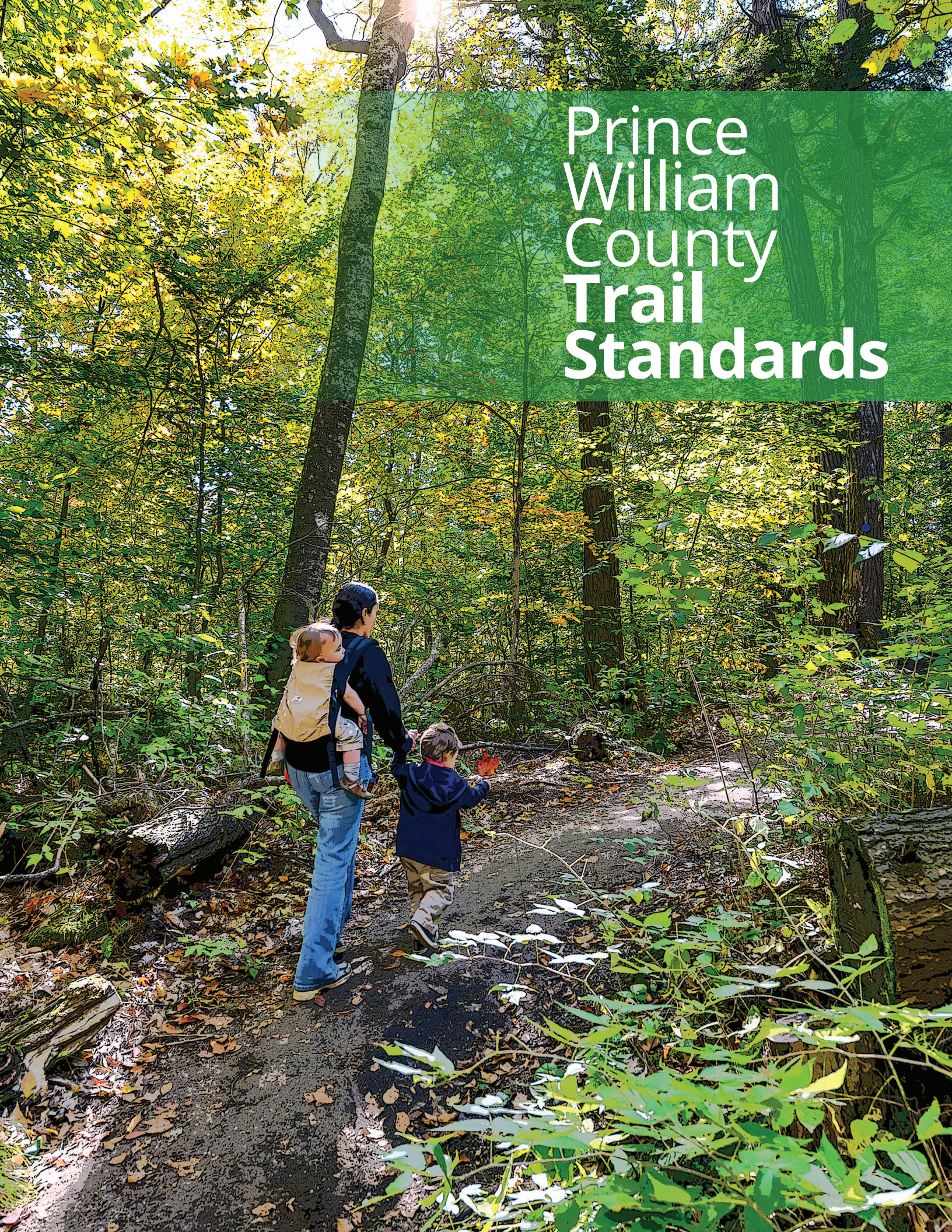


Prince William County **Trail Standards**

Prince William County
PARKS & RECREATION

CONTENTS

1. Introduction

1.1 Intent

This manual lays out the standards for the construction, **Figure**, and management of recreational trails on lands managed by the Prince William County Department of Parks and Recreation (DPR). All trail developments undertaken after adoption of this manual shall be built according to these standards. Existing trails will be upgraded to conform to these standards as they are maintained and renovated, or as resources permit full re-builds.

Trail standards provide the foundation for a recreational trail system that is environmentally, socially, and economically sustainable, and that provides a world-class user experience to the County's residents and visitors. A successful trail system depends not only on great trails, but also on the cooperation of stakeholders; from trail users and volunteers to County staff. To facilitate this cooperative and collaborative approach, the county's trail system operates under a full multi-use management scheme for non-motorized uses (pedestrian, equestrian, and cyclist), though different design standards and right of ways may apply depending on the primary use of the trail.

These standards apply to all publicly-accessible trails managed by the DPR within Prince William County. While the DPR-managed trail system does connect and provide access to many parcels of county, state, and federal public lands, these entities have their own trail design standards and users should not expect 100% consistency in trail construction as they cross jurisdictional boundaries. Every effort will be made to coordinate with other jurisdictions to provide consistent wayfinding as trail users navigate the regional trail network. As use patterns and overall volume change over time, these standards may be revised to address current conditions.

Currently, DPR's trail system is limited to non-motorized uses, though limited access for motor vehicles by County staff and contractors is permitted during construction and maintenance activities, and during emergencies. In the future, there may be designated areas for permitted Off Highway Vehicle (OHV) access, in cooperation with local OHV clubs and non-profits. Should OHV areas be added to the DPR system, these standards will be updated with best practices for design, construction, and management of OHV trails.

DPR's vision is to establish a high-quality, interconnected, and equitably distributed recreational trail network, connecting communities to educational and recreational opportunities throughout the county. To establish this network, DPR is working with a coalition of diverse stakeholders to complete long distance connector trails like the Potomac Heritage National Scenic Trail and the Broad Run Trail, while investing in existing trails in our parks to create a great experience for users of all modes and ages.

With the support of the public and the guidance of these standards, the Prince William County trail network can become an incredible resource for our citizens and visitors for years to come.

2. Trail System Management

2.1 Trail Classifications

Prince William County Department of Parks and Recreation has adapted the U.S. Department of Agriculture Forest Service (USFS) Trail Classifications to describe and categorize trails in the county parks system. These classifications describe the general development scale and intended design, use, and management of the trail. Local variations of individual trail attributes are permitted, provided that the deviations from these standards do not undermine the general intent of the Trail Class. Existing trails will be classified as field assessments are performed, and new or proposed trails will be classified in the design phase.

These classifications apply to recreational trails managed by DPR. They do not correspond with the transportation classifications represented in the Prince William County Comprehensive Plan. Trail Class 5 under the Parks classification matrix above is roughly comparable in design and construction to Class 1 trails as described in the Comprehensive Plan. When constructing Class 5 trails on park property that connect to existing or proposed Class 1 trails, all efforts will be made to conform to the *AASHTO Bike and Pedestrian Guides*, as well as the design of the non-park trail.

2.2 Trail Maintenance and Inspection Standards

Trails, like any park facility, require regular inspections and maintenance. All inventoried trails will be regularly inspected by County staff and trained volunteers utilizing the Trail Assessment form (Appendix), in accordance with the Department of Parks and Recreation's Trail Maintenance Policy.

Maintenance schedules may be altered by the DPR based on a number of variables, from risk management to input from the public and elected officials. Unscheduled maintenance is expected to occur regularly, as environmental and user impacts to the trail system occur. Example triggers for unscheduled repairs and maintenance include:

- Vegetation Loss
- Storm Damage
- Soil Loss
- Persistent Wet Tread or Standing Water
- Trail Widening or Braiding

Figure 2.1 Trail Class Matrix

Trail Attributes	Trail Class 1 Minimally Developed	Trail Class 2 Moderately Developed	Trail Class 3 Developed	Trail Class 4 Highly Developed	Trail Class 5 Fully Developed
Tread & Traffic Flow	• Tread intermittent and often indistinct • May require route finding • Single lane with no allowances constructed for passing • Predominantly native materials	• Tread continuous and discernible, but narrow and rough • Single lane with minor allowances constructed for passing • Typically native materials	• Tread continuous and obvious • Single lane, with allowances constructed for passing where required by traffic volumes in areas with no reasonable passing opportunities available • Native or imported materials	• Tread wide and relatively smooth with few irregularities • Single lane, with allowances constructed for passing where required by traffic volumes in areas with no reasonable passing opportunities available • Double lane where traffic volumes are high and passing is frequent • Native or imported materials • May be hardened	• Tread wide, firm, stable, and generally uniform • Single lane, with frequent turnouts where traffic volumes are low to moderate • Double lane where traffic volumes are moderate to high • Commonly hardened with asphalt or other imported material
Obstacles	• Obstacles common, naturally occurring, often substantial and intended to provide increased challenge • Narrow passages; brush, steep grades, rocks and logs present	• Obstacles may be common, substantial, and intended to provide increased challenge • Blockages cleared to define route and protect resources • Vegetation may encroach into trailway	• Obstacles may be common, but not substantial or intended to provide challenge • Vegetation cleared outside of trailway • Constructed TTFs may be placed to add challenge	• Obstacles infrequent and insubstantial • Vegetation cleared outside of trailway • Constructed TTFs may be placed to add challenge	• Obstacles not present • Grades typically <8% • Constructed TTFs may be placed to add challenge
Constructed Features & Trail Elements	• Structures minimal to non-existent • Drainage typically accomplished without structures • Natural fords • Typically no bridges	• Structures of limited size, scale, and quantity; typically constructed of native materials • Structures adequate to protect trail infrastructure and resources • Natural fords • Bridges as needed for resource protection and appropriate access	• Structures may be common and substantial; constructed of imported or native materials • Natural or constructed fords • Bridges as needed for resource protection and appropriate access • Bike-specific Technical Trail Features may be present	• Structures frequent and substantial; typically constructed of imported materials • Constructed or natural fords • Bridges as needed for resource protection and user convenience • Trailside amenities may be present • Bike-specific technical trail features may be present	• Structures frequent or continuous; typically constructed of imported materials • May include bridges, boardwalks, curbs, handrails, trailside amenities, and similar features • Bike-specific Technical Trail Features may be present

Figure 2.1 Trail Class Matrix *(continued)*

Trail Attributes	Trail Class 1 Minimally Developed	Trail Class 2 Moderately Developed	Trail Class 3 Developed	Trail Class 4 Highly Developed	Trail Class 5 Fully Developed
Signs[1]	Route identification signing limited to junctions Route markers present when trail location is not evident Regulatory and resource protection signing infrequent Destination signing, unless required, generally not present Information and interpretive signing generally not present	Route identification signing limited to junctions Route markers present when trail location is not evident Regulatory and resource protection signing infrequent Destination signing typically infrequent outside of wilderness; generally not present in wilderness Information and interpretive signing not common	Route identification signing at junctions and as needed for user reassurance Route markers as needed for user reassurance Regulatory and resource protection signing may be common Destination signing likely outside of wilderness; generally not present in wilderness Information and interpretive signs may be present outside of wilderness	Route identification signing at junctions and as needed for user reassurance Route markers as needed for user reassurance Regulatory and resource protection signing common Destination signing common outside of wilderness; generally not present in wilderness Information and interpretive signs may be common outside of wilderness Accessibility information likely displayed at trailhead	Route identification signing at junctions and for user reassurance Route markers as needed for user reassurance Regulatory and resource protection signing common Destination signing common Information and interpretive signs common Accessibility information likely displayed at trailhead
Typical Recreation Environs & Experience[2]	Natural, unmodified ROS: Typically Primitive to Roaded Natural WROS: Typically Primitive to Semi-Primitive	Natural, essentially unmodified ROS: Typically Primitive to Roaded Natural Typically WROS: Typically Primitive to Semi-Primitive	Natural, primarily unmodified ROS: Typically Primitive to Roaded Natural WROS: Typically Semi-Primitive to Transition	May be modified ROS: Typically Semi-Primitive to Rural Roaded Natural to Rural setting WROS: Typically Portal or Transition	May be highly modified Commonly associated with visitor centers or high-use recreation sites ROS: Typically Roaded Natural to Urban

Source: USDA Forest Service Trail Fundamentals and Trail Management Objectives Training Reference Package

1 For standards and guidelines for the use of signs and posters along trails, refer to Section 3.5 of this manual

2 The Trail Class Matrix shows the combinations of Trail Class and Recreation Opportunity Spectrum (ROS) or Wilderness Recreation Opportunity Spectrum (WROS) settings that commonly occur, although trails in all Trail Classes may and do occur in all settings. For guidance on the application of the ROS and WROS, refer to FSM 2310 and 2353 and FSH 2309.18. In the context of Prince William County, read these spectra as describing "Frontcountry" and Backcountry" recreational opportunities, respectively.

- Creation of unauthorized or user-created trails.
- Deterioration or damage to bridges and built structures

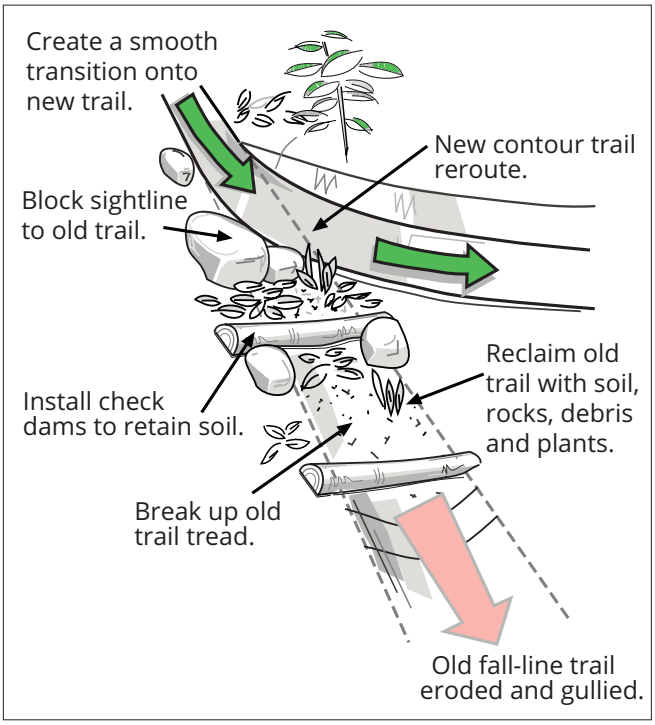
Trail issues that adversely impact user safety, trail access, and critical signage will be prioritized over more routine maintenance activities such as tread maintenance and removal of fallen trees. DPR will, in cooperation with volunteer and interagency partners, determine priority issues and schedule maintenance accordingly.

Inspections of existing trails may reveal the need for temporary closure to address maintenance needs. When this is the case, the rationale for closure must be well documented, and all relevant stakeholders consulted. Clear, concise communications from DPR, including appropriate signage and digital and social media outreach.

When trails must be permanently closed or realigned, the decommissioned trail shall be fully reclaimed, to prevent future use and environmental impact. Proper closure technique is illustrated in **Figure 2.2**.

In the event a popular trail must be permanently closed, every effort will be made to recreate the user experience it offered within the same park unit, to provide an attractive alternative for trail users and keep the problematic trail closed.

Figure 2.2 Trail Closure and Reclamation



Source: IMBA Trail Solutions

2.3. Risk Management

2.3.1. Trail Difficulty Ratings

DPR has adopted the International Trail Marking system, used at trail systems worldwide, to describe difficulty ratings of our trails (**Figure 2.3**). Trail difficulty ratings reflect the technical difficulty, rather than the aerobic difficulty, of a particular trail. It is most critical to sign difficulty ratings on trails with heavy off-road bicycle or equestrian use, and on hiking trails with unusual amounts of obstacles or downhill exposure. These ratings are based on four criteria: Tread Width, Tread Surface, Trail Grade, and Natural Obstacles/Technical Trail Features (IMBA 2007). Not all trails in the system will be marked explicitly with trail difficulty signage. Trails without explicit ratings should be considered "Easy".

Figure 2.3 Trail Difficulty Ratings

Easiest	White Circle
Easy	Green Circle
More Difficult	Blue Square
Very Difficult	Black Diamond
Extremely Difficult	Double Black Diamond

3. Trail Construction Standards and Best Practices

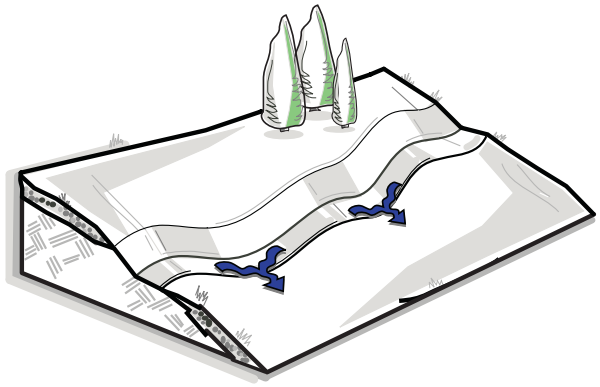
3.1. Standards and Guidelines

Trails within the county parks system are designed and constructed in accordance with the best practices for sustainable trails as described in the USDA Forest Service's *Trail Construction and Maintenance Notebook: 2007 Edition,* the International Mountain Bicycling Association's publications *Trail Solutions: IMBA's Guide to Building Sweet Singletrack*, and *Bike Parks: IMBA's Guide to New School Trails*, and the Resort Municipality of Whistler's *Whistler Trail Standards: Environmental and Technical Trail Features*. These works contain extensive design and construction resources and are incorporated herein by reference.

Whenever practicable, trails will be sited to minimize environmental impacts. This includes avoiding sensitive habitats, wetlands, water crossings, and problematic soils whenever possible, as well as minimizing impacts to vegetation by routing the trail to avoid unnecessary damage to or removal of significant trees or vegetative communities. Trails will be constructed to preserve the natural hydrology of the site and minimize erosion and sedimentation into the county's waterways.

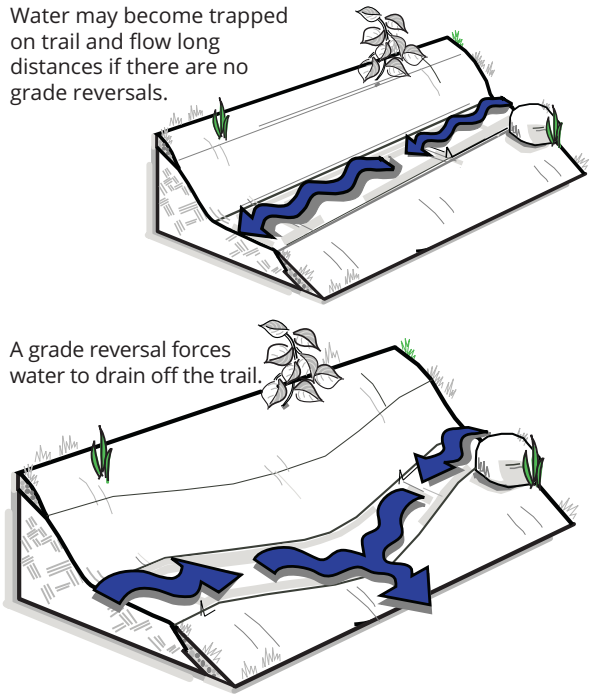
In addition, all trail design, construction, maintenance, and programming will be undertaken in compliance with the County's environmental statement, to insure DPR, our contractors, and community partners are acting as good stewards of our natural resources and public lands. See **Section 3.1.1** for the full text of the statement.

Figure 3.1 Rolling Contour Trail Design



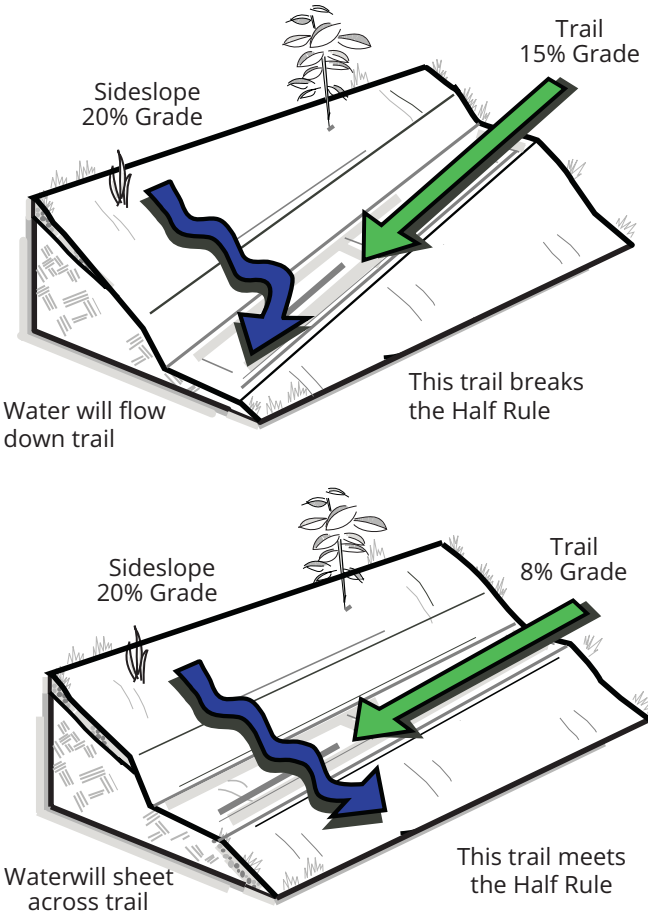
Source: IMBA Trail Solutions

Figure 3.2 Grade Reversal



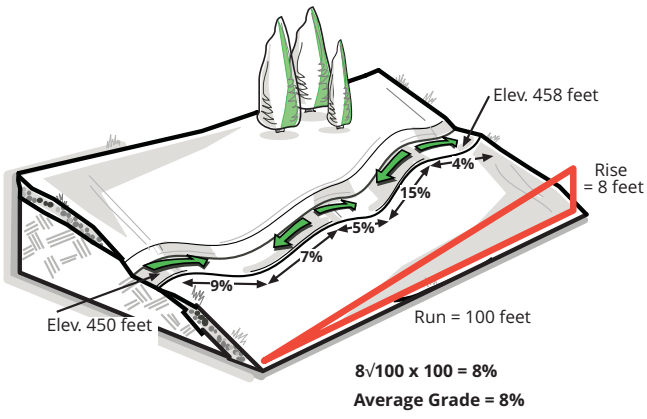
Source: IMBA Trail Solutions

Figure 3.3 The Half Rule



Source: IMBA Trail Solutions

Figure 3.4 Average Segment Grade



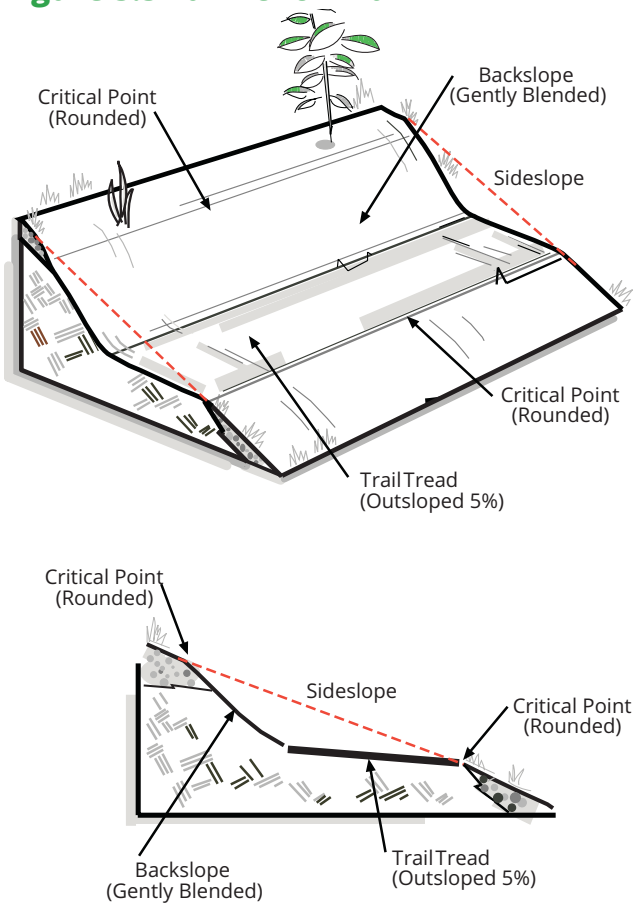
Source: IMBA Trail Solutions

For sustainability reasons, the majority of natural and hardened surface trails within the county parks system will be built with a rolling contour design (**Figure 3.1**). A contour trail is a path that traverses a hill or sideslope at a gentle grade. It's defined by undulations called grade reversals (**Figure 3.2**) and an outsloped tread that encourages water to flow off the downhill edge of the trail. These features minimize erosion and sedimentation by promoting sheet flow of water, rather than channeling water onto the trail tread (USFS 2007).

Sustainable trails follow "The Half Rule" (**Figure 3.3**), which states that a trails grade shouldn't exceed half the grade of the hillside or sideslope that the trail traverses. Trails that do exceed this rule follow the hill's fall line and will present erosion and maintenance issues over time (USFS 2007). Much of the land managed by DPR is located in the coastal plain and flatter sections of the piedmont, and contain marginal soils. The half rule is especially important where gentle slopes are prevalent. Slopes don't have to be severe for fall line trails to erode quickly, and care must be taken while utilizing the gentle microtopography of Prince William County to create the most sustainable trail alignment.

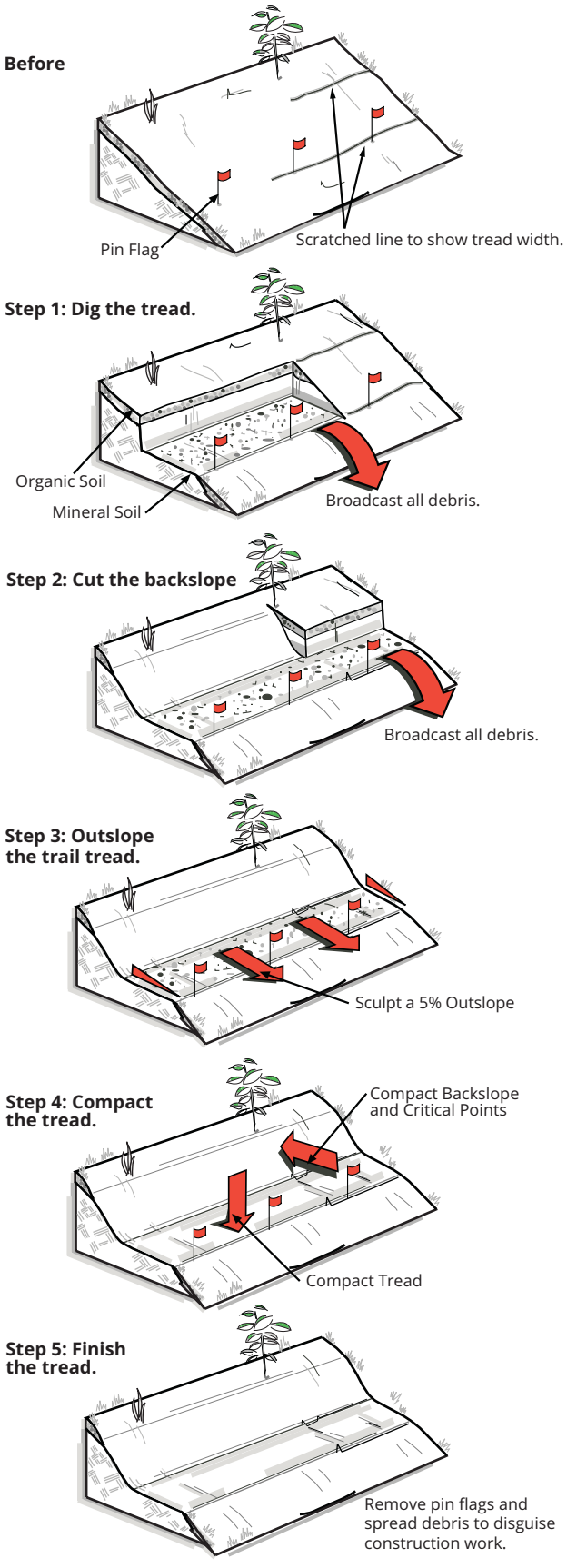
In general, trails on county lands will also follow the Ten Percent Average guideline (**Figure 3.4**), which holds that an average grade of 10% for a trail segment is the most sustainable from an erosion control standpoint. Some soil types and construction techniques (such as hardening or rock armoring) may mitigate the need to strict-

Figure 3.5 Full Bench Trail



Source: IMBA Trail Solutions

Figure 3.6 Stages of Construction



Source: IMBA Trail Solutions

ly adhere to the Ten Percent Average guideline (USFS 2007).

Trails will be built using full bench construction wherever practicable. Full bench is built by cutting the full width of the tread into the hillside and broadcasting excavated soils downslope to prevent a dam of displaced soil from forming and holding water on the trail (USFS 2007). A full bench trail is shown in **Figure 3.5**, while the stages of construction are shown in **Figure 3.6.**

In order to minimize environmental impacts, trails should be sited to avoid sensitive habitats, wetland areas, cultural resources, and water resources whenever possible. If, due to site constraints or other factors, sensitive areas cannot be avoided, care will be taken to minimize construction impacts and maximize the interpretive and educational value of the trail traversing the area.

3.1.1. County Environmental Statement

Prince William County is dedicated to serving as environmental stewards to our community through

the use of an Environmental Management System that we promote throughout the organization.

Prince William County's Environmental Management System (EMS) will meet the following goals:

Meet and exceed regulatory compliance in County owned/leased facilities and operations through continuous program improvement and annual reviews of local, state, and federal regulations.

Educate County employees on EMS goals, best management practices, and environmental stewardship. Support the Green Guiding Committee in their mission to share green tips and practices, inspire employee action and seek ways to reduce the impact of County government operations on our local natural environment.

Reduce the potential impact of the County organization's activities on the environment. Seek to integrate pollution prevention, waste minimization, and natural resource conservation into all County planning and decision making.

Figure 3.7 Accommodating Equestrians

Designed Use[1] Equestrian		Trail Class 1	Trail Class 2	Trail Class 3	Trail Class 4	Trail Class 5
Design Tread Width	Wilderness[3] (Single Lane)	Typically not designed or actively managed for equestrians, although use may be accepted	12" – 18" May be up to 48" along steep side slopes 48" – 60" or greater along precipices	18" – 24" May be up to 48" along steep side slopes 48" – 60" or greater along precipices	24" May be up to 48" along steep side slopes 48" – 60" or greater along precipices	Typically not designed or actively managed for equestrians, although use may be accepted
	Non-Wilderness (Single Lane)		12" – 24" May be up to 48" along steep side slopes 48" – 60" or greater along precipices	18" – 48" 48" – 60" or greater along precipices	24" – 96" 48" – 60" or greater along precipices	
	Non-Wilderness (Double Lane)		60"	60" – 84"	84" – 120"	
	Structures (Minimum Width)		Other than -bridges: 36" Bridges without handrails: 60" Bridges with handrails: 84" clear width	Other than bridges: 36" Bridges without handrails: 60" Bridges with handrails: 84" clear width	Other than bridges: 36" Bridges without handrails: 60" Bridges with handrails: 84" clear width	
Design Surface[2]	Type		Native, limited grading May be frequently rough	Native with some onsite borrow or imported material where needed for stabilization, occasional grading Intermittently rough	Native, with improved sections of borrow or imported material, routine grading Minor roughness	
	Protrusions		≤ 6" May be common and continuous	≤ 3" May be common, not continuous	≤ 3" Uncommon, not continuous	
	Obstacles (Maximum Height)		12"	6"	3"	
Design Grade [2]	Target Grade		5% – 20%	3% – 12%	2% – 10%	
	Short Pitch Maximum		30%	20%	15%	
	Maximum Pitch Density		15% – 20% of trail	5% – 15% of trail	5% – 10% of trail	

Protect our natural resources by promoting the purchase of goods that are reusable instead of disposable, made of recycled or recyclable materials, biodegradable, and/or safer for the environment. Identify cost saving efficiencies that reduce waste.

Continue to design, develop, construct, and maintain County facilities to encourage resource efficiency and follow LEED silver standards for new facilities and major renovations of existing facilities.

Share environmental best practices with the public and encourage the implementation of these practices at their work places.

Continuously work to improve the County organization's environmental goals and policies to ensure the highest quality of life for our citizens.

An Employee Environmental Management System Council, made up of facility representatives, will work to advance and promote these goals.

3.2. Equestrian Trail Standards

Trails that see significant (20% or more of the total user volume) equestrian use should be built and maintained to the following standards, and will be signed as appropriate for equestrian access. In general, tread and vegetative clearing should follow the guidelines in **Figure 3.7** to safely accommodate equestrians. The majority of DPR's existing equestrian trails fall into Class III and Class IV on the matrix below.

Water crossings (fords and bridges) on equestrian trails should be designed and built to support equestrian use. Alternate crossings or routes to accommodate equestrians on multi-use trails will be acceptable, provided there is proper signage delineating the equestrian route.

For more detailed information on equestrian trail design and management, DPR staff and volunteers should refer to the USDA Forest Service's *Equestrian Design Guidebook for Trails, Trailheads, and Campgrounds*, incorporated herein by reference.

3.3 Mountain Bike Trail Standards

Multi-use trails that see significant (20% or more of the total user volume) mountain bike use should be built and maintained to the following standards, and will be signed as appropriate for bike access. In general, tread and vegetative clearing should follow the guidelines in **Figure 3.8** to safely accommodate mountain bicyclists. The majority of DPR's existing mountain bike trails fall into Class II and

Figure 3.7 Accommodating Equestrians *(continued)*

Designed Use[1] Equestrian		Trail Class 1	Trail Class 2	Trail Class 3	Trail Class 4	Trail Class 5
Design Cross Slope	Target Cross Slope		5% – 10%	3% – 5%	0% – 5%	
	Maximum Cross Slope		10%	8%	5%	
Design Clearing	Height		8′ – 10′	10′	10′ – 12′	
	Width		72″ Some light vegetation may encroach into clearing area	72″ – 96″	96″	
	Shoulder Clearance		6″ – 12″ Pack clearance: 36″ x 36″	12″ – 18″ Pack clearance: 36″ x 36″	12″ – 18″ Pack clearance: 36″ x 36″	
Design Turn	Radius		4′ – 5′	5′ – 8′	6′ – 10′	

1 For definitions of Design Parameter attributes (e.g., Design Tread Width and Short Pitch Maximum) see FSH 2309.18, section 05.

2 The determination of trail-specific design grades, design surface, and other Design Parameters should be based upon soils, hydrological conditions, use levels, erosion potential, and other factors contributing to surface stability and overall sustainability of the trail.

3 The Designed Use table makes a distinction between Wilderness and Non-Wilderness settings. While PWC does not contain any federally-designated Wilderness areas, the Wilderness design specification may be appropriate for less developed or more rural trail systems. In the context of Prince William County, read these spectra as describing "Frontcountry" and Backcountry" recreational opportunities, respectively.

Source: USDA Forest Service Trail Fundamentals and Trail Management Objectives Training Reference Package

Figure 3.8 Accommodating Bicycles

Designed Use Bicycle		Trail Class 1	Trail Class 2	Trail Class 3	Trail Class 4	Trail Class 5
Design Tread Width	Single Lane	6" – 12"	12" – 24"	18" – 36"	24" – 48"	36" – 60"
	Double Lane	36" – 48"	36" – 48"	36" – 48"	48" – 84"	72" – 120"
	Structures (Minimum Width)	18"	18"	36"	48"	60"
Design Surface[2]	Type	Native, un-graded May be continuously rough Sections of soft or unstable tread on grades < 5% may be common and continuous	Native, limited grading May be continuously rough Sections of soft or unstable tread on grades < 5% may be common	Native with some onsite borrow or imported material where needed for stabilization, occasional grading Intermittently rough Sections of soft or unstable tread on grades < 5% may be present, but not common	Native, routine grading with improved sections of borrow or imported materials Stable with minor roughness	Likely imported material, routine grading Uniform, firm, and stable
	Protrusions	≤ 24" Likely common and continuous	≤ 6" May be common and continuous	≤ 3" May be common, not continuous	≤ 3" Uncommon, not continuous	No protrusions
	Obstacles (Maximum Height)	24"	12"	10"	8"	No obstacles
Design Grade [2]	Target Grade	5% – 20%	5% – 12%	3% – 10%	2% – 8%	2% – 5%
	Short Pitch Maximum	30% 50% on downhill-only segments	25% 35% on downhill-only segments	15%	10%	8%
	Maximum Pitch Density	20% – 30% of trail	10% – 30% of trail	10% – 20% of trail	5% – 10% of trail	0% – 5% of trail

1 For definitions of Design Parameter attributes (e.g., Design Tread Width and Short Pitch Maximum) see FSH 2309.18, section 05.

2 The determination of trail-specific design grades, design surface, and other Design Parameters should be based upon soils, hydrological conditions, use levels, erosion potential, and other factors contributing to surface stability and overall sustainability of the trail.

Source: USDA Forest Service Trail Fundamentals and Trail Management Objectives Training Reference Package

Class III on the matrix below. When designing multi-use trails to accommodate mountain bike use, it is important to design the trail to control the speed of faster users like cyclists and trail runners. The International Mountain Bicycling Association (IMBA) recommends a few tactics and design elements to control speed and promote user harmony in their book *Managing Mountain Biking: IMBA's Guide to Providing Great Riding*:

1. Understanding Trail Flow
2. Use More Singletrack
3. Design for Optimum Speed
4. Use Turns
5. Corral the Trail
6. Install Choke Points
7. Modify the Surface Texture
8. Plan for Passing
9. Consider Sitelines

These elements allow riders to experience the sensation of speed and challenge without creating a potentially dangerous speed differential between user groups, as well as encouraging awareness of users moving along the trail at different rates. This allows users to make safe passes without leaving the trail tread or coming to an unexpected stop mid-trail.

As the sport of mountain bicycling evolves, there is increasing demand for bike-specific or bike-optimized trails. These types of trails are characterized by natural and man-made technical trail features (TTFs), insloped turns, rollers,

Figure 3.9 Fountainhead Regional Park

Source: Mid-Atlantic Off-Road Enthusiasts (MORE)

Figure 3.10 Wooden Berm at Meadowood SRMA

Source: IMBA

tabletops, and "lifted and tilted" tread construction designed to maximize momentum and create a sense of "flow" through the trail system (IMBA 2014). Rather than following a direct path from point A to point B as an interpretive or transportation-oriented trail might, a mountain bike trail will meander through the landscape, smoothly carrying riders from feature to feature along the most sustainable and enjoyable route, rather than the most direct one.

Local examples of similar trails include Fountainhead Regional Park's Mountain Bike Trail in Fairfax Station, Virginia (**Figure 3.9**), and the Bureau of Land Management's Meadowood Special Recreation Management Area (SRMA) in Lorton, Virginia (**Figure 3.10**).

When designing TTFs for mountain bike trails, it is important to meet the standard for safety and sustainability to protect the trail user. DPR has adopted the TTF construction standards described in the Resort Municipality of Whistler's *Whistler Trail Standards: Environmental and Technical Trail Features* as guidelines. Additional material on the philosophy and conceptual design behind bike-specific trail features can be found in *Bike Parks: IMBA's Guide to New School Trails*.

Bike-specific and bike-optimized trails can be constructed to accommodate cyclists of all skill levels, and will adhere to the trail difficulty rating system described in Section **2.3.1**.

In all cases, signage must be posted at trailheads and intersections to delineate difficulty and indicate whether or not the trail is multi-use, bike-specific, or closed to bikes to eliminate user confusion.

3.3.1. Fall Zone Guidelines

Due to the challenging nature of TTFs on mountain bike trails, it is important to build risk management into the design of the trail itself. The fall zone of an area adjacent to a trail feature that is managed to provide a less dangerous area for a rider to divert to in case of, or to avoid, a fall. They are typically sited adjacent to constructed or natural TTFs of significant difficulty, at the bottom descents, and on the outside of constructed turns.

The fall zone at significant TTFs should be designed to minimize hazards and be regularly reviewed for obstructions. Establishment and maintenance of fall zones will be focused on trails rated More Difficult and higher, where falls may be more likely as riders seek to hone their technical skills (Resort Municipality of Whistler 2003).

DPR will maintain a fall zone of **6 feet** on each side of the trail at technically difficult spots as described above. Fall zone maintenance consists of:

- Removing sharp objects that present hazards (broken branches, displaced rocks, rebar)
- Dulling edges or points on exposed rock
- Pruning overhanging branches back to the branch shoulder
- Covering immovable hazards with native soil, rotten logs, mulch, etc. to blunt potential impacts

Fall zone maintenance will occur regularly twice per year, and will be executed with the same respect for sustainability and resource protection as all trail construction and maintenance undertaken by DPR and its partners.

While fall zones are a concept born from the risk management needs of modern, bike-specific trails, similar maintenance practices may be applied to multi-use or equestrian trails where features such as fords or bridges may present technical challenges to trail users.

3.4. Trails in Wet Areas

Prince William County Parks manages a variety of stream valley and wetland trails, from the Broad Run and Catharpin trail systems in the northwestern portion of the county to the Potomac Heritage National Scenic Trail along the Potomac River to the east. In general, constructing sustainable trails in perennially wet areas is difficult, expensive, impactful to water resources, and will require significantly more maintenance than trails in dry areas (USFS 2007a). Thus, whenever possible, trails are designed to avoid long sections of wet terrain and significant water crossings. Due to site constraints or the interpretive and educational goals of a particular project, this is not always possible.

A variety of techniques are used to create sustainable trails in wet areas, and DPR and our partners have implemented many creative solutions to traverse the county's wetlands and floodplains. Wherever possible, trail solutions for wet terrain must preserve the pre-construction hydrology and minimize impacts to water resources. For that reason, turnpikes, puncheons, and bog bridges that lay directly on the soil are not generally employed in the county's trail system.

For construction of trails in floodplains or marginal soils with high clay content that retain water, Prince William County may employ the All-Weather trail designs detailed in **Figures 3.11 and 3.12**). Trails with this design will drain quickly and resist erosion more robustly than natural surface trails when sited in chronically wet areas. These trails are also appropriate for the construction of high-volume equestrian and mountain bike trails that may otherwise be closed to minimize impacts during prolonged periods of wet weather or freeze thaw.

Stone pitching and other rock armoring techniques, such as flagstone paving as described in *Trail Solutions: IMBA's Guide to Building*

Figure 3.11 All-weather natural surface trail in floodplain

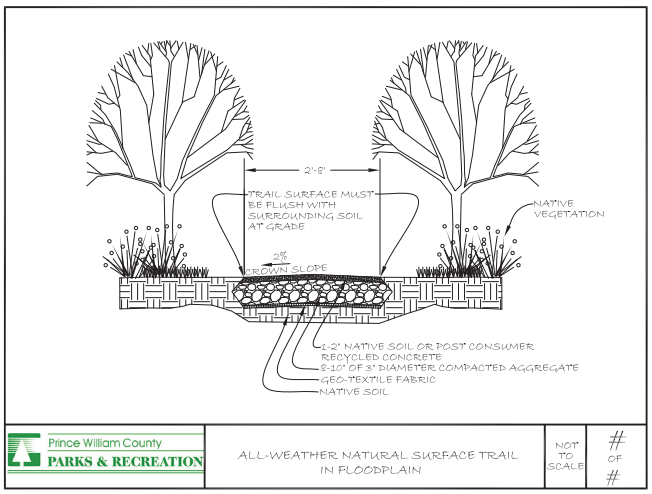
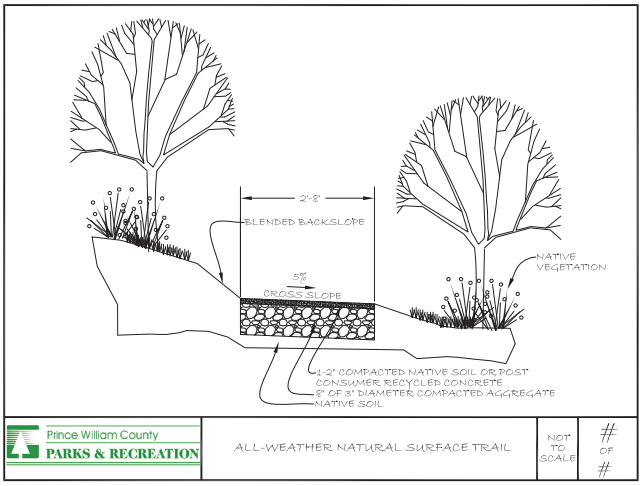
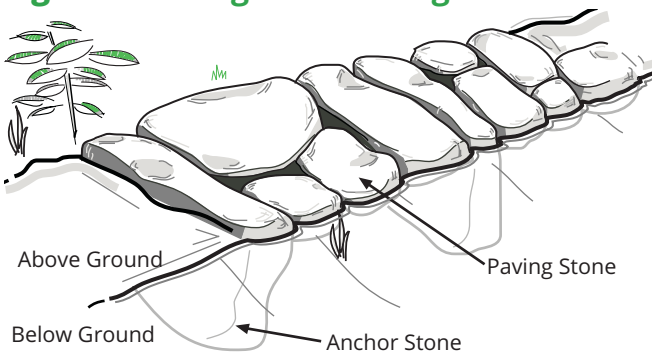


Figure 3.12 All-weather natural surface trail



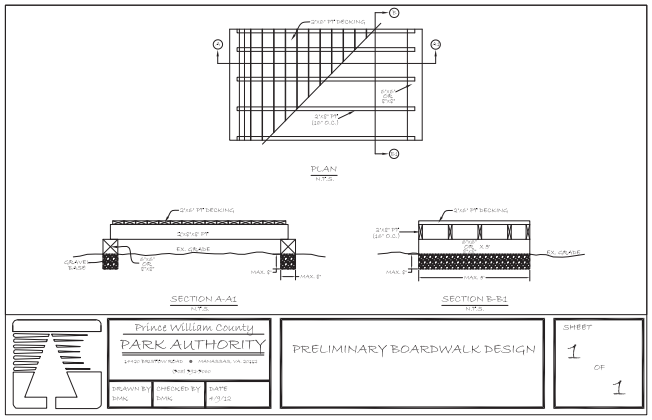
Sweet Singletrack and shown in **Figure 3.13**, are also great ways to sustainably build trails in wet areas, reinforce fords and stream crossings, and stabilize steep trail slopes. Rock armoring will add challenge to a trail as well, and may intimidate some users causing them to deviate from the tread. Rock armoring should always be wider than the tread (preferably twice as wide) and incorporate choke points to corral users and prevent soil compaction outside the trail tread. For this reason, armoring may not be the best solution on less difficult trails. Whenever possible, native stone should be used for these techniques to minimize the possibility of spreading invasive species or changing the natural conditions of an area.

Figure 3.13 Flagstone Paving



Source: IMBA Trail Solutions

Figure 3.14 Preliminary Boardwalk Design



For longer sections of trail that traverse wetlands or open water, DPR and Recreation has created a preferred boardwalk design to use as a template (**Figure 3.14**). This design will be shared with county staff and volunteer groups who contribute to the county's trail system and adapted as needed (**Figure 3.14**. Whenever possible, boardwalks will be constructed with the "top-down" method, to minimize impacts to wetlands and water resources. This boardwalk design is not appropriate for equestrian trails, and alternative crossings must be considered for equestrian users where boardwalks are employed.

The information presented above is meant to serve as a starting point for wetland trail design in Prince William County. Creating sustainable trail in wetlands and floodplains is a specialized task that is highly dependent on the site conditions. For additional information on the design and construction of trails in wet areas, DPR staff and volunteers should refer to the USDA Forest Service's *Wetland Trail Design and Construction: 2007 Edition.*

3.5. Trail Signage Standards

Trails in the DPR system will utilize three primary marking mechanisms, trailhead kiosks, paint blazes, and treated 4x4 posts, to mark official trails and serve as navigational aids to trail users. Trail signage and wayfinding will be complemented by additional online resources, from downloadable trail maps to mobile apps and digital information sharing with partner organizations and agencies.

In some cases, trails in the DPR inventory form sections of long-distance, inter-jurisdictional trail corridors that may have their own signage standards. Where this is the case, DPR will make every effort to coordinate with other land managers to ensure coherent wayfinding and branding throughout the length of the trail system. For example, the Potomac Heritage National Scenic Trail (PHNST) managed by DPR shall utilize the National Park Service's (NPS) PHNST marker, rather than DPR's trail identification scheme, and trail markings along those segments shall conform to NPS's *Potomac Heritage National Scenic Trail Route Marking and Graphic Identity Guide*.

3.5.1. Trailhead Kiosks

Kiosks function as points of primary contact with park visitors and shall include contact information, trail system maps, etiquette, accepted uses, trail difficulty ratings, and a bulletin board for posting community events. Trailhead kiosks shall be used at all major trailheads and parking areas to better inform visitors and create opportunities for interaction with DPR. At trail systems with multiple access points, full kiosks should be reserved for the trailheads that see the most use to avoid over-signing natural areas. Small, single-panel signs and 4x4 posts with directional information are acceptable alternatives for secondary trailheads and neighborhood access points.

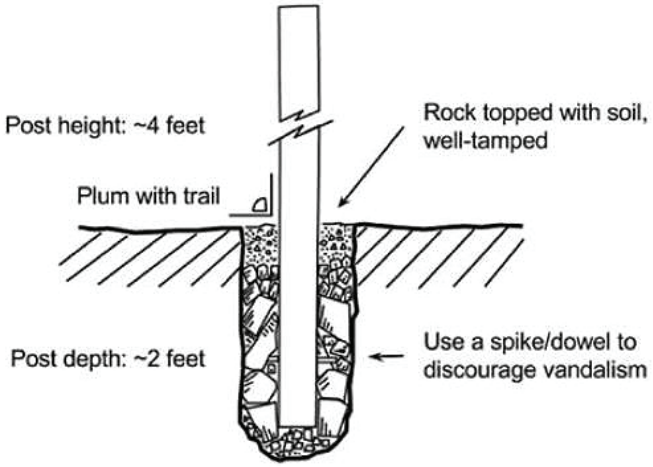
3.5.2. 4x4 Posts

Treated 4x4 posts shall be used at intersections within trail systems to augment paint blazes, and to mark smaller-scale or pedestrian accessible trailheads not associated with a formal parking area or park facility. They may also be used at other critical locations such as road crossings, property boundaries, or special-use area boundaries (to mark the boundary of

a resource protection area, for example). These posts will be labeled with wayfinding information from DPR's library of compatible signage tiles. Tiles are brown with white lettering, and indicate (from top to bottom, the name of the trail, distance/direction/destination information, and, at trailheads, trail use information. These posts may alternatively utilize the identification sign of inter-jurisdictional trails where appropriate.

Posts shall be 72" long and installed with 48" exposed. Posts must be secure enough for visitors to lean on and must resist damage from environmental conditions and vandalism. Best practices for installation of 4x4 posts are shown in **Figure 3.15**.

Figure 3.15 4x4 Post BMPs



4x4 Installation BMPs
(height + depth apply to composites)

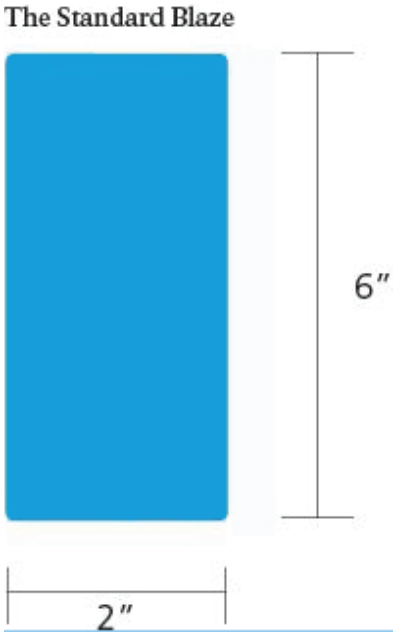
Source: Maryland Park Service Wayfinding Guidelines for Back-country Trails

3.5.3. Paint Blazes

Color-coded paint blazes shall be used to indicate trail routes within the county's trail network. These blazes shall be a vertically-oriented rectangle, 6x2 inches in size and installed at approximately eye level. Boundary-grade, enamel paint shall be used whenever practicable for durability. Blazes shall be placed on the right-hand side of the trail as perceived by the trail user, and for all bi-directional trails, shall be marked to be visible for trail users traveling in both directions.

Blaze color associated with each trail will generally be selected at the discretion of DPR staff, in coordination with community partners. Colors will not be duplicated for different trails within a single park, though the same color me be used to

Figure 3.16 PHNST Blaze



blaze trails elsewhere in the county trail system (for example, there may be a red-blazed trail at both Locust Shade and James Long Parks, but there will not be two, discontinuous red trails within Locust Shade Park). However, two colors are reserved for specific applications.

The main route of long-distance trail corridors in the county (Broad Run Trail, Neabsco Greenway, Catharpin Greenway, East End Trail), shall be blazed **white.**

Segments of the Potomac Heritage National Scenic Trail in Prince William County shall be blazed **Pantone 299 blue** as shone below in **Figure 3.16**, per the *Potomac Heritage National Scenic Trail Route Marking and Graphic Identity Guide.*

These colors are reserved specifically for these applications and shall not be utilized elsewhere in the park system.

4. Trail Users

4.1. User Groups

All trail users must abide by DPR's Trail Etiquette, shown below (**Figure 4.1**). These trail use guidelines are designed to encourage a positive user experience, preserve the sustainability of the trail system, and minimize user conflict. Trail Etiquette signs shall be posted at all trailhead kiosks along with maps and information specific to that trail system.

Figure 4.1

4.1.1. Pedestrian

Pedestrian use is permitted on all trails within the county system. However, some trails may be designated equestrian or mountain bike trails, and pedestrian user should be aware of the access rules and appropriate etiquette of other user groups. Trails shall be signed to inform trail users of trail-specific rules, including use guidelines, directional restrictions, and right of ways. On trails designated bike- or equestrian-optimized, riders have the right of way and pedestrians must yield to other user group traffic.

4.1.2. Equestrian

Horses may vary widely in their responses to other users on trail. To promote user safety on multi-use trails, equestrians have the right of way at all times. Both pedestrians and cyclists must yield to horses, provide as much room as possible, and provide a verbal greeting or warning before attempting to pass an equestrian.

Riders are encouraged to follow IMBA's Rules of the Trail at all times:

Ride Open Trails: Respect trail and road closures — ask a land manager for clarification if you are uncertain about the status of a trail. Do not trespass on private land. Obtain permits or other authorization as required. Be aware that bicycles are not permitted in areas protected as state or federal Wilderness.

1. **Leave No Trace:** Be sensitive to the dirt beneath you. Wet and muddy trails are more vulnerable to damage than dry ones. When the trail is soft, consider other riding options. This also means staying on existing trails and not creating new ones. Don't cut switchbacks. Be sure to pack out at least as much as you pack in.
2. **Control Your Bicycle:** Inattention for even a moment could put yourself and others at risk. Obey all bicycle speed regulations and recommendations, and ride within your limits.
3. **Yield Appropriately:** Do your utmost to let your fellow trail users know you're coming — a friendly greeting or bell ring are good methods. Try to anticipate other trail users as you ride around corners. Bicyclists should yield to other non-motorized trail users, unless the trail is clearly signed for bike-only travel. Bicyclists traveling downhill should yield to ones headed uphill, unless the trail is clearly signed for one-way or downhill-only traffic. In general, strive to make each pass a safe and courteous one.
4. **Never Scare Animals:** Animals are easily startled by an unannounced approach, a sudden movement or a loud noise. Give animals enough room and time to adjust to you. When passing horses, use special care and follow directions from the horseback riders (ask if uncertain). Running cattle and disturbing wildlife are serious offenses.
5. **Plan Ahead:** Know your equipment, your ability and the area in which you are riding and prepare accordingly. Strive to be self-sufficient: keep your equipment in good repair and carry necessary supplies for changes in weather or other conditions. Always wear a helmet and appropriate safety gear.

Source: IMBA.com

Riders are responsible for keeping their horses under control and keeping speeds below a gallop while on public trails. Additionally, riders are responsible for removal and disposal of horse droppings on the trail and parking areas within County parks.

4.1.3. Mountain Bike

All trails in the Prince William County system, unless otherwise posted, are open to cyclists. When on multi-use trails, riders must yield to both pedestrians and equestrians. Riders should be cautious when approaching and passing other trail users, and utilize verbal cues and/or bike bells to notify other trail users.

On trails designated bike-specific or bike-optimized, riders have the right of way and pedestrians should yield to bike traffic where it is safe to do so.

4.1.4 Winter Uses

Other uses, such as cross country skiing, snowshoeing, and snow biking are permitted when sufficient snowfall events make them feasible. Winter trail users shall follow all posted signs and keep to existing, signed trails when- and wherever practicable. Snowmobiling is not permitted on non-motorized trails within the county trail system.

4.1.5. Managing User Conflict

User conflict is managed by a combination of trail design, information, and education. Throughout the county trail system signage describing access rules, difficulty ratings, and trail etiquette norms shall be clearly posted at trailheads to educate and manage the expectations of trail users. The universal Trail Courtesy sign, as shown in **Figure 4.2** shall also be posted at all trailheads and kiosks on multi-use trails to reinforce the need for all users to share the trail system. Additionally, trail system and park brochures and digital media will reflect these norms in an effort to educate the public on trail etiquette.

DPR will encourage user cooperation and development of a community of diverse trail stewards by regularly hosting multi-user volunteer days for trail maintenance and construction in cooperation with non-profit partners.

4.1.5 Volunteer Trail Stewards

Prince William County Parks and Recreation is fortunate to have existing partnerships with several local and regional non-profits that focus on trail stewardship and programming. These groups are authorized to perform trail maintenance and construction activities in cooperation with DPR, and in accordance with the terms of their Stewardship Agreement with the Department and in compliance with the trail standards laid out in this manual. These groups represent valuable advocates and stakeholders, and without their support, the trail system would quickly become unmanageable.

Groups interested in becoming trail stewards or in seeing new trail built should contact the Department of Parks and Recreation to begin the conversation. Volunteers are the lifeblood of any world-class public trail system, and many hands make light work!

Individuals interested in trailwork should approach either DPR or its partner groups to find opportunities to get involved. Unauthorized trail construction or alteration, by groups or individuals, is illegal and may lead to environmental damage, injury, citation, and potential trail closure.

Figure 4.2 Share the trail

Source: IMBA.com

5. References

American Association of State Highway and Transportation Officials (AASHTO). (2012). *Guide for the Development of Bicycle Facilities: Fourth Edition.* Washington, DC. AASHTO.

Eller, Mark (Ed.). (2014). *Bike Parks: IMBA's Guide to New School Trails.* Boulder, CO: International Mountain Bicycling Association (IMBA).

Hancock, Jan et al. (2009). *Equestrian Design Guidebook for Trails, Trailheads, and Campgrounds.* Missoula, MT: USDA Forest Service, Technology and Development Program.

Hesselbarth, Woody, and Vachowski, Brian. (2007). *Trail Construction and Maintenance Notebook: 2007 Edition*. Missoula, MT: USDA Forest Service, Technology and Development Program.

IMBA – Rules of the Trail. Retrieved from https://www.imba.com/about/rules-trail

IMBA Store: Sign – Share the Trail. Retrieved from https://www.imba.com/catalog/clone-sign-share-trail

Maryland Park Service. (2016). *Wayfinding Guidelines for Backcountry Trails: Version 1.1.* Annapolis, MD: Maryland DNR Park Service.

National Park Service (NPS). (2015). *Potomac Heritage National Scenic Trail: Route Marking and Graphic Identity Guide.* Retrieved from https://www.nps.gov/pohe/learn/management/upload/POHE_guidelines-route-marking-graphic-identity_30MAR2015.pdf

Resort Municipality of Whistler. (2003). *Whistler Trail Standards: Environmental and Technical Trail Features, 1st Edition*. Whistler, BC, Canada. Retrieved from http://www.mbta.ca/assets/pdfs/trail_standards_first_edition.pdf

Steinholtz, Robert T., and Vachowski, Brian. (2007). *Wetland Trail Design and Construction: 2007 Edition.* Missoula, MT: USDA Forest Service, Technology and Development Program.

USDA Forest Service. (2011) *Trail Fundamentals and Trail Management Objectives Training Reference Package*. Retrieved from http://www.fs.fed.us/recreation/programs/trail-management/documents/trailfundamentals/Fundamentals_Trng_Pkg_05_01_2011.pdf

Webber, Peter (Ed.). (2004). *Trail Solutions: IMBA's Guide to Building Sweet Singletrack*. Boulder, CO: International Mountain Bicycling Association (IMBA).

Webber, Peter (Ed.). (2007). *Managing Mountain Biking: IMBA's Guide to Providing Great Riding*. Boulder, CO: International Mountain Bicycling Association (IMBA).

Prince William County
PARKS & RECREATION

6. Append

Trail Assessment Tool

Date:	Assessor(s):
Basic Information	
Trail Segment ID:	Trail Color:
Trail Name or Number:	Trail Classification: ☐ Class 1 ☐ Class 2 ☐ Class 3 ☐ Class 4 ☐ Class 5
Trail status: ☐ Open ☐ Closed ☐ Under Construction ☐ Other:	
Detail Information	
Trail segment length:	Typical Width:
Typical grade:	Typical Cross slope:
Structures or obstacles present? ☐ Bridges ☐ Gates ☐ Kiosks ☐ Retaining walls ☐ Rock outcroppings ☐ Technical Trail Features ☐ Waterbars/Check dams ☐ Road Transition/Entrance ☐ Other: ☐ Other Description:	Short Pitch Maximum: Are there any water crossings on the trail? ☐ No ☐ Yes If yes, how many crossings? _____ Are the crossings seasonal? ☐ No ☐ Yes Average Trail Tread Condition: ☐ Good ☐ Average ☐ Poor If rated "poor" include description of issues such as erosion, cupping, standing water, etc.
Average Level of Use: ☐ Heavy ☐ Moderate ☐ Light	
Are any portions of the trail in a flood plain? ☐ No ☐ Yes	
Managed Use	
Allowed use: / Prohibited use: Hiker/pedestrian ☐ ☐ Equestrian ☐ ☐ Bicycle ☐ ☐ XC Ski/Snowshoe ☐ ☐ Forest Maintenance/ ☐ ☐ Emergency Access ☐ ☐ Motorized/OHV ☐ ☐ Other: ☐ ☐ Other Description:	Maintenance schedule: ☐ Annual ☐ Semi-annual ☐ As needed Primary Trail Maintainer: Additional Comments:
Special considerations and other activities:	

Oct. 2016

14420 Bristow Road
Manassas, VA 20112

703-792-7060

PWCParks.org
Trails@pwcgov.org