

Appendix 3

Greenway Design Standards

This chapter discusses two design standards for the greenway types discussed above. First, trail design standards are presented together with trailhead facilities and their typical design features. Second, riparian design standards are also discussed for resource protection and conservation greenways.



Trail Design Standards

The Township is currently preparing a comprehensive trail plan for the community. Insofar as trails will be part of some of the Township's greenways, they are discussed here. Table 3A summarizes trail construction standards for several kinds of trail facilities. Several different kinds of trails will be needed within the Township greenway system depending on the greenway type and surrounding conditions. Several issues are involved with trail design, including adjacent land uses, terrain, land cover, and user types.

Trail User Types

Trail design affects the level of trail use and the recreational activities it can support. Trails are used by many types of people: young, old, physically fit and those that are less active, parents with young children, people using wheelchairs, people riding horseback or bicycles, people engaging in strenuous exercise and those just taking a leisurely stroll. All of these trail users should be accommodated on the trails within Whitemarsh Township's greenway system. Typical trail users and activities are described below. Design specifications needed by individual user types are discussed in the next section.¹³

Pedestrians

Pedestrians include runners, walkers, and in-line skaters. As stated above, this includes people of all ages and abilities, from seniors to the very young. Pedestrian speeds vary greatly, which can affect trail design parameters, with in-line skaters moving at greater speeds than runners and walkers. Pedestrians with baby strollers and dogs are a subset of pedestrian trail users.

Bicyclists

Bicyclists include those riding road/racing bicycles, those riding mountain and hybrid bicycles, and those riding with small children. Road/racing bicyclists tend to move more quickly than those riding mountain and hybrid bicycles. Families that are riding with young children tend to move along the trail more slowly than road and mountain bicyclists, and may require more areas to pull off to the side of the trail. Young children

¹³ At the time of preparation of this Plan, the Township was also working with a consultant to prepare a Township Trail Master Plan, the recommendations of which should be followed by the Township with regard to trail alignment and design..

may ride on a cart attached to an adult bicycle, or they may ride their own bicycle, tricycle or scooter. Many mountain bikers seek the more challenging ride provided by off-road, natural trails, rather than more formal paved trails.

Americans with Disabilities Act

Wheelchair users must also be accommodated on trails, and trails must be designed for their access and safe use. Trails must be designed in accordance with the accessibility standards of the Americans with Disabilities Act (ADA) which addresses issues such as trail access, grades, and surface material, while the converse is true for most road/racing bicyclists.

Equestrians

Horseback riders should be accommodated on the less urban portions and park sections of Whitemarsh Township's greenway system. Horses prefer a softer surface as opposed to stone or asphalt. On paved trail sections open to pedestrian and bicycle use, equestrians can utilize the grassed shoulder to avoid slipping on pavement, causing pavement damage, and to reduce conflicts with bicyclists and pedestrians. Areas of the trail systems appropriate for horses will be determined in the Township's Trail Master Plan.

General Trail Design Guidelines

General trail types and design standards are discussed below. The Pennsylvania Greenway Partnership offers the following general design guidelines for trail construction:

- Design trails with adequate lines of sight
- Design methods to control access such as gates
- Design security lighting for buildings and access points, and
- Determine environmentally sensitive areas and habitats and cultural features.

For urban, non-motorized trails The Pennsylvania Greenway Partnership recommends the following:

- Design trails to be consistent with existing neighborhood character
- Include as many access points as possible
- Incorporate multiple transportation modes
- Design social gathering areas
- Provide a sense of security and aesthetics
- Consider stormwater management and urban stream restoration in designs
- Design for multiple uses, and
- Design to accommodate maintenance vehicles¹⁴
- Areas with sensitive environmental features such as wetlands require specialized design which may include the construction of boardwalks or footbridges to protect the area and still provide connectivity.

¹⁴ *Creating Connections, The Pennsylvania Greenways Partnership, 1998, p. 65.*

Agency	Tread Width	Shoulder Width	Surface Material	Running Slope	Cross Slope	Vertical Clearance
Shared, Multi-Use Trail: Bicyclists, In-line skaters, walkers, runners, wheelchairs & strollers						
AASHTO	10'	2'	Paved or fine aggregates	5% (1:20)	2% (1:50)	6'-6"
BC	6'-8'	1'-2'	Crusher fines	4%	N/A	
MCPC	12'	2'-5'	Asphalt, macadam, or cinders	5%	1%	8'-10'
Pathway: Walkers, runners, wheelchairs & strollers						
MCPC	6'	2'	Cinder/macadam	1%-5%	1%-2%	10'
Bike Lane: Bicycles only						
AASHTO	3'-5'*	4'	Macadam	N/A	N/A	N/A
BC	5'	N/A	Macadam	N/A	N/A	8'
MCPC	4'-6'	6'-8'	Macadam	N/A	N/A	N/A
AASHTO: American Association of State Highway and Transportation Officials, BC: Brandywine Conservancy, MCPC: Montgomery County Planning Commission.						
*Depends on off-street parking						

Table 3A: Comparison of Trail Design Standards

Other general trail design elements to be considered include:

- the installation of gates at trailhead areas
- bollards to slow bicycle speeds, especially in high trail traffic areas
- crosswalks and signage at all road crossings
- landscaping and shade trees
- benches and trash receptacles
- wayfinding, directional and cautionary signage, for trail users and drivers
- pull off areas, and
- safety fencing along steep slopes.

Multi-Use Recreational Trails

The Montgomery County Planning Commission (MCPC) defines a multi-use trail as A trail that permits more than one user group (jogger, bicyclist, hiker, etc.) at a time, creating a two-way shared use area. The trail is constructed of a hard paved surface or hard compacted cinder to facilitate wheeled or pedestrian traffic.¹⁵

Trail tread widths vary between 6 feet to twelve feet, with between one-foot and five-foot shoulders. Gravel/cinder or crusher fine trails provide a hard surface but typically cost more to maintain than asphalt paved trails. If not properly maintained, cinder trails can develop potholes and weed infiltration. Asphalt paved trails typically cost more to construct but need less maintenance. Asphalt or macadam trails are typically the easiest surface for wheelchairs and in-line skaters to navigate, but are not well-suited for horses. Multi-use trails may vary in their design as to width and surface material. Design standards are influenced not only by user types, but also by adjacent land uses, setting, land cover and terrain. Multi-use trail tread widths typically range from eight feet to

¹⁵ *Guidelines for Trail Development within Montgomery County, Pennsylvania, MCPC, p. 4.*

twelve feet, depending on anticipated levels of use, types of users, and location. Grassed, maintained shoulder widths vary from two feet to five feet per side, with four to five feet being desirable according to the MCPC.¹⁶

Pathways

The MCPC also defines another type of trail facility, pathways, as a temporary or permanent area that is normally dirt or cinder although some areas are asphalt or concrete. A pathway typically indicates the common route taken by pedestrians between two locations.¹⁷ Pathways may serve as connectors to multi-use trails or may be constructed within parks, residential developments and smaller-scale trail projects.

Other trail facilities that may be implemented within the Township's greenway system include sidewalk retrofitting, which involves widening existing sidewalks to more safely accommodate two-way pedestrian traffic, and the construction of on-road bicycle facilities, including bike lanes and bike routes. A primitive or natural trail may be desired in areas such as meadows or woodlands where natural resource preservation is desired. The surface of a primitive or natural trail may consist of a mowed or dirt footpath.

Trailheads

Trailheads are areas where trails can be accessed from adjacent land. Depending on their intended function, trailheads and may provide a full range of support facilities and amenities or only a few. Trailheads can be described as primary or secondary and are described below.

Primary Trailheads

Primary trailheads are typically trailheads that are anticipated to have higher trail user numbers and provide a wider array of support facilities and amenities than do secondary trailheads. Standard facilities included at a primary trailhead include:

- ADA accessible parking areas, without or without lighting
- ADA accessible restrooms
- “Stub” trails leading to the main trail
- Gate at the beginning of the trail to block unauthorized vehicles
- Information kiosks containing mapping and trail related information
- Wayfinding and directional signage
- Picnic areas, benches and trash receptacles
- Water fountains
- Bicycle racks, and
- Landscaping and shade trees.

¹⁶ When a municipality enters the County's Green Fields/Green Towns program and applies for the County Trail Connection Grant Option, the municipality will be required to meet county trail guidelines.

¹⁷ Guidelines for Trail Development within Montgomery County, Pennsylvania, MCPC, p. 4.

Primary trailheads may or may not be located within an existing or proposed park. Parks make excellent places to establish primary trailheads because they may already provide many of the needed facilities and amenities. The number of parking spaces to be provided depends on the average daily number of anticipated trail users and site constraints.

Secondary Trailheads

Secondary trailheads are those that may serve lower numbers of trail users, may be located in more remote areas along the trail, or are simply limited by the size of the tract to be used for the trailhead. Secondary trailheads may consist only of a gate, an informal parking area and signage marking the trail access point.

Riparian Buffer Standards

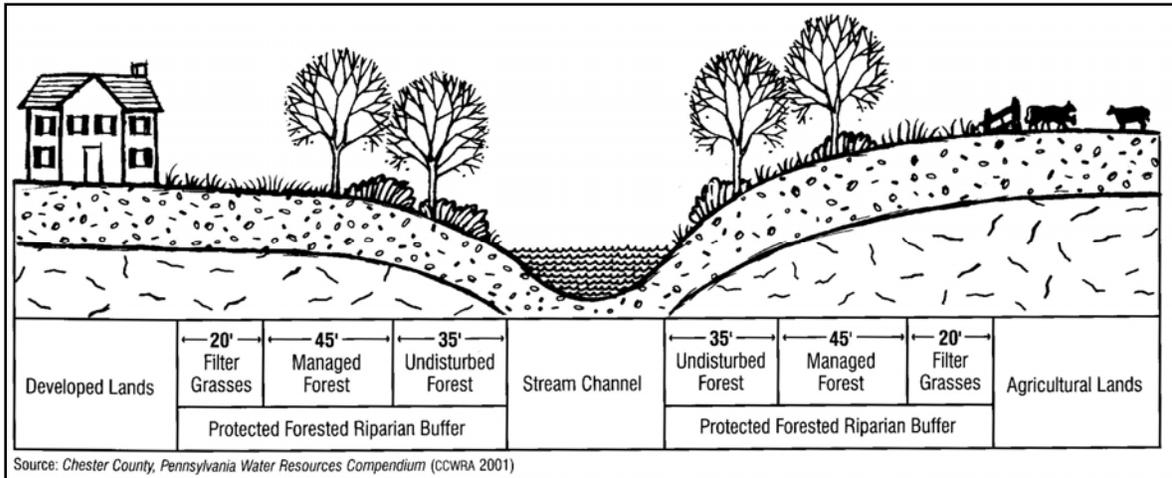
Riparian buffer greenways primarily serve conservation and resource protection functions and therefore should remain in or be restored as close to their natural states as possible. Riparian buffer greenways may include trail facilities, the design of which may vary in terms of width and construction materials. Trail design is also affected depending on the existing conditions of the buffer area. Forested riparian buffers may also be developed solely on private lands, providing no public access. In these cases, the purpose of the buffer is to provide environmental function. Riparian buffer width may vary according to existing land uses and the general setting of the area, i.e., urban, suburban, rural, etc. Typical riparian buffers range from 50 feet to 300 feet from the edge of the waterway, with 50 feet being appropriate for more urban areas and 300 feet being appropriate for rural areas. Chester County's water resources plan Watersheds includes this description of a typical riparian buffer:

To be most effective, riparian buffers should include three zones. The streamside zone should include natural, undisturbed trees and bushes that provide shade and detritus to the stream, and root masses that stabilize stream banks and channels. The second zone is a managed forest zone with trees and shrubs that provide pollution filtering and uptake through the roots of the plants, as well as infiltration. The third or upland zone includes grasses and features to slow and disperse the runoff as it enters the buffer and filters sediments and pollutants.¹⁸

Figure 3A on the following page shows the three sections of a typical 100-foot wide riparian buffer, consisting of a 35-foot wide undisturbed forest adjacent to the edge of the stream channel, followed by a 45-foot wide managed forest area (the widest section), and a 20-foot wide grassed area.

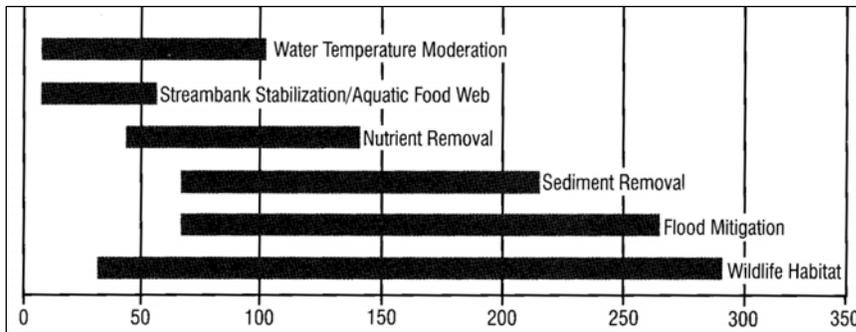
¹⁸ *Watersheds*, Chester County Water Resources Authority, 2002, p. 33.

Figure 3A: Riparian Buffer Cross-Section¹⁹



Recommended riparian buffer widths depend in part on the desired function of buffer, as shown in Figure 3B. Variation in buffer width needed to accomplish various environmental goals, ranging from water temperature moderation to wildlife habitat preservation. Sediment removal, flood mitigation and wildlife habitat preservation require the most buffer land, from 200 feet to almost 300 feet.

Figure 3B: Desired Buffer Function and Minimum Buffer Width (Linear Feet)²⁰



Depending on the desired function(s), the width of a riparian buffer may vary along stream sections. The Montgomery County Comprehensive Plan 2025 provides the following principles to follow regarding riparian buffer areas:

- Forest riparian buffer corridors should be maintained and reforestation should be encouraged where there are no wooded buffers
- The riparian corridor should be uninterrupted so reduce concentrated stream flows and provide continuous habitat for the passage of animals

¹⁹ *Watersheds*, Chester County Water Resources Authority, 2002, p. 33.

²⁰ *Watersheds*, Chester County Water Resources Authority, 2002, p. 34.

Riparian corridors should extend at least 75’ from the edge of the stream for optimal performance, consisting of an undisturbed forest to provide shade followed by managed woodlands

Recreation within the riparian buffer should be balanced with the impact it may have upon existing natural features and,

Generally the riparian buffer should remain in its natural state. Minor landscaping to reduce concentrated flow and the removal of exotic plant species should be permitted.²¹

Whitmarsh Township’s Riparian Corridor Conservation District Zoning Ordinance (Article XXXV) contains riparian corridor design requirements, described in Table 3B below. For perennial and intermittent streams, the ordinance requires a minimum riparian buffer area of 150 feet within two zones, plus the width of the stream. The ordinance also requires the reestablishment of forest cover and woodland habitat within required buffer areas. This overlay district is not currently shown on the Township’s Zoning Map.

Table 3B: Riparian Corridor Conservation District Ordinance Design Requirements

Stream Type	Corridor Width	
	Zone 1	Zone 2
Perennial	Minimum Width: 25' from edge of watercourse.	Minimum Width: 50' from outer edge of Zone 1, or equal to the extent of the 100-year floodplain, or 25' beyond outer edge of wetland margin, whichever is greater. Total minimum width of Zones 1 and 2 = 150' plus stream width.
Intermittent	Minimum Width: 25' from edge of watercourse.	Minimum Width: 50' from outer edge of Zone 1, or equal to the extent of the 100-year floodplain, or 25' beyond outer edge of wetland margin, whichever is greater. Total minimum width of Zones 1 and 2 = 150' plus stream width.
Wetlands & Waterbodies	Minimum Width: 25' from edge of wetland or water body.	Zone 2: Does not apply

²¹ *The Montgomery County Comprehensive Plan 2025*, Montgomery County Planning Commission, 2005, pp. 44-43.