at all times. Rough edges, severe bumps or depressions, cracked or uneven pavement, gullies, rills and washed out treads should be repaired immediately. Volunteer vegetation occurring in the tread of the trail should be removed in such a manner so that the trail surface is maintained as a continuous, even and clean surface.

Property owned or used by Wendell & Zebulon for the Open Space and Greenway System shall be maintained in a condition that promotes safety and security for greenway users and adjacent property owners. To the extent possible, the property shall also be maintained in a manner that enables the corridor to fulfill multiple functions (i.e. passive recreation, alternative transportation, stormwater management and habitat for wildlife). Property that is owned or managed by other entities should be managed and maintained in accordance with the policies of that public body responsible for the affected parcel.

Private lands and neighborhood groups wanting to connect to the Wendell & Zebulon system will need to seek permission from the Wendell & Zebulon Parks and Recreation Department. Efforts to connect to the system will require the approval of the Department and will be decided on a case-by-case basis. Development expenses will not be covered by the Wendell & Zebulon Parks and Recreation Department. Connecting to the Wendell & Zebulon municipal system does not relieve neighborhood greenways management bodies of their responsibilities of safety, security, and/or maintenance.

Vegetation adjacent to trails shall be managed as necessary to maintain clear and open lines of sight along the edge of the trail, and eliminate potential hazards that could occur due to natural growth, severe weather or other unacceptable conditions. To promote safe use of any greenway trail, all vegetation should be clear cut to a minimum distance of three (3) feet from each edge of a trail. Selective clearing of vegetation should be conducted within a zone that is defined as being between three (3) to ten (10) feet from each edge of a trail. At any point along a trail, a user should have a clear, unobstructed view, along the centerline of a trail, 300 feet ahead and behind his/her position. The only exception to this policy should be where terrain or curves in a trail serve as the limiting factor.

Wendell & Zebulon or their designated agent should be responsible for the cutting and removal of vegetation. Removal of vegetation by an individual or entity other than the Town of Wendell & Zebulon or its designee shall be deemed unlawful and subject to fines and/or prosecution.

It may also be necessary for Wendell & Zebulon to conduct wildlife management programs on lands that are publicly owned. This shall be accomplished in a

Greenway Facility Management

Land Management

Safety and Security

manner that is in keeping with accepted laws, professional practices and/or recommended strategies that are provided to Wendell & Zebulon by wildlife management experts.

In order to provide a standard of care that offers reasonable and ordinary safety measures, Wendell & Zebulon shall cooperatively develop and implement a Safety and Security Program for the Open Space and Greenway System. This program will consist of well-defined safety and security policies; the identification of trail management, law enforcement, emergency and fire protection agencies; the proper posting, notification and education of the trail user policies; and a system that offers timely response to the public for issue or problems that are related to safety and security. The safety and security of the Open Space and Greenway System will need to be coordinated with local law enforcement officials, local neighborhood watch associations, and Adopt-a-Greenway organizations.

Important components of the safety and security program include the following. Wendell & Zebulon should:

- 1) Work with law enforcement agencies to establish a Greenway Safety and Security Committee that can meet periodically to discuss management of the Open Space and Greenway System.
- 2) Prepare a Greenway Safety Manual and distribute this to management agencies and post it at all major trailheads.
- 3) Post User Rules and Regulations at all public access points to greenway trails.
- 4) Work with the management agencies to develop Trail Emergency Procedures.
- 5) Prepare a Safety Checklist for the Open Space and Greenway System, and utilize it monthly during field inspection of greenway facilities.
- 6) Prepare a Greenway User Response Form for complaints and compliments and provide copies at all trailheads.
- 7) Work with management agencies to develop a system for accident reporting analysis.
- 8) Conduct a regular Maintenance and Inspection Program, and share the results of these investigations with all management agencies.
- 9) Coordinate other Public Information Programs that provide information about greenway events and activities that Town residents can participate in.
- 10) Have an ongoing evaluation of greenway program objectives.

Trails within greenway corridors shall be operated like all other parks within Wendell & Zebulon open for public use from sunrise to sunset, 365 days a year, except as specifically designated. Individuals who are found to be using unlighted facilities after dusk and before dawn should be deemed in violation of these hours of operation and treated as trespassers. Where trails are lighted for nighttime use, the rules established within the Trail Ordinance should govern permitted uses and activities.

Wendell & Zebulon shall enforce trespassing laws as defined under North Carolina General Statutes for publicly owned lands and facilities.

Wendell & Zebulon should always discourage the general public from using any segment of a greenway trail that is under construction. Trail segments should not be considered officially opened for public use until such time as a formal dedication ceremony and official opening has been completed. Individuals who use greenway segments that are under construction, without written permission from the Town should be deemed in violation of this access and use policy and treated as a trespasser.

Trail Ordinance

Multi-use conflict is a national problem for community and regional Open Space and Greenway Systems. Typically, conflicts are caused by overuse of a greenway trail, however, other factors may be problematic including poorly designed and engineered trail alignments, inappropriate user behavior, or inadequate facility capacity. The most effective conflict resolution plan is a well-conceived safety program that provides the individual user with a Code of Conduct for the greenway trail, sometimes called a Trail Ordinance. Several communities across the United States have adopted progressive trail ordinances to govern public use and keep trails safe for all users. The following Rules and Regulations are recommended for the Wendell & Zebulon Greenway System. These rules should be displayed both on brochures and information signs throughout the Open Space and Greenway System.

- 1) Be Courteous: All Trail users, including bicyclists, joggers, walkers, wheelchairs, skateboarders and skaters, should be respectful of other users regardless of their mode of travel, speed, or level of skill. Never spook animals; this can be dangerous for you and other users. Respect the privacy of adjacent landowners! No trespassing allowed from trails, remain on trails at all times.
- 2) Keep Right: Always stay to the right as you use the Trail, or stay in the lane that has been designated for your user group. The exception to this rule occurs when you need to pass another user.
- 3) Pass on the Left: Pass others going in your direction on their left. Look ahead and behind to make sure that your lane is clear before you pull out and around the other user. Pass with ample separation. Do not move back to the right until you have safely gained distance and speed on the other user. Faster traffic should always yield to slower oncoming traffic.
- 4) Give Audible Signal When Passing: All users should give a clear warning signal before passing. This signal may be produced by voice, bell or soft horn. Voice signals might include *Passing on your left!* or *Cyclist on your left!* Always be courteous when providing the audible signal - profanity is unwarranted and unappreciated.
- 5) Be Predictable: Travel in a consistent and predictable manner. Always look behind before changing position on the Trail, regardless of your mode of travel.
- 6) Control Your Bicycle: Lack of attention, even for a second, can cause disaster - always stay alert! Maintain a safe and legal speed at all times.
- 7) Do not Block the Trail: When in a group, including your pets, use no

User Rules and Regulations

Emergency Response Plan

more than half the trail, so as not to block the flow of other users. If your group is approached by users from both directions, form a single line or stop and move to the far right edge of the Trail to allow safe passage by these users.

8) Yield when Entering or Crossing Trails: When entering or crossing the Trail at an uncontrolled intersection, yield to traffic already using the other trail.

9) Do not Use this Trail Under the Influence of Alcohol or Drugs: It is illegal to use this Trail if you have consumed alcohol in excess of the statutory limits, or if you have consumed illegal drugs. Persons who use a prescribed medication should check with their doctor or pharmacist to ensure that it will not impair their ability to safely operate a bicycle or other wheeled vehicle.

10) Clean-up Your Litter: Please keep this Trail clean and neat for other users to enjoy. Do not leave glass, paper, cans or any other debris on or near the Trail. Please clean up after your pets. Pack out what you bring in - and remember to always recycle your trash.

11) Keep Pets on Leashes: All pets must be kept on secure and tethered leashes. Keep pets off of adjacent private property. Failure to do so will result in a fine.

12) Prohibition on Camp Fires: Fires, for any purpose, are prohibited within the Trails System. Any person caught lighting a fire for any purpose will be prosecuted to the fullest extent of the law.

In order to effectively patrol the Open Space and Greenway System and respond to the potential for fire, flash floods and other natural or human-caused disasters, Wendell & Zebulon shall adopt a greenway emergency response plan. This plan defines a cooperative law enforcement strategy for greenways based on services required and those that are typically provided by police, sheriff, fire and EMS agencies. Specifically, all trails should be provided with an address system that denotes specific locations along the length of a trail corridor. A site plan that illustrates points of access to each trail corridor should be produced and kept on file and provided to each agency. Trails in flash flood areas shall be appropriately signed to warn users. Each trail should be designed to permit access for law enforcement, fire and EMS agencies and vehicles that are not in excess of 6.5 tons gross vehicle weight. Typically, inter-governmental agreements are executed for this. A system of cellular-type emergency phone should be located in remote sections of the system, providing users with access to the area 911 Emergency System. All emergency phone should be placed above the flood elevation to ensure long term usage.

The emergency response plan should also define the agencies that should respond to 911 calls, and provide easy to understand routing plans and access points for emergency vehicles. For long distance trails, access points for emergency and maintenance vehicles should be located at reasonable distances from trailheads (approximately every 2-3 miles). Local hospitals should be notified of these routes so that they may also be familiar with the size and scope of the project. The entire Open Space and Greenway System should be designed and develop to support a minimum gross vehicle weight of 6.5 tons.

Risk Management Plan

The purpose of a Risk Management Plan is to increase safety for the users of the Wendell & Zebulon Open Space and Greenway System and reduce the potential for accidents to occur within the system or on lands adjacent to the system. While it is impossible to guarantee that all risk will be eliminated by a Risk Management Plan, implementation of a plan is in fact a critical step to reduce liability and improve safety. A Risk Management Plan establishes a methodology for greenway management that is based on current tort liability and case law in the United States related to the development, operation and management of public use greenway lands and facilities.

The ultimate responsibility for managing the Open Space and Greenway System, as defined within this Plan, rests with Wendell & Zebulon. The Risk Management Plan has as its major goals:

- 1) Risk Identification: determining where risk (threat to safety or potential loss) exists within the corridor.
- 2) Risk Evaluation: conducting appropriate examination of areas defined as a risk and determining the factors that contribute to risk.
- 3) Risk Treatment: defining and implementing an appropriate solution to the area of risk in accordance with one of the four options:
 - a) Risk avoidance: prohibiting use of a risk area.
 - b) Risk reduction: limit use of area and repair risk area immediately.
 - c) Risk retention: obtain waivers from all potential users of the risk area.
 - d) Risk transfer: transfer risk area (property) to an agency better suited to manage the area.

The following sixteen step plan should be implemented by Wendell & Zebulon to establish a Risk Management Plan for the Wendell & Zebulon Open Space and Greenway System.

- 1) Develop a policy statement about risk management.
- 2) Conduct a needs assessment for the greenway program.
- 3) Determine goals and objectives for risk management - what are acceptable and not acceptable management levels.
- 4) Develop specifications for site and facility development.
- 5) Establish a clear and concise program for risk management.
- 6) Define supervision and responsibility for risk management.
- 7) Define appropriate rules and regulations that govern the use of the trail system.
- 8) Conduct routine/systematic inspections and investigations of the trail system.
- 9) Develop an accident reporting and analysis system.
- 10) Establish procedures for handling emergencies.
- 11) Develop appropriate releases, waivers and agreements for use and management.
- 12) Identify best methods for insuring against risk.
- 13) Develop a comprehensive in-service training program for employees of the Town.

Liability

- 14) Implement a public relations program that can effectively describe the risk management program and activities.
- 15) Conduct periodic reviews of the Risk Management Plan by outside agents to ensure that the Plan is up to date.
- 16) Maintain good legal and insurance representation.

The design, development, management, and operation of the Wendell & Zebulon Open Space and Greenway System must be carefully and accurately executed in order to provide a resource that protects the health and welfare of the public. Liability may occur when a facility has been under-designed to handle its intended volume of use; when management of the facility is poor; or when unexpected accidents occur because the trail manager failed to recognize the possibilities of a potentially hazardous situation. To reduce the possibility and exposure to liability, the Town should have in operation the following measures prior to opening the first segment of greenway:

- 1) A thorough Maintenance Program that provides the appropriate duty or level of care to greenway users;
- 2) A Risk Management Plan that appropriately covers all aspects of the Open Space and Greenway System, and as necessary adjacent landowners;
- 3) A comprehensive working knowledge of public use laws and recent case history applicable in North Carolina.

Wendell & Zebulon's existing program may be adequate to protect the Town government from financial loss that might occur through the development and operation of the Open Space and Greenway System. Trails are no greater liability to the Town than park and recreation, sidewalk or urban open space resources. The Town should review its current policy and check coverages to be certain that all aspects of its policies are up to date.

Wendell & Zebulon should exercise reasonable care in the design and construction of all greenway facilities to reduce hazardous, public nuisance and life threatening situations. In fact, it is very difficult to find any case law in the United States where an adjacent property owner has been sued because a trail user strayed onto the adjacent private property and fell victim to an accident that was caused by the adjacent landowner. Some landowners have claimed that their insurance rates will go up because of the presence of a trail abutting their property. Once again, there is no case history among insurance companies to support this claim — provided the landowner has not gone out of their way to create an attractive nuisance and lure trail users onto their property.

It is also important that a fee not be charged to use any portion of the Open Space and Greenway System, because typically this may impact the way in which the recreational use statutes in North Carolina apply to the use of the system. A voluntary donation applied to the Open Space and Greenway System will generally not affect the recreational use statute.

Studies of Trial Liability

A recent study by the Rails to Trails Conservancy (RTC)⁵ provides a primer on trail related liability issues and risk management techniques. Below is a section of the report that addresses concerns in the proposed Wendell & Zebulon Open Space and Greenway Master Plan. The report was written by Hugh Morris of RTC in cooperation with the National Park Service: Rivers, Trails, and Conservation Assistance Program.

Concerns and Solutions

There are two primary categories of people who might be concerned about liability issues presented by a trail: the trail managing and owing entity (typically a public entity) and private landowners. Private landowners can be divided into two categories, those who have provided an easement for a trail over their land and those who own land adjacent to a trail corridor.

Similarly, there may be a preexisting corridor traversing or lying adjacent to their property such as a former rail corridor that has been converted to a trail. In either situation, private landowners may have some concerns about the liability should a trail user stray onto their land and become injured. In the first instance, where an easement is granted, the concern may be over injuries on both the granted right-of-way as well as injuries that may occur on land under their control that is adjacent to the trail. Under the latter condition, where the landowner has no ownership interest in the trail, the landowner will only be concerned with injury to trail users wandering onto their property and getting hurt or perhaps a tree from their property falling onto the trail.

In general, people owing land adjacent to a trail-whether the trail is an easement granted by them or is held by separate title-foresee that people using the trail may be endangered by a condition on their land. Potential hazards such as a pond, a ditch, or a dead tree may cause the landowner to worry about liability for a resulting injury. The landowner may reduce their liability by taking the following actions (BCEMC 1997, p. 58):

- * Work with trail designers to have the trail located away from hazards that cannot be corrected
- * Make it clear that trail users are not invited onto the adjoining land. This can be aided by having the trail designer develop signs, vegetative screening, or fencing.
- * If a hazardous condition does exist near the trail, signs should be developed to warn trail users of the hazard if it cannot be mitigated.

Of particular concern to adjacent landowners are attractions to children that may be dangerous, such as a pond. Many states recognize that children may trespass to explore an attractive nuisance. These states require a legal responsibility to children, even as trespassers, that is greater than the duty of care owed to adults (BCEMC 1997, p.58).

If a landowner provides an easement for a public-use-trail, the easement contract should specify that the managing agency will carry liability insurance, will design

Forms of Protection

the trail to recognized standards, and will develop and carry out a maintenance plan. The landowner may also request that an indemnification agreement be created in their favor.

Abutting property owners frequently express concerns about their liability to trail users. In general, their liability, if any, is limited and is defined by their own actions in relation to the trail. If an abutting property owner possesses no interest in the trail, then he or she does not have any right or obligation to warn trail users about defects in the trail unless the landowner creates a dangerous condition on the trail by his own act or omission. In that event, the abutting landowner would be responsible for his own acts or omissions that caused the injury to a third party using the trail, just as the operator of one car is responsible to the operator of another for an accident he cause on a city street (Montagne 1989, p. 127).

There are three legal precepts, either alone or in combination that define and in many cases limit liability for injury resulting from trail use. The first is the concept of duty of care, which speaks to the responsibility that a landowner (private or public) has to anyone on his or her land. Second is the Recreational Use Statute (RUS), which is available in all 50 states and provides protection to private landowners and some public landowners who allow public free access to land for recreational purposes. For those public entities not covered by a RUS, states tend to have a tort claims act, which defines and limits governmental liability. Third, for all private and public parties, liability insurance provides the final line of defense. Trail owners can also find much protection through risk management.

Duty of Care

Tort law, with regard to finding fault for an incident that occurs in a particular location is concerned with the “class” of person who incurs the injury and the legal duty of care that a landowner owes a member of the general public varies from state to state but is generally divided into four categories. In most states, a landowner’s responsibility for injuries depends on the status of the injured person. A landowner owes increasingly greater duties of care (i.e.; is more at risk) if the injured person is a “trespasser”, a “licensee”, an “invitee”, or a “child”.

Trespasser-a person on land without the landowners permission, whether intentionally or by mistaken belief that they are on public land. Trespassers are due the least duty of care and therefore pose the lowest level of liability risk. The landowner is generally not responsible for unsafe conditions. The landowner can only be held liable for deliberate or reckless misconduct, such as putting up a trip wire. Adjacent landowners are unlikely to be held liable for injuries sustained by trespassers on their property.

Licensee-a person on land with the owners’ permission but only for the visitor’s benefit. This situation creates a slightly higher liability for the landowner. For example, a person who is permitted to hunt on a farm without paying a fee, if there were no RUS, would be classified as a licensee. If the landowner charged a fee, the hunter would probably be classified as an invitee. Again, the landowner is not responsible for discovering unsafe conditions; however, the landowner must provide warning of the known unsafe conditions.

Invitee-a person on the owner's land with the owner's permission, expressly or implied, for the owner's benefit, such as a paying customer. This is the highest level of responsibility and therefore carries the highest level of liability. The owner is responsible for unknown dangers that should have been discovered. Put in a different way, the landowner has a duty to:

- 1) Inspect the property and facilities to discover hidden dangers;
- 2) Remove the hidden dangers or warn the user of their presence;
- 3) Keep the property and facilities in reasonably safe repair; and
- 4) Anticipate foreseeable activities by users and take precautions to protect users from foreseeable dangers.

The landowner does not insure the invitee's safety, but must exercise reasonable care to prevent injury. Generally, the landowner is not liable for injuries caused by known, open, or obvious dangers where there has been an appropriate warning. For example, customers using an ice rink open to the public for a fee would be invitees.

Child-even if trespassing, some states accord children a higher level of protection. The concept of "attractive nuisance" is particularly relevant to children. Landforms such as ponds can be attractive to children who, unaware of potential danger, may be injured if they explore such items.

Prior to the widespread adoption of RUS' by the states (see discussion below); this classification system defined the liability of adjacent landowners. Even now, trail managers or private landowners who charge a fee are at greater risk of liability because they owe the payee a greater responsibility to provide a safe experience.

Thus, where no RUS exists or is unavailable, trail users would be of the licensee class, provided the trail manager does not charge an access fee. If a trail manager charges a fee, the facility provider tends to owe a greater duty of care to the user and thus has a greater risk of liability if a trail user is injured due to a condition of the trail.

The council of State Governments produced a model recreational use statute (RUS) in 1965 in an effort to encourage private landowners to open their land for public recreational use by limiting the landowner's liability for recreational injuries when access was provided without charge (Kozlowski, p. V1D1).

Recreational use statutes are now on the books in all fifty states. These state laws provide protection to landowners who allow the public to use their land for recreational purposes. The theory behind these statutes is that if landowners are protected from liability they would be more likely to open up their land for public recreational use and that, in turn, would reduce state expenditures to provide such areas. To recover damages, an injured person must prove "willful and wanton misconduct" on the part of the landowner essentially the same duty of care owed to a trespasser. However, if the landowner is charging a fee for access to the property, the protection offered by the recreational use statute is lost in most

Recreational Use Statutes (RUS)

Risk Management

states.

The preamble of the model RUS is clear that it was designed for private landowners but the actual language of the model legislation does not differentiate between private and public landowners. The result is that while some states have followed the intent of the model statute and limited the immunity to private landowners, other states have extended the either immunity to cover public landowners legislatively or judicially (Goldstein 1997, p. 788).

Under the Federal Tort Claims Act, the federal government is liable for negligence like a private landowner under the law of the state. As a result, RUS is intended for private individuals have been held applicable to the federal government where it has opened land up for public recreation (Kozlowski, p. V1D1).

Under lease arrangements between a public agency and a private landowner, land can be provided for public recreation while the public agency agrees to defend and protect the private landowner. The private landowner may still be sued but the public agency holds the landowner harmless, taking responsibilities for the cost of defending a lawsuit and any resulting judgments (Kozlowski, p. V1D2).

While state RUS's and the court interpretations of these laws vary somewhat, a few common themes can be found. The statutes were created to encourage landowners to make their land available for public recreation purposes by limiting their liability provided they do not charge a fee. The RUS limits the duty of care a landowner would otherwise owe to recreational licensee to keep his or her premises safe for use. It also limits a landowner's duty to warn of dangerous conditions provided such failure to warn is not considered grossly negligent, willful, wanton, or reckless. The result of many of these statutes is to limit landowner liability for injuries experienced by people partaking in recreational activities on their land. The existence of a RUS may also have the effect of reducing insurance premiums for landowners whose lands are used for recreation (BCEMC 1997, p. 58).

These laws do not prevent somebody from suing a trail manager/owner or a private property owner who has made his or her land available to the public for recreational use, it only means the suit will not advance in court if certain conditions hold true. Thus, the trail manager/owner may incur costs to defend himself of herself. Such costs are the principal reason for purchasing liability insurance.

All of the above-mentioned forms of protection aside, perhaps the best defense a trail manager has are sound policy and practice for trail maintenance and usage. Developing a comprehensive technique is the best defense against an injury-related lawsuit (BCEMC 1997, p. 60).

Trails that are properly designed and maintained go a long way to warding off any potential liability. There are some general design guidelines (AASHTO and MUTCD) that, if adhered to can provide protection by showing that conventional standards were used in designing and building the trail. Trails that are designed in accordance with recognized standards or "best practices" may be able to take

advantage of any design immunities under state law. Within the spectrum of public facilities, trails are quite safe, often less risky than roads, swimming pools, and playgrounds.

The managing agency should also develop a comprehensive maintenance plan that provided for regular maintenance and inspection. These procedures should be spelled out in detail in a trail management handbook and a record should be kept of each inspection including what was discovered and any corrective action taken. The trail manager should attempt to warn of or eliminate any hazardous situations before an injury occurs. Private landowners that provide public easements for a trail should ensure that such management plans are in place and used to reduce their own liability. Key points include (BCEMC 1997, p. 57); (LTA 1991, p. 8).

During trail design and development:

- * Develop an inventory of potential hazards along the corridor;
- * Create a list of users that will be permitted on the trail and the risks associated with each;
- * Identify all applicable laws;
- * Design and location of the trail such that obvious dangers are avoided. Warnings of potential hazards should be provided, and mitigated to the extent possible;
- * Trail design and construction should be completed by persons who are knowledgeable about design guidelines, such as those listed in AASHTO and MUTCD documents;
- * Trail regulations should be posted and enforced.

Once the trail is open for use:

- * Regular inspections of the trail by a qualified person who has the expertise to identify hazardous conditions and maintenance problems.
- * Maintenance problems should be corrected quickly and documented. Where a problem cannot be promptly corrected, warnings to trail users should be erected.
- * Procedures for handling medical emergencies should be developed. The procedures should be documented as well as any occurrence of medical emergencies.
- * Records should be maintained of all inspections, what was found, and what was done about it. Photographs of found hazardous conditions can be useful.

These risk management techniques will not only help to ensure that hazardous conditions are identified and corrected in a timely manner, thereby averting injury

Managing Special Situations

to trail users, but will also serve to protect the trail owner and managing agency from liability. Showing that the agency had been acting in a responsible manner can serve as an excellent defense in the event that a lawsuit develops (BCEMC 1997, p. 58).

The following are circumstances that the Rails-to-Trails Conservancy has heard about through numerous conversions with local trail advocates who have expressed concern about situations that might present themselves. For the most part, these situations can be addressed through management techniques.

Hunting adjacent to Trails

Some trails traverse public and/or private land that may at certain periods permit hunting. Such proximity can expose trail users to potential injury. Like pesticide use/hunting tends to take place at limited times during the year. Thus a similar mitigation technique can be used: post signs at the trail heads when hunting season is open. While the landowner may technically be liable for such an incident because it is generally unlawful to conduct a hazardous activity that can migrate into adjacent property, simple warnings to trail users can provide trail managers with notification of when such activity will occur. Trails can also be closed during specific times of the year to allow hunting to take place unabated.

Use of Volunteers for Trail Work

Trail managers often use volunteers for routine trail maintenance or even for trail construction. What happens if the volunteer is injured while performing trail-related work? What happens if an action taken by a volunteer leads to an injury of a trail user? First, make sure your insurance covers volunteer workers. Second, the trail manager should be protected from any user injury created by an act of a volunteer provided the act is not one of willful or reckless misconduct. The Federal Volunteer Protection Act of 1997 protects the volunteer worker. This act protects volunteers of nonprofit organizations or governmental entities. The Act states that such volunteers are not liable for harm caused by their acts of commission or omission provided the act are in good faith.

North Carolina Tort Claims Acts and Recreational Use Statutes

Tort Claims Act: NC General Statute ss 143-291 to 143-300.I

Recreational Use Statute: NC General Statute Section 113A-95

End Notes

1) There is a long history in the United States of private landowners allowing public use of their land for recreation. This can happen in an informal way such as for hunting or fishing, or in a more formal way where a trail is established.

2) Recreational Use Statute protects the property “owner”. While the definition of “owner” can vary somewhat from state to state, most define it broadly to include the legal owner of the land, a tenant, lessee, occupant, or person in control of the premises. Some statutes specifically include public entities in the definition of owner while other states specifically exclude public entities, while still others have left it for the courts to decide.

3) Most states define recreational use in the statute by listing a broad range of activities such as swimming and hiking and may even include the phrase “includes, but is not limited to” in order to prevent as narrow interpretation of the term recreation.

4) “Guide for the Developments of Bicycle Facilities”. American Association of State Highway and Transportation Officials (AASHTO, 1999). More information can be found at: www.aashto.org

Manual on Uniform Traffic Control Devices (MUTCD, 2001). More details can be found at:
www.ohs.fhwa.dot.gov/devices/mutcd.html.

5) “Rails-Trails and Liability-A primer on Trail-Related Liability Issues & Risk Management Techniques. Published by the Rails-to-Trail Conservancy, in cooperation with National Park Service Rivers, Trails, and Conservation Assistance Program. September, 2000.

Appendix F: Model Ordinance of Development Regulations

The model ordinance provides for the use-by-right of conservation subdivisions in residential zones. Most of the provisions of the ordinance have been discussed in the text. Text in [brackets] indicates terms that need to be written specifically for the local jurisdiction, such as the jurisdiction name. Definitions are generally not included, but may need to be added to the appropriate portion of the local code if they are not elsewhere used or if they are used in a different context. Depending on the structure of the local code, some elements of the ordinance may need to be inserted into the zoning code and others may need to be added to the subdivision or development ordinance. (This document used with the permission from the University of Georgia Institute of Ecology Office of Public Service and Outreach.

SECTION 1.1

A. To provide a residential zoning district that permits flexibility of design in order to promote environmentally sensitive and efficient uses of the land.

B. To preserve in perpetuity unique or sensitive natural resources such as ground-water, floodplains, wetlands, streams, steep slopes, woodlands and wildlife habitat.

C. To preserve important historic and archaeological sites.

D. To permit clustering of houses and structures on less environmentally sensitive soils which will reduce the amount of infrastructure, including paved surfaces and utility easements, necessary for residential development.

E. To reduce erosion and sedimentation by minimizing land disturbance and removal of vegetation in residential development.

F. To promote interconnected greenways and corridors throughout the community.

G. To promote contiguous greenspace with adjacent jurisdictions.

H. To encourage interaction in the community by clustering houses and orienting them closer to the street, providing public gathering places and encouraging use of parks and community facilities as focal points in the neighborhood.

I. To encourage street designs that reduce traffic speeds and reliance on main arteries.

J. To promote construction of convenient landscaped walking trails and bike paths both within the subdivision and connected to neighboring communities, businesses, and facilities to reduce reliance on automobiles.

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K. To conserve scenic views and reduce perceived density by maximizing the number of houses with direct access to and views of open space.

L. To protect prime agricultural land and preserve farming as an economic activity.

SECTION 1.2

A. Applicability of Regulations.

This Conservation Subdivision option is available as a use by right in all residential zoning districts, including [list of applicable zoning districts]. Applicant shall comply with all other provisions of the zoning code and all other applicable laws, except those that are incompatible with the provisions contained herein.

B. Ownership of Development Site.

The tract of land to be subdivided may be held in single and separate ownership or in multiple ownership. If held in multiple ownership, however, the site shall be developed according to a single plan with common authority and common responsibility.

C. Housing Density Determination.

The maximum number of lots in the Conservation Subdivision shall be determined by either of the following two methods, at the discretion of the applicant:

1. *Calculation:* The maximum number of lots is determined by dividing the area of the tract of land by the minimum lot size specified in the underlying zoning. In making this calculation, the following shall not be included in the total area of the parcel:

- a). slopes over 25% of at least 5000 square feet contiguous area;
- b). the 100-year floodplain;
- c). bodies of open water over 5000 square feet contiguous area; and
- d). wetlands that meet the definition of the Army Corps of Engineers pursuant to the Clean Water Act.

2. *Yield Plan:* The maximum number of lots is based on a conventional subdivision design plan, prepared by the applicant, in which the tract of land is subdivided in a manner intended to yield the highest number of lots possible. The plan does not have to meet formal requirements for a site design plan, but the design must be capable of being constructed given site features and all applicable regulations.

SECTION 1.3

A. Site Analysis Map Required.

Concurrent with the submission of a site concept plan, Applicant shall prepare and submit a site analysis map. The purpose of the site analysis map is to ensure that the important site features have been adequately identified prior to the creation of the site design, and that the proposed Open Space will meet the requirements of this article. The preliminary site plan shall include the following features:

APPLICATION REQUIREMENTS

1. Property boundaries;
2. All streams, rivers, lakes, wetlands and other hydrologic features;
3. Topographic contours of no less than 10-foot intervals;
4. All Primary and Secondary Conservation Areas labeled by type, as described in Section 1.4 of this Article;
5. General vegetation characteristics;
6. General soil types;
7. The planned location of protected Open Space;
8. Existing roads and structures;
9. Potential connections with existing greenspace and trails.

B. Open Space Management Plan Required.

An open space management plan, as described in Section 1.4, shall be prepared and submitted prior to the issuance of a land disturbance permit.

C. Instrument of Permanent Protection Required.

An instrument of permanent protection, such as a conservation easement or permanent restrictive covenant and as described in Section 1.4, shall be placed on the Open Space concurrent with the issuance of a land disturbance permit.

D. Other Requirements.

The Applicant shall adhere to all other applicable requirements of the underlying zoning and the [subdivision code].

SECTION 1.4

A. Definition.

Open Space is the portion of the conservation subdivision that has been set aside for permanent protection. Activities within the Open Space are restricted in perpetuity through the use of an approved legal instrument.

B. Standards to Determine Open Space.

1. The minimum restricted Open Space shall comprise at least 40% of the gross tract area.
2. The following are considered Primary Conservation Areas and are required to be included within the Open Space, unless the Applicant demonstrates that this provision would constitute an unusual hardship and be counter to the purposes of this article:
 - a). The 100-year floodplain
 - b). Riparian zones of at least 75 ft width along all perennial and intermittent streams
 - c). Slopes above 25% of at least 5000 square feet contiguous area
 - d). Wetlands that meet the definition used by the Army Corps of Engineers pursuant to the Clean Water Act
 - e). Populations of endangered or threatened species, or habitat for such species
 - f). Archaeological sites, cemeteries and burial grounds
3. The following are considered Secondary Conservation Areas and should be included within the Open Space to the maximum extent feasible.
 - a). Important historic sites

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- b). Existing healthy, native forests of at least one acre contiguous area
- c). Individual existing healthy trees greater than 8 inches caliper, as measured from their outermost drip line
- d). Other significant natural features and scenic viewsheds such as ridge lines, peaks and rock outcroppings, particularly those that can be seen from public roads
- e). Prime agricultural lands of at least five acres contiguous area
- f). Existing trails that connect the tract to neighboring areas

4. Above-ground utility rights-of-way and small areas of impervious surface may be included within the protected Open Space but cannot be counted towards the 40% minimum area requirement (exception: historic structures and existing trails may be counted). Large areas of impervious surface shall be excluded from the Open Space.

5. At least 25% of the Open Space shall consist of land that is suitable for building.

6. At least 75% of the Open Space shall be in a contiguous tract. The Open Space shall adjoin any neighboring areas of Open Space, other protected areas, and non-protected natural areas that would be candidates for inclusion as part of a future area of protected Open Space.

7. The Open Space shall be directly accessible to the largest practicable number of lots within the subdivision. Non-adjoining lots shall be provided with safe, convenient access to the Open Space.

C. Permitted Uses of Open Space.

1. Uses of Open Space may include the following:

- a). Conservation of natural, archeological or historical resources;
- b). Meadows, woodlands, wetlands, wildlife corridors, game preserves, or similar conservation-oriented areas;
- c). Walking or bicycle trails, provided they are constructed of porous paving materials;
- d). Passive recreation areas, such as open fields;
- e). Active recreation areas, provided that they are limited to no more than 10% of the total Open Space and are not located within Primary Conservation Areas. Active recreation areas may include impervious surfaces. Active recreation areas in excess of this limit must be located outside of the protected Open Space.
- f). Agriculture, horticulture, silviculture or pasture uses, provided that all applicable best management practices are used to minimize environmental impacts, and such activities are not conducted within Primary Conservation Areas;
- g). Landscaped stormwater management facilities, community wastewater disposal systems and individual wastewater disposal systems located on soils particularly suited to such uses. Such facilities shall be located outside of Primary Conservation Areas;
- h). Easements for drainage, access, and underground utility lines;
- i). Other conservation-oriented uses compatible with the purposes of this ordinance.

D. Prohibited uses of Open Space

1. Golf courses;
2. Roads, parking lots and impervious surfaces, except as specifically authorized in the previous sections;
3. Agricultural and forestry activities not conducted according to accepted Best Management Practices;
4. Impoundments;
5. Other activities as determined by the Applicant and recorded on the legal instrument providing for permanent protection.

E. Ownership and Management of Open Space.

1. Ownership of Open Space.

A homeowner association representing residents of the conservation subdivision shall own the Open Space. Membership in the association shall be mandatory and automatic for all homeowner of the subdivision and their successors.

The Homeowners' Association shall have lien authority to ensure the collection of dues from all members. The responsibility for maintaining the Open Space and any facilities located thereon shall be borne by the Homeowner's Association.

2. Management Plan.

Applicant shall submit a Plan for Management of Open Space and Common Facilities ("Plan") that:

- a). allocates responsibility and guidelines for the maintenance and operation of the Open Space and any facilities located thereon, including provisions for ongoing maintenance and for long-term capital improvements;
- b). estimates the costs and staffing requirements needed for maintenance and operation of, and insurance for, the Open Space and outlines the means by which such funding will be obtained or provided;
- c). provides that any changes to the Plan be approved by the Board of Commissioners; and
- d). provides for enforcement of the Plan.

3. Maintenance of the Open Space.

In the event the party responsible for maintenance of the Open Space fails to maintain all or any portion in reasonable order and condition, [the jurisdiction] may assume responsibility for its maintenance and may enter the premises and take corrective action, including the provision of extended maintenance. The costs of such maintenance may be charged to the Homeowner's Association, or to the individual property owners that make up the Homeowner's Association, and may include administrative costs and penalties. Such costs shall become a lien on all subdivision properties.

F. Legal Instrument for Permanent Protection.

1. The Open Space shall be protected in perpetuity by a binding legal instrument that is recorded with the deed. The instrument shall be one of the following:
 - a). A permanent conservation easement in favor of either:
 - (i) a land trust or similar conservation-oriented non-profit organization with legal authority to accept such easements. The organization shall be bona fide and in perpetual existence and the conveyance instruments shall contain an appropriate provision for re-transfer in the event the organization becomes unable to carry out its functions; *or*
 - (ii) a governmental entity with an interest in pursuing goals compatible with the

SIDEWALK REQUIREMENTS

purposes of this ordinance. If the entity accepting the easement is not [the jurisdiction], then a third right of enforcement favoring [the jurisdiction] shall be included in the easement.

b). A permanent restrictive covenant for conservation purposes in favor of a governmental entity.

c). An equivalent legal tool that provides permanent protection, if approved by [the jurisdiction].

2. The instrument for permanent protection shall include clear restrictions on the use of the Open Space. These restrictions shall include all restrictions contained in this article, as well as any further restrictions the Applicant chooses to place on the use of the Open Space.

G. Tax Assessment of Open Space.

Once a legal instrument for permanent protection has been placed upon the Open Space, [the jurisdiction tax assessment office] shall be directed to reassess the Open Space at a lower value to reflect its more limited use. If the Open Space is used purely for passive recreational purposes and the terms of the instrument for permanent protection effectively prohibit any type of significant economic activity, then the assessment shall be at a value of zero.

SECTION 1-5

Sidewalk, walkway, on-road improvements, and trail systems sufficient to serve both existing and projected pedestrian and bicyclist's needs shall be reflected in all site and subdivision plans. Such systems may include either conventional sidewalks along street rights-of-way, wide outside travel lanes or bike lanes on roadways, or walkways and trails in alternative locations as appropriate. Design, location, dimensions, dedications, easements, and reservations, shall conform to applicable City and/or County Urban Growth Area policies and plans for sidewalks, bicycle routes, and trails.

1. Location: Unless an alternative walkway is approved, conventional sidewalks within the Urban Growth Area shall be located as follows:

- a). on both sides of major and minor thoroughfares (as defined by an adopted Thoroughfare Plan) except on freeways;
- b). on one side of collector streets and nonresidential streets with existing or projected traffic of 2,000 or more vehicles per day;
- c). on one side of residential streets of all types that are not cul-de-sacs;
- d). on one or both sides of local streets in nonresidential areas where review indicates that sidewalks are, or will be, needed to accommodate pedestrian traffic.

2. If a conflict exists between these standards and provisions of the Subdivision Ordinance, then the stricter requirements shall apply.

In general, sidewalks shall be 5 feet in width and shall be constructed of concrete. Alternative dimensions and materials may be approved by the City Engineering Department. When the approving body determines that, the construction of a conventional sidewalk or alternative walkway is unfeasible due to special circum-

stances, including but not limited to:

Impeding road widening, significant street trees, severe roadside conditions, or limited pedestrian volumes, the approving body may require either:

1. Payment in lieu funds of sidewalk construction; or
- 2 .A combination of sidewalk and/or alternative walkways and/or payment in lieu funds may be used.
- 3 .Either wide outside travel lanes or bicycle lanes, as determined by the City Public Works Department or the North Carolina Department of Transportation (NCDOT), shall be a part of any road improvements made on roadways, which are indicated as bicycle routes on either the City's Open Space or Greenway Master Plan.

NOTE:

For greenway trail development, other situations may be explored. Since some trail and greenway routes are located on roadways or sidewalks, development through transportation improvements is certainly an important part of trail growth. NCDOT is now routinely including bicycle and pedestrian improvements on projects on State roads; the City should consider following suit. The Wake County should encourage NCDOT to follow its own published guidelines on State roads in the County as well. NCDOT published guidelines state: roads with an Average Daily Traffic Count (ADT) a 4,000 and 8,000 vehicles should have two-foot paved shoulders as a minimum; roads with an ADT over 8,000 should have four-foot paved shoulders. As the City's rural roads continue to increase in traffic counts with anticipated growth, this last improvement would make the County and City's roads significantly more bicycle friendly, while making off-road and on-road trail connections much easier and safer.

Appendix G:

Variable-Width Model

Riparian Buffer Ordinance

This is a sample riparian buffer ordinance, using a fixed width, written as an amendment to an existing zoning ordinance. It creates a new buffer overlay zone along all perennial and intermittent streams. (Adaptive use of this document with permission from the University of Georgia Institute of Ecology Office of Public Service and Outreach.

This ordinance complies with the state minimum standards for river corridor protection as well as the minimum standards for water supply watershed protection that relate to riparian buffers. Some local governments may be subject to additional requirements for water supply watershed protection. These requirements are summarized at the end of this document. Language that is optional or variable is indicated by brackets and/or parentheses. The name of the local government should be inserted for *[county/municipality]*.

ARTICLE I: Riparian Buffer Zone

1. The streams and rivers of *[county/municipality]* supply much of the water required by *[county/municipality]* citizens for drinking and other municipal and industrial uses *[alternatively, for regions that rely on groundwater]*. The quality of the groundwater that is used for drinking, agricultural and industrial purposes in *[county/municipality]* is connected with the quality of the surface water in the streams and rivers of *[county/municipality]*. Furthermore, the people of *[county/municipality]* use the surface waters for fishing, canoeing, and other recreational and economic purposes. The *[county/municipality]* Board of Commissioners finds that the protection of the streams and rivers of *[county/municipality]* is vital to the health, safety and economic welfare of its citizens.

It is therefore the intent of this ordinance to amend the Zoning Ordinances of *[county/municipality]* to establish a new riparian buffer zone of restricted development and limited land use adjacent to all perennial streams and rivers in *[county/municipality]*. The purposes of the riparian buffer zone are: to protect public and private water supplies, to trap sediment and other pollutants in surface runoff, to promote bank stabilization, to protect riparian wetlands, to minimize the impact of floods, to prevent decreases in base flow, to protect wildlife habitat, and to generally maintain water quality.

The standards and regulations set forth in this ordinance are created under the authority of the *[county/municipality]*'s Home Rule and zoning powers. In the event of a conflict between or among any provisions of this ordinance, or any other ordinances of *[county/municipality]*, the requirement that is most restrictive and protective of water quality shall apply.

INTENT AND PURPOSE.

This section establishes the justification for the ordinance. It should be tailored to emphasize the important aquatic resources of the local area.

For example, if endangered species of fish are present, insert a sentence that says "In addition, the [local river] and its tributaries provide habitat for a number of threatened and endangered species of fish." If these terms are defined previously in the zoning ordinance then they may not have to be redefined here

TITLE.

DEFINITIONS.

The width of the riparian buffer zone is first defined here. Naturally, this width must be consistent through-out the ordinance. If a width is narrower as specified, a separate ordinance or section of this ordinance must be added to cover those stream segments governed by minimum standards (water supply watersheds and large rivers).

“Stream bank” means the uppermost limit of the active stream channel, usually marked by a break in slope. This ordinance specifies the use of soil survey maps, which may be the most accurate maps for determining affected streams. In some areas other map types may be preferable. This section should be changed to refer to the most accurate map available for the jurisdiction, with accuracy determined by field evaluations.

2.

This Ordinance shall be known as “The Riparian Buffer Zone Requirements of [county/municipality]” and may be referred to generally as “Riparian Buffer Requirements.”

3.

“Existing land use” means a land use which, prior to the effective date of this ordinance, is either:

- (1) completed; or
- (2) ongoing, as in the case of agricultural activity; or
- (3) under construction; or
- (4) fully approved by the governing authority; or
- (5) the subject of a fully completed application, with all necessary supporting documentation, which has been submitted for approval to the governing authority or the appropriate government official, for any construction-related permit.

“Impervious surface” means any paved, hardened or structural surface which does not allow for complete on-site infiltration of precipitation. Such surfaces include but are not limited to buildings, driveways, streets, parking lots, swimming pools, dams, tennis courts, and any other structures that meet the above definitions.

“Land-disturbing activity” means any grading, scraping, excavating or filling of land, clearing of vegetation and any construction, rebuilding, or significant alteration of a structure.

“Protected area” means any land and vegetation that lies within the riparian buffer zone, as defined herein.

“Riparian Buffer Zone” or “RBZ” is an overlay zoning district along all streams and rivers in [insert jurisdiction], extending from the bank of each stream or river to a width determined by the following calculation:

- (a) 50 feet, plus
- (b) 2 feet per one percent of slope, measured along a line perpendicular to the stream bank to the highest point within 100 feet of the stream; plus
- (c) the width of any impervious surfaces within 50 feet of the stream; plus
- (d) the width of any jurisdiction wetlands within 50 feet of the stream.

Buffer width calculations shall be made no less than every 100 feet along a stream, and never less than once per property. If at any point the width of the buffer is less than the width of the 100-year floodplain, as defined by the latest flood elevation maps issued by the Federal Emergency Management Agency (FEMA), then the buffer width shall be extended to the width of the 100-year floodplain at that point. The Riparian Buffer Zone shall be maintained in an undisturbed, naturally vegetated state.

“Second order stream or higher” means any stream that is formed by the confluence of two or more other streams, as indicated by solid or dashed blue lines on the United States Geological Survey 7.5 minute quadrangle maps, of the most recent edition.

“Stream” or “River” means all of the following:

- (a) any perennial stream or river (or portion thereof) that is portrayed as a solid line on a United States Department of Agriculture Soil Survey Map of the most recent edition; and
- (b) any intermittent stream or river (or portion thereof) that is portrayed as a dashed line on a United States Department of Agriculture Soil Survey Map of the most recent edition; and
- (c) any lake or impoundment that does not lie entirely within a single parcel of land; and
- (d) any other stream as may be identified by [county/municipality].

4.1. The Riparian Buffer Zone District (RBZ) is overlay zoning that encompasses all land (as defined above) on either side of all streams in [name of county/municipality], measured as a line extending from the stream bank. The RBZ must be maintained in a naturally vegetated state. Any property or portion thereof that lies within the RBZ is subject to the restrictions of the RBZ as well as any and all zoning restrictions that apply to the tax parcel as a whole.

4.2. The following land uses are prohibited within the protected area:

- (a) any land-disturbing activity;
- (b) septic tanks and septic tank drain fields;
- (c) buildings, accessory structures, and all types of impervious surfaces;
- (d) hazardous or sanitary waste landfills;
- (e) receiving areas for toxic or hazardous waste or other contaminants;
- (f) mining;
- (g) storm water retention and detention facilities, except those built as constructed wetlands that meet the approval of the Office of Planning and Zoning of [county/municipality].

5.1. The following land uses are excepted from the provisions of Section 4:

- (a) Existing land uses, except as follows:
 - 1. when the existing land use, or any building or structure involved in that use, is enlarged, increased, or extended to occupy a greater area of land; or
 - (h) Construction- of a single family residence, including the usual appurtenances, provided that:
 - 2. based on the size, shape or topography of the property, as of the effective date of this ordinance, it is not reasonably possible to construct a single-family dwelling without encroaching upon the Riparian Buffer Zone; and
 - 3. the dwelling conforms with all other zoning regulations; and
 - 4. the dwelling is located on a tract of land containing at least two acres. For purposes of these standards, the size of the tract of land shall not include any area that lies within the protected river or stream; and
 - 5. there shall be only one such dwelling on each two-acre or larger tract of land; and
 - 6. septic tank drain fields shall not be located within the buffer area, although a septic tank or tanks serving such a dwelling may be located within the RBZ.
- (i) Other uses permitted by the North Carolina DNR or under Section 404 of the Clean Water Act.

5.2. Notwithstanding the above, all excepted uses, structures or activities shall comply with the requirements of the Erosion and Sedimentation Act of 1975 and all

DISTRICT USE AND REGULATIONS.

EXCEPTIONS.

Important Note:

If Section 5.1(h)-1 exceeds the state minimum standards by requiring the residence to be located outside of the riparian buffer if possible. As of this writing, such a provision may require other approval.

MINOR VARIANCES.

Minor variances allow for buffer averaging,” which gives the land-owner a fast and easy method for reducing the width of the RBZ by small amounts, if necessary.

applicable best management practices and shall not diminish water quality as defined by the Clean Water Act. All excepted uses shall be located as far from the stream bank as reasonably possible.

6.1. A minor variance is a reduction in buffer width over a portion of a property in exchange for an increase in buffer width elsewhere on the same property such that the average buffer width remains as specified above. No minor variance can decrease buffer width to less than 25 feet less than the buffer width. A property owner may request a minor variance from the requirements of the RBZ by preparing the appropriate application with the [county/municipality] Office of Planning and Zoning.

6.2. Each applicant for a minor variance must submit documentation that issuance of the variance will not result in a reduction in water quality. All minor variances shall adhere to the following criteria:

- (a) the width of the RBZ shall be reduced by the minimum amount possible, and never to less than 25 feet less than the buffer width at any point; and
- (b) reductions in the width of the RBZ shall be balanced by corresponding increases in the RBZ elsewhere on the same property, such that the total area included in the RBZ is the same as the (width specified above) wide; and
- (c) land-disturbing activities must comply with the requirements of the Erosion and Sedimentation Act of 1975 and all applicable best management practices (BMP).

MAJOR VARIANCES.

7.1. A major variance is a reduction in RBZ width that is not balanced by a corresponding increase in buffer width elsewhere on the same property, or else a reduction in buffer width to less than as specified above. A property owner may request a major variance from the requirements of the RBZ by preparing the appropriate application with the [county/municipality] Office of Planning and Zoning. Such requests shall be granted or denied by application of the criteria set forth below in section 7.3 and will be subject to the conditions set forth below in section 7.4. Under no circumstances may an exception be granted which would reduce the buffer to a width less than the minimum standards established by state or federal law.

7.2. Each applicant for a major variance must provide documentation that describes:

- (a) existing site conditions, including the status of the protected area; and
- (b) the needs and purpose for the proposed project; and
- (c) justification for seeking the variance, including how buffer encroachment will be minimized to the greatest extent possible; and
- (d) a proposed mitigation plan that offsets the effects of the proposed encroachment during site preparation, construction, and post-construction- phases.

7.3. No major variance shall be issued unless the [county/municipality] Zoning Board of Appeals determines that:

- (a) the requirements of the RBZ represent an extreme hardship for the landowner such that little or no reasonable economic use of the land is available without reducing the width of the RBZ; or
- (b) the size, shape, or topography of the property, as of the effective date of this ordinance, is such that it is not possible to construct a single-family dwelling

without encroaching upon the Riparian Buffer Zone.

7.4. Any major variance issued by the [county/municipality] Zoning Board of Appeals will meet the following conditions:

- (a) the width of the RBZ is reduced only by the minimum extent necessary to provide relief; and
- (b) land-disturbing activities must comply with the requirements of the Erosion and Sedimentation Act of 1975 and all applicable BMP's. Such activities shall not impair water quality, as defined by the federal Clean Water Act and the rules of the North Carolina Department of Natural Resources, Division of Water Quality; and
- (c) as an additional condition of issuing the variance, the [county/municipality] Zoning Board of Appeals may require water quality monitoring downstream from the site of land-disturbing activities to ensure that water quality is not impaired.

8. The provisions of any ordinances or resolutions or parts thereof in conflict herewith are repealed, save and except such ordinances or resolutions or parts thereof which provide stricter standards than those provided herein.

9. Should any section, subsection, clause, or provision of this Article be declared by a court of competent jurisdiction to be invalid, such decision shall not affect the validity of this Article in whole or any part thereof other than the part so declared to be invalid.

10. This Article may be amended from time to time by resolution of the Board of Commissioners of [county/municipality]. Such amendments shall be effective as specified in the adopting resolution.

11. This article shall become effective upon its adoption.

**REPEAL
CLAUSE.**

SEVERABILITY.

AMENDMENT.

**EFFECTIVE
DATE.**

ADDITIONAL WATERSHED SUPPLY REQUIREMENTS.

The above ordinance meets the riparian buffer provisions of the state minimum standards for water supply watershed protection. However, the minimum standards place other restrictions on small and large water supply watersheds in addition to riparian buffer requirements. A water supply watershed is the drainage basin upstream of governmentally owned drinking water supply intake; a small water supply watershed is less than 100 square miles, while a large water supply watershed is 100 square miles or larger. A water supply reservoir is a governmentally owned impoundment of water for the primary purpose of providing water to one or more governmentally owned public drinking water systems.

Within a seven-mile radius upstream of a water supply reservoir, no impervious surfaces, septic tanks or septic tank drain fields may be installed within 150 feet of a stream bank.

Note: The EPD can approve alternate criteria for protecting drinking water standards. Because the ordinance above is generally stricter than the state minimum standards, the EPD may allow local governments to waive certain criteria, such as the 150-foot impervious surface/septic setbacks. We do not recommend waiving the other requirements described here.

In both large and small water supply watersheds, new facilities which handle hazardous materials of the types and amounts determined by the Department of Natural Resources must perform their operations on impermeable surfaces having spill and leak collection systems as prescribed by the Department of Natural Resources. In small water supply watersheds only, new hazardous waste treatment or disposal facilities are prohibited, and new sanitary landfills are allowed only if they have synthetic liners and leachate collection systems. The impervious surface area (including all public and private structures, utilities or facilities) of the entire water supply watershed shall be limited to twenty-five percent (25%) of the area of the watershed or existing use, whichever is greater.

For more information, see the following resources, categorized by topic.
Publications data for this additional material can be found in the References.
Riparian Buffers

Chesapeake Bay Riparian Handbook:

A Guide for Establishing and Maintaining Riparian Forest Buffers.

R. S. Palone and A. H. Todd, eds., 1998.

Available on the Internet at <http://www.chesapeakebay.net/facts/forests/handbook.htm>.

Site Planning for Urban Stream Protection.

T. Schueler, 1995.

Available from the Center for Watershed Protection at 410-461-8323.

State and Federal Laws Affecting Streams and Rivers

Environmental Management Requirements for Stream and River Corridors in Georgia.

G. Cowie and P. Hardy, 1997.

Available from the EPD at 1-888-EPD-5947 (Atlanta: 404-657-5947).

Floodplain Protection

Protecting Floodplain Resources: A Guidebook for Communities.
Federal Interagency Floodplain Management Task Force, 1996.
Available from the EPD floodplain management office at 404-656-6382.

Conservation Easements

A Landowner's Guide: Conservation Easements for Natural Resource Protection
(second edition).
L. Fowler and H. Neuhauser, 1998.
Available from the Georgia Environmental Policy Institute at 706-546-7507.

Reducing Impervious Surfaces and Other Local Environmental Provisions

Land Development Provisions to Protect Georgia Water Quality.
University of Georgia School of Environmental Design, 1997. Available from the
EPD at 1-888-EPD-5947 (Atlanta: 404-657-5947).

Reducing the Impacts of Storm Water Runoff through Alternative Development Practices.

A. E. Miller and A. Sutherland, 1999
Available from the Institute of Ecology, University of Georgia, Athens, GA 30602-2202; call 706-542-2968; or email lfowler@arches.uga.edu.

Stream Restoration

Stream Corridor Restoration: Principles, Practices and Processes
USDA interagency document, 1998.
Available on the Internet at http://www/hqnet.usda.gov/streams_restoration.htm.
Guidelines for Stream Bank Restoration
Georgia Soil and Water Conservation Commission, 1994.
Available from GSWCC at 706-542-4242.

Takings

Counties and the Takings Issue: How Far Can Government Go in Regulating Private Property?
J. Witten, 1997. Available from the Association County Commissioners of Georgia at 404-522-5022.

A Summary of Takings Law

R. L. Zoeckler, 1997. Available from the Georgia Environmental Policy Institute at 706-546-7507.

Transferable Development Rights (TDRs)

An Introduction to Transferable Development Rights
M. Bledsoe et al.
Available from the Institute of Ecology at 706-542-2968.

For Other Model Ordinances for Natural Resources Protection, Contact:

Office of Public Service and Outreach
Write to Institute of Ecology, University of Georgia,
Athens, GA 30602-2202; call 706-542-2968; or
email *lfowler@arches.uga.edu*.