Fountainhead Regional Park
Mountain Bike Trails
Enhancement Plan

Richard Edwards

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Summary

This conceptual plan for the enhancement of the Fountainhead mountain bike trails has been developed by IMBA Trail Solutions for Mid Atlantic Off Road Enthusiasts (MORE) Inc. The plan recommends modifying and expanding the trail system to provide a greater diversity of riding experience, improve sustainability, and prevent future damage to the natural resource. In the given foot print of the current mountain bike trail system, it is possible to create a sustainable 12 to 16 mile stacked loop system that would provide a superior recreation opportunity by including a combination of both easier trail and more challenging trail opportunities.

Description of Site

The mountain bike trail system at Fountainhead Regional Park has been under development since 1996 and open to riding since 1997. The system is a mix of mountain biking specific trail and legacy hiking trail. The newest of the trails was designed and developed by MORE in partnership with the Northern Virginia Regional Park Authority.

There are several bike only, directional loops, with a short bi-directional section. The trail system offers intermediate to advanced level cross-country riding. The system also supports an annual cross-country mountain bike race, Adventure Race and several running races that bring hundreds of participants and spectators to the park each year. Fountainhead is only one of a few parks in Northern Virginia which provides mountain bike opportunities in Fairfax County.

The trail system traverses the slopes above the Occoquan Reservoir. A hardwood forest, with few canopy breaks, covers the hills and there is an open understory with a clear sightline at ground level in most of the forest.

The soil does not have a high clay content and thus drains and dries quickly, but is less suitable for steeper trail grades and more susceptible to user displacement during dry seasons. There are some sections with soils unsuitable for grades over 7%. There are numerous outcroppings of rock, usually quartz, and the individual rocks are rarely more than 2 cubic feet in size.

The high frequency of beech and hemlock trees, both of which have extensive surface root systems, contribute to the large amount of root-covered trail sections.

The forest has an evident browse line and appears to have an abundance of whitetail deer comfortable with cyclists.

Current Trail Conditions

The current 8 miles of trail provide a fairly challenging cross country trail system. However, in many locations there is evidence of erosion and tread widening. These are a result of unsustainable alignments, steep grades, poor flow, and riders going off trail to find a less challenging route.

The first loop from the parking area was designed and built as a short hiker only trail. Large sections of this loop do not follow the contour but instead traverse up and down the fall lines. Aligning a trail on the fall line greatly increases the potential for erosion from run off. This poor design resulted in erosion before the trail was adopted for bike use. One short section was located in a drainage downslope from the park access road and sees increased water flow.

Unsustainable sections in this loop have the most evidence of trail widening, with some sections up to 10' wide. This is caused by ongoing water erosion due to poor trail alignment and less skilled riders attempting to avoid the rocks and roots uncovered by the erosion. The majority of the trail widening is in locations where there is an obviously easier route adjacent to a section of water damaged trail.

Sections of the trails that are currently eroding will continue to degrade. The rate of erosion is likely to increase as gullies are created. These sections will require significant maintenance in the future. The largest areas of concern are where the eroded sections are adjacent to running water and may be contributing to sedimentation.

A secondary, but important issue is the degradation of the recreational experience being caused by the erosion and trail widening. The mountain bike community is concerned not only for the current environmental impacts of the trail system but also for decrease in riding experience. In order for the Fountainhead trail

system to maintain value as a recreation facility, steps need to be taken to address basic design flaws and ongoing erosion.

Objectives & Opportunities

The Fountainhead trail system has the potential to be the best riding destination in the Metro DC area. The directional, single-use management style, implemented by the Northern Virginia Regional Park Authority, allows many mountain bike oriented trail techniques that are not feasible on the other shared-use trails. The hilly terrain also allows for longer, more technical climbs and descents, than any where else in Fairfax County.

Managing the Fountainhead mountain bike trail network as a stacked loop system, with progressively increasing levels of difficulty, would diversify the riding experience at the park. The entrance loop would become easier, while the other loops would become consistently more challenging.

The combination of a less challenging loop with several more difficult loops will facilitate the development of novice cyclists, increase participation in the sport of mountain biking and ultimately increase the number of visitors to Fountainhead Regional Park. Increasing trail visitation serves the dual goals of improving public fitness and nature appreciation.

Increasing the length of the system by 30% or more, while staying within the current trail system foot print, will help disperse riders through out the loops giving users the feel of a solo outing.

The additional length, combined with the added time required to negotiate the more advanced loops will help minimize the need for riders to complete multiple loops. The stacked loops also allow riders to tailor their visits to the time available and skill level required.

The trail redesign will ultimately reduce maintenance related expenses (labor and material) required to keep the current trail system usable and fun. Sedimentation will be reduced through the use of erosion resistant trail alignments and trail construction techniques.

Current trail-widening would be prevented by improving flow and sustainability. By providing an easier entrance loop, less

Current trail-widening would be prevented by improving flow and sustainability. By providing an easier entrance loop, less accomplished riders can work on gaining the skills and confidence required for the more difficult trails. This combined with effective filters, such as bridges without ramps at the entrance to the more difficult trails, should aid in keeping the single track 24" wide or less.

Even though the overall mileage of the trail system is recommended to increase, the reduction in width on many sections may result in a very similar footprint in terms of square feet of compacted trail.

Lastly, it appears possible that the redesign will eliminate the remaining two-way sections of trail. When completed, the new trail system will be completely one-way with a handful of one or two directional shortcuts. This should facilitate navigation and enhance the value of the trail system for events.

Recommendations

To achieve these objectives the current system will need to be modified into a directional, stacked loop system, with easiest, more difficult, and most difficult loops. This will require reconstructing and armoring some of existing trail, constructing several miles of new trail and closing some eroded sections.

Some sections are rapidly eroding and would be too costly in terms of the benefit to armor. These unsustainable and eroded sections should be reclaimed and replaced with longer and sustainable sections of contour trail that follow IMBA sustainable trail guidelines for grade. These relocations will allow around 1.5 miles of existing trail to be traded for approximately 8 miles or more of new sustainable trail.

There are many techniques available to stabilize eroding sections of trail and improve the riding experience simultaneously. The mountain bike specific and directional nature of the trail greatly increases these options and allows for very creative solutions.

Aesthetics are also an important consideration and care must be taken to ensure the techniques chosen balance any ride enhancement and resource protection with how well they blend into the landscape.

Loop Descriptions

First loop (counter clockwise) Easiest, Green

Experience: The green loop will provide a fairly easy ride with climbs and descents as long as possible.

Width of trail surface: 24- 36”

Description: This loop is largely legacy trail that pre-dates mountain biking in the park. There are several unsustainable sections that should be relocated to prevent future erosion. The relocations could also be used to decrease the difficulty of the trail and increase the length.

The first loop will become a slightly less challenging loop that will provide newcomers and beginners an enjoyable and manageable mountain bike experience. This is a marked difference from other local trail systems.

A mix of small ledge drops, insloped turns, and relocations will add length and create a less challenging, yet playful warm-up/cool-down loop that will help prepare riders for the blue and red trails.

While there may be optional features over 4” tall, the main trail tread shouldn’t have any obstacles over 4” high. Descending ledges may be taller, but should be rollable without advanced skill level.

A mix of log rides and log overs with ride-a-rounds could be scattered along the trail side to add diversity and interest for more experienced riders.

Second Loop (clockwise) More Difficult, Blue

Experience: The blue loop increases rider awareness and requires more skill to negotiate the technical sections than the green loop. It is also over twice as long as the green loop.

Width of trail surface: 18-36”

Description: Many of the eroded sections are replaced with long segments of new single track. Log-rides, log-overs, rock gardens, bermed turns, and larger drops will be scattered throughout the trail and will be used to create either mandatory or optional challenges. While there may be optional features over 8” tall, the main trail tread shouldn’t have any obstacles over 8” high. Descending rollable drops may be taller.

Alternate routes, which are more challenging than the main line, should be developed. Besides providing a more challenging path for the experienced rider, they also serve as “passing lines”. These bypasses should reward racers, who have sufficient skills, with a faster route.

Rampless bridges are used as filters at the entrance to discourage use by riders lacking the skills to negotiate the mandatory features.

Second Loop ~ Shock-a-Billy

Shock-a-Billy Hill: This short, but well known section of trail, currently provides two opposing functions. First, it is the best known, most challenging section of trail in the park. Second, it is a critical part of the second loop as it is required for connectivity.

In order to preserve the challenging experience and provide a consistent “blue” loop; it is recommended that an alternative route be developed.

The alternative route will bear right in the middle of the hill, just before the grade breaks and contour across the hill at a 10% grade, with 8-10” high ledges. The trail will reach the floodplain at the bottom of the current alternate trail and make a 180-degree bermed turn onto the current trail.

Below, where the new alternate line turns off, the existing steep section would be armored with a combination of stone and wood.

The current alternative route would be closed and harvested for rocks to use in armoring. The rubber water bars would be removed during the armoring.

At the bottom of the hill, the bridge width should be increased and the alignment adjusted so the final part of the descent and the bridge are in line.

Third Loop (clockwise) Most Difficult, Black or Red

Experience:	The black or red loop is the most challenging loop and should be more difficult than the current trail. A combination of log pyramids, ledges, stacked steps, drop offs, ladder bridges, tight switchbacks, and rock gardens throughout the trail should test the most skilled riders in the area.
Width of trail surface:	12”-36”
Description:	The entrance bridge to this section is reduced to 2’ wide and extends across the floodplain with multiple steps leading to elevated turns climbing up the hillside. This initial climb would use boardwalks to traverse unstable steep slopes and avoid damaging large root webs. This loop also contains numerous difficult sections with steps and ledges for both climbing and descending combined with boardwalks and log-overs and insloped turns. While there should be optional features over 12” tall the main trail tread shouldn’t have any obstacles over 12” high. However descending rollable drops may be higher. Obstacles will need to be well anchored and provide the path of least resistance. Any obstacle, that can be easily ridden or walked around, needs to be considered optional.

Future Trailhead Enhancements

Trailheads are great opportunities to expand visitors' riding opportunities and provide training facilities that reduce risk by providing areas to build skills and warm up before heading into a difficult to access area. The Fountainhead trailhead offers good locations for two different enhancements, a pump track and a skills area.

A skills area could be developed in the pines on the berm between the parking area and the access road. It would consist of a series of low to the ground TTFs(Technical Trail Features), such as ledges, narrow bridges, rock gardens, log-rides, and log-overs, that would prepare visitors for the features out on the trail. The skills area should replicate as many of the challenges found on the trail as possible to best prepare visitors for their ride. Providing these features at the trailhead will help riders increase their confidence and skill in a low risk location. The TTF's would be constructed to blend into the natural area within the pines. Signage in this area could be used to educate the rider on proper technique and skill level for the various trail sections.

A pump track could be sited on the grassy area south of the current trail entrance. These short dirt tracks are built to allow riders to negotiate them without pedaling by using the undulations of the track and bermed turns to propel the bike. They are excellent fitness and bike handling training facilities. A pump track would have a footprint no larger than 100' x 60'.

Pump track in Highbridge Park, NYC

Risk Management and Emergency Response

Outdoor recreation and risk go hand in hand. Once visitors leave the built environment they are exposed to many risks. It is not possible to offer a risk free natural experience. However, it is feasible to manage the risk and facilitate emergency response so that an incident's severity is reduced. One method to achieve this is via a progressively difficult trail system that encourages visitors to experiment and warm up on easier terrain before encountering more challenging trail.

The first step is to inform visitors at the trailhead that they are leaving the built environment and they need to be aware of environmental and natural hazards, as well as the man made hazards. The main trail head kiosk should also include information on emergency services and a physical address for communicating with emergency service providers.

The second step is to enable visitors to successfully communicate their location to emergency service providers. This can be facilitated through intersection signage and numbered reassurance markers along the trail. During this age of instant communication visitors expect to be able to communicate their location without returning to the trailhead. The navigation signage identification should also be included on the map supplied to emergency service providers

The third step is to delineate on the map alternative access routes to parts of the trail network. At Fountainhead there are several skid roads which provide more direct and smoother access to sections of trail. Developing a map of the existing access routes, including air, land, and water will aid in determining which is the most efficient extraction route .

During the trail design process, the designer should meet with the local emergency service providers and determine which access methods have been used in the past and how to best facilitate location, access, and extraction in the redesign of the system. Ensuring that the emergency

service providers have appropriate equipment for backcountry and high angle rescue is also recommended.

Natural Resource Protection

The recommended enhancements to the trail system will prevent future erosion, sedimentation, and vegetation loss. Closing the unsustainable sections of trail and reclaiming them will eliminate current and future soil loss from those sections. While the replacement sections of trail may be longer, they should be narrower resulting in a similar square footage of compacted soil.

Many locations have steep slopes and extensive surface root systems from large beech trees. In these areas, care will need to be taken to avoid damaging roots. Techniques such as bridges, retaining walls, and earthen fill may be used to keep the root system intact. In most cases the trail alignment will be beside a large tree's trunk to minimize impact to the sensitive drip line edge.

Part of protecting the natural resource for human visitation is maintaining the natural aesthetic. Any modifications or enhancements should make every effort to blend in with the natural landscape. When dimensional lumber is used it is preferable to create structures with bends and twists, rather than ruler straight lines. Another technique is to add natural wood to a dimensional wood structure. An example is using locust or cedar logs as railings or bull rails on a dimensional lumber bridge.

All changes to the trail system must take into account the dual goals of improving the trail experience and protecting the natural landscape, for without the beauty of the landscape much of the value of the trail is lost.

Implementation Plan

Achieving the goal of a 12-16 mile sustainable stacked loop system, that is the premier trail system in the region, will require significant funding and effort. The proposed implementation plan is a roadmap to achieving that goal and consists of the following steps. Both the design and construction work could be broken into phases that would reduce the size of the projects.

Design/Flagging

The first phase is the physical flagging of the relocations, closures, and required maintenance. It would be best to do this during the winter when trail closures are more likely, and there will be less opportunity for the flags delineating changes to be disturbed.

Staggering the design of each loop and completing its reconstruction before moving on to the next loop will reduce the time flags are in the ground and spread out the cost of the project.

One way to continue to develop the skills of MORE's trail bosses would be to flag the new alignments and sections requiring maintenance with combined teams of Trail Solutions staff and MORE volunteers.

Demonstration Project

A project that demonstrates some of the recommended enhancement techniques and relocation would be useful for developing support within the cycling community. It will be important to demonstrate the ability to build challenging, fun trail, to gain credibility with the more skilled riders.

More than one location may be required to demonstrate both blue and red techniques. The Blue Loop (intermediate) would provide a good opportunity to use several techniques including rock armoring, ledges, a short relocation, a bermed turn, and woodwork.

Conclusion

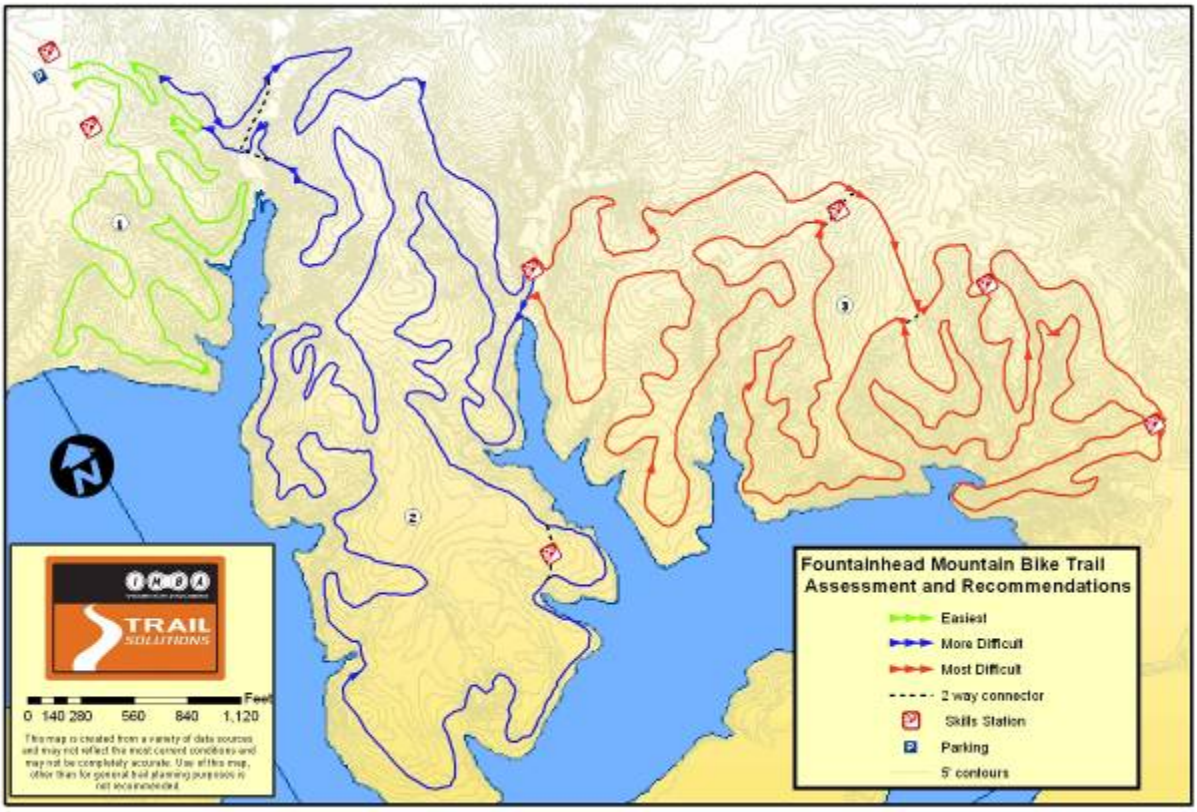
While the current Fountainhead trail system is great fun to ride, it is showing increasing signs of wear and does not use the terrain or location to its full potential. The recommended enhancements will create a diverse trail system that should draw new riders and keep single track veterans challenged.

While this process will not be easy or inexpensive it is completely within MORE's and IMBA's ability to accomplish and will help set the standard for a mountain bike specific trail system on public land.

Appendix A Maps

The maps are conceptual diagrams of the recommended changes. Most recommendations were verified on the ground. It is quite likely that during flagging and development, these conceptual plans may be improved or modified.

The recommended closures and sustainable single track sections are suggestions. During the flagging phase, decisions will need to be made about the exact closure locations and which sections of existing trail can be stabilized enough to be considered sustainable. It is likely the exact alignments will change during flagging. These improvements should enhance the riding experience and be consistent with the difficulty of that loop


Fountainhead Mountain Bike Trail
Assessment and Recommendations
Easiest
More Difficult
Most Difficult
2 way connector
Skills Station
Parking
5' contours
TRAIL SOLUTIONS
0 140 280 560 840 1,120
Feet

Appendix C TrailBuilding Techniques

Many techniques are available to stabilize eroding sections of trail and simultaneously improve the riding experience. The mountain bike specific and directional nature of the trail greatly increases these options and allows for very creative solutions. Aesthetics are also an important consideration and care must be taken to ensure the techniques chosen balance any ride enhancement and resource protection with how well they blend into the landscape.

Boardwalks: Boardwalks, also called catwalks and puncheons, depending on their location, can be used to prevent erosion on unsustainable grades and to avoid impact and compaction when traversing the roots of mature trees. Boardwalks can also be used to traverse wet areas.

Ideally the boardwalks would incorporate vertical and horizontal curves whenever possible to improve aesthetics and the riding experience. Use of an anti-slip compound creates a surface climbable at a 40% grade.

Steps and ledges can also be incorporated into boardwalks. These built features should blend in with and match the natural aesthetics as much as possible.

Santos Trail system, Florida Office of Greenways and Trails

Oleta River State Park, Florida. This boardwalk prevents damage to federally protected plant species.

Rock armoring can be used to provide challenge and prevent erosion on steep sections. When armoring the trail it is important to make sure the armored line is still the least challenging line. Otherwise users will make it an alternate line by creating a ride-around. If the rock garden is optional then corralling isn't required.

The local Vulcan materials quarry offers gneiss and granite in class 1 and 2 rip-rap sizes that would be ideal for this application. Transport to the work sites could be accomplished by a low psi tracked crawler.

Stone pitched trail. Coed y Brenin, Wales

Armoured section of trail. Blacksburg, Virginia

The Canycom 602 is one of several tracked compact utility carriers available.

Steps, also called ledges and risers, create challenge and can be used to reduce the grade of natural soil sections while retaining a steeper overall grade than would normally be sustainable. These ledges can be used both on uphills and downhills. They can be constructed using rocks, logs, or dimensional lumber.

While the more advanced trails may have 2-4 steps stacked it is advisable to leave at least a bike length between ledges or step sets. On a descent even more space should be considered.

These features will need to be anchored in such a way to prevent riders seeking an easier route from riding around the step or ledge .

Ledges on a shared use trail with a running grade of over 20%. Wissahickon Park, Philadelphia.

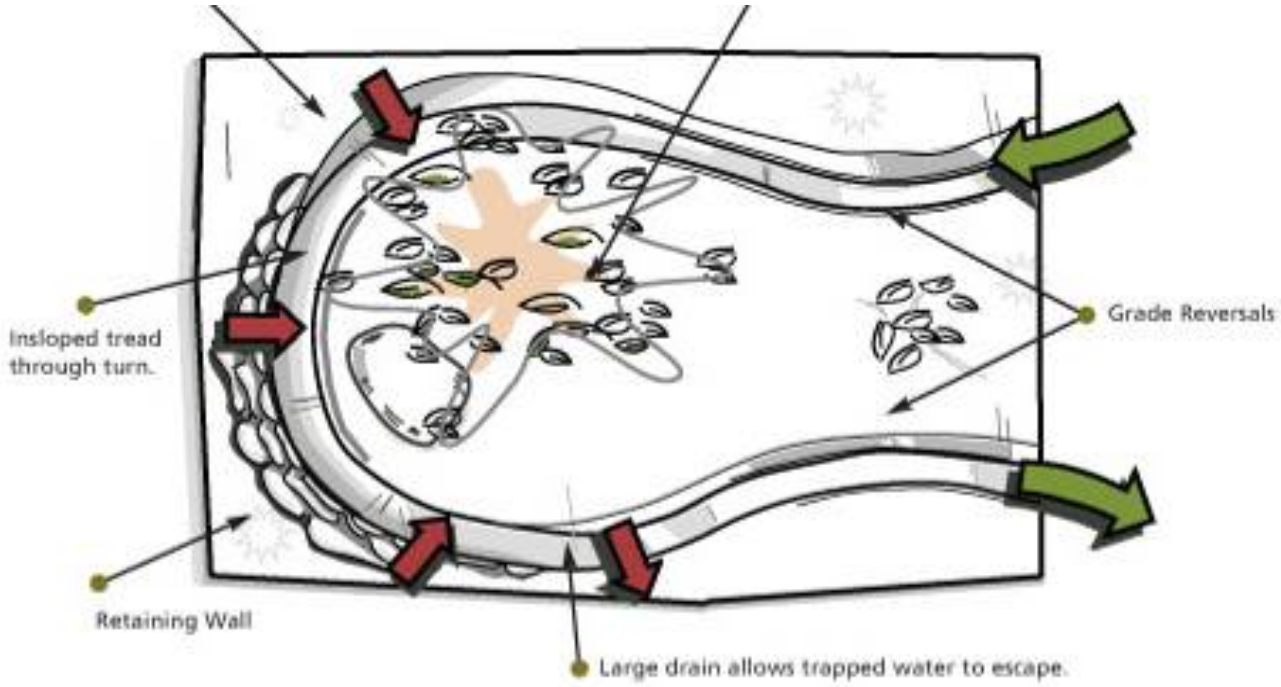
Well anchored steps on the Mcafee Knob section of the AT.

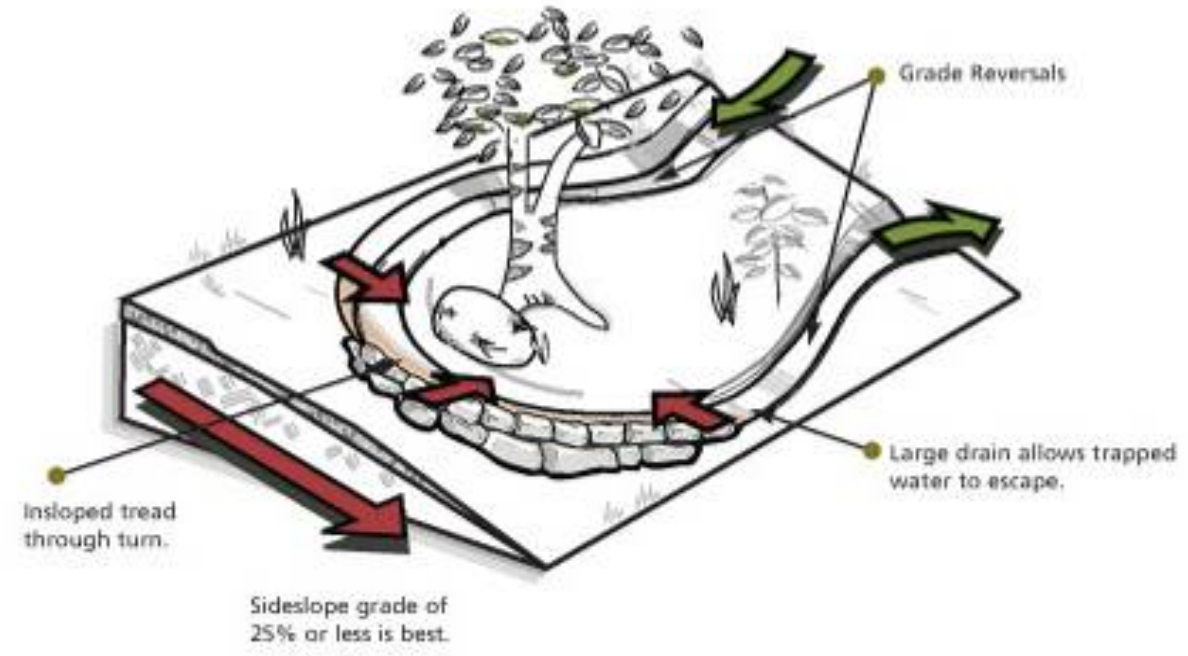
Log step.

Insloped and bermed turns allow an abrupt change in direction without a loss of momentum and reduce erosion from braking and skidding. Well placed and built berms can greatly improve the flow and sustainability of the trail. It is important to consider drainage when building insloped or bermed turns.

Machine built berm, Santos Florida

Insloped turn, Long Cane Horse Trail, Sumter NF


Insloped tread through turn.
Grade Reversals
Retaining Wall
Large drain allows trapped water to escape.


Grade Reversals
Large drain allows trapped water to escape.
Insloped tread through turn.
Sideslope grade of 25% or less is best.

Tight switchbacks, under 12' in diameter, teach good slow speed bike handling skills and are a great option for climbing sections. It is recommended that at least one pair of switchbacks be installed to help teach visitors this skill important for riding trails in the mountains.

Log overs are a classic mid-Atlantic trail feature with many variations. They are naturally occurring in any forested landscape. Logs can be 6" tall to over 36" tall.

On the more difficult trails logs can be arranged at oblique angles to the trail tread to increase the challenge. They can also be higher on one side than the other to create a sloping log.

A common variation on the log-over is the log pyramid. These help teach riders the body language required to roll over large logs.

All logs incorporated into the trail should be stable under riders and have clear fall zones. Over the life span of a trail, logs are temporary features and the sustainability of the trail alignment shouldn't be compromised by the desire to incorporate a log. It is

preferable to relocate the log to the trail than move the trail to the log.

Existing log pyramid at Fountainhead

Optional log pyramid

Natural log across trail in Fort Dupont Park, DC

Manipulated optional log over

Log rides made of native logs are appropriate throughout the system, but should always have clear fall zones. It is best to align them in a slower section of trail.

Omitting ramps and requiring a step up onto a log ride creates an effective filter. Riders hopping up a step onto a log ride have demonstrated they have some of the skill required to exit the log ride successfully. A ramp allows riders who are unable to lift their front wheel to enter a situation that might not be within their ability to exit.

Natural log ride in George Washington National Forest.

Placed and shaped log ride on Bartram Trail, Georgia.