

City Of Elkins, WV

EAST
Trail Master Plan



September 2023



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Executive Summary

Elkins Area Shared Trails (EAST) has positioned the City of Elkins to dramatically increase trails-based opportunities near the central business district. With more than 30 stakeholding partners EAST has developed a broad and inclusive vision that has opened up collaborative recreation development opportunities on four different properties- Glendale Park, Davis & Elkins College (D&E), Davis Memorial Hospital (DMH) land located between the College and the Allegheny Highlands Trail (AHT), and the WV Department of Agriculture's Darby Farm just outside of town.

This Trail Master Plan translates the EAST goals into a professionally designed system of diverse, sustainable trail opportunities, including two skills development-focused bike parks, 1.8 miles of all-weather, all-abilities trails, and nearly 10 miles of family-friendly natural surface trails. With the paved Allegheny Highlands Trail as a connector, beginning in downtown Elkins and traveling adjacent to neighborhoods on the northern side of town, these new trail systems will create easy access to residents and visitors, and provide local youth with ample opportunities to spend time outside and active. The proximity to downtown will influence business growth and activity, and position Elkins as the regional recreation basecamp to the Monongahela National Forest.

With four different sites, realizing this vision of community vibrancy through outdoor asset development is scalable, and as an economic development and community livability strategy, the total Investment is quite small. \$1.5 - \$2.2 Million would complete the redevelopment, while lower levels of funding of \$225,000 - \$800,000 could transform each site into a node of community gathering, health, and recreation.



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Master Plan Goals

Elkins Area Shared Trails (EAST) is a coalition of more than 30 local stakeholders, trail use groups, residents, and land managers. The group has received funding for the master planning and field design of natural surface trails accessible from downtown Elkins. The group endeavors to:



Link downtown Elkins and residential neighborhoods to natural surface trails;



Position Elkins as the regional recreation basecamp to the Monongahela National Forest;



Facilitate quality of life improvements such as community health, vibrancy, and economic opportunities for area residents via nature access and recreation;



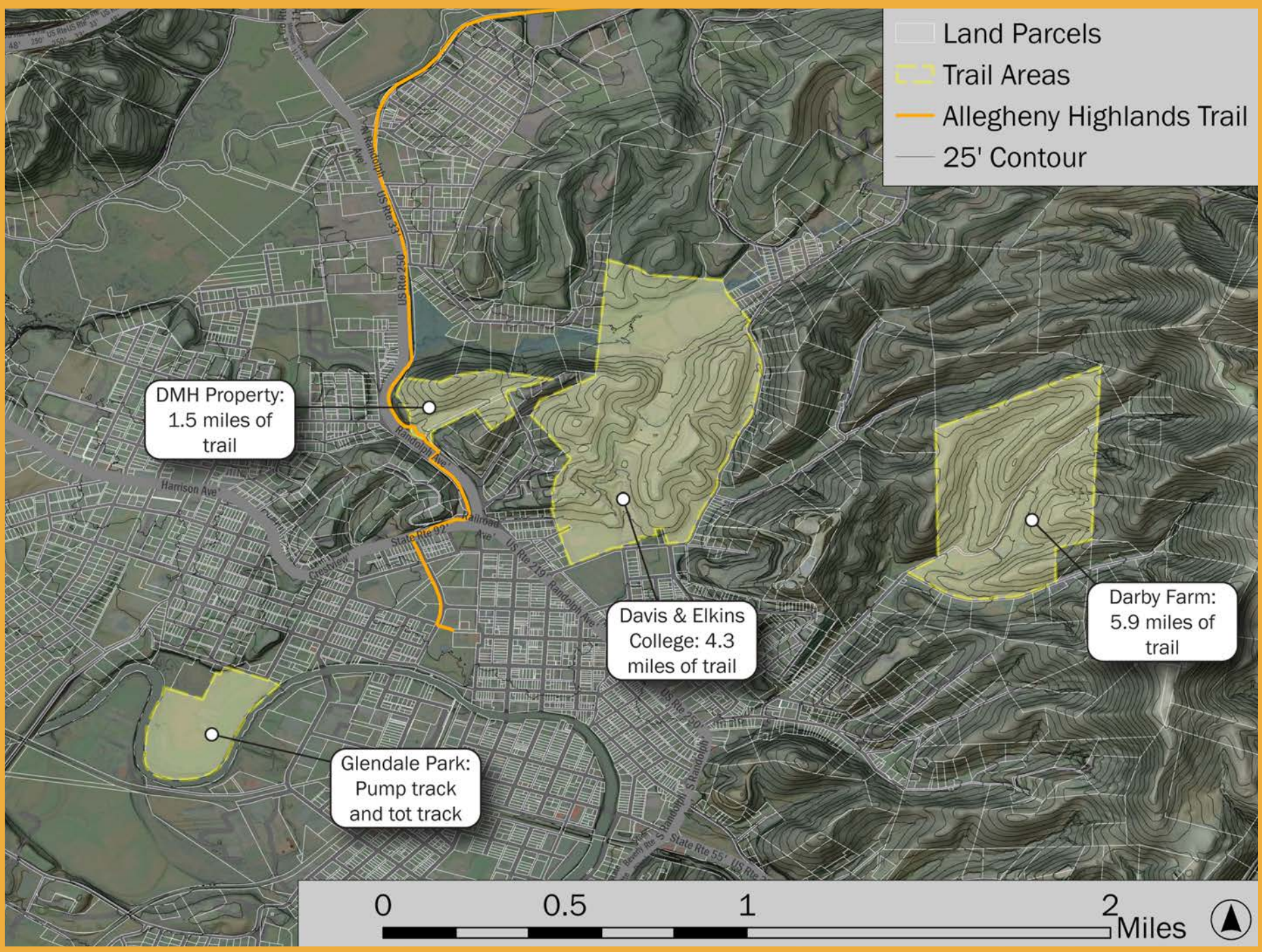
Provide high-quality opportunities for regional youth to spend more time active and outside; and



Influence business growth and boost community spending.



-  Land Parcels
-  Trail Areas
-  Allegheny Highlands Trail
-  25' Contour



Opportunities

The City of Elkins has set a course to transform its urban identity as regional recreation hub. With multiple concurrent initiatives, including designation as a WV Ascend community and Mon Forest Town, a redevelopment plan for the Tygart River corridor in downtown, and further trail planning and development on adjacent areas of the Monongahela National Forest, this in-town natural surface trail plan is well-aligned as a major component of this transformation.

EAST has facilitated access to develop trails on more than 200 acres of forested lands near downtown Elkins, working with the City of Elkins' Glendale Park, Davis & Elkins College, Davis Memorial Hospital, and the WV Department of Agriculture's Darby Farm property. DMH and Davis & Elkins recreation development lands are connected to the commercial business district by 3/4-mile of the paved Allegheny Highlands trail and the Darby Farm is just over 1.5 miles from the commercial business district. This proximity and ease of access is an incredible asset for residents and visitors alike, positioning the city center as the primary basecamp for the forest.

The quality of this land base is ideal for a diverse trail system due to well-draining soils, moderate topography, and mature forest cover. The lack of rocky ground, steep slopes, and non-native forest undergrowth allows for easier trail construction, especially for family and beginner-friendly experiences. Ample flat ground is available for a significant trailhead at the Darby Farm property.

The broad support present in the EAST coalition is a key factor for this plan implementation. This high level of community engagement virtually ensures the successful development and strategic utilization of a trail system of the highest quality.



Elkins Trail System Properties: Slope Map

Areas shaded yellow and orange represent hill slopes of 20 - 65%, ideal for the development of natural surface trails



Percent Slope

0 - 5
5 - 10
10 - 20
20 - 40
40 - 65
65+



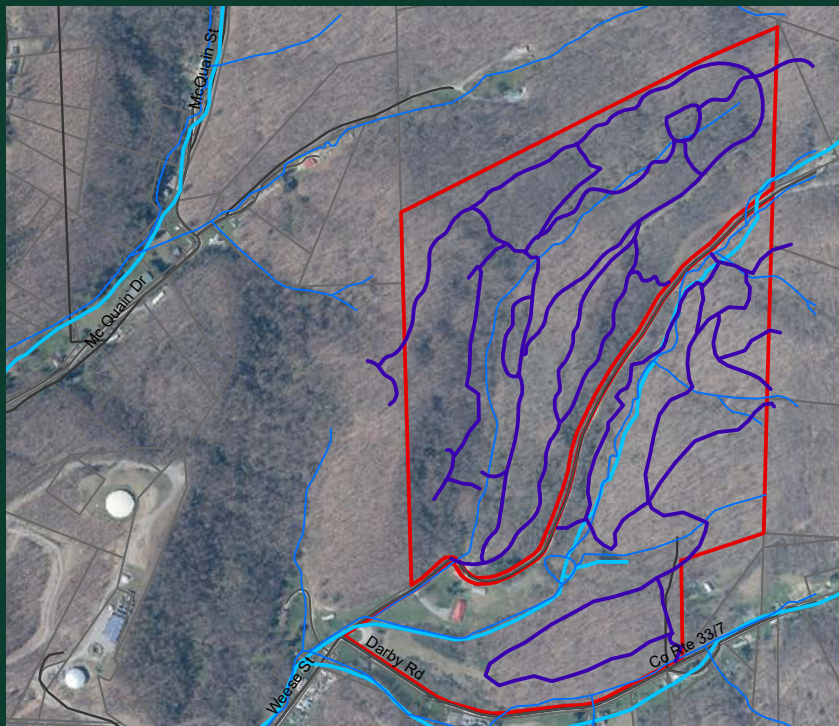
Challenges

While the land base, access, connectivity, and support for the trail master plan are ideal, there are still a few challenges to address. The trails on Davis & Elkins' Urban Preserve need upgrading for long-term sustainability and recreation quality. Some trail segments are overly steep and suffer moderate erosion (photo, far left). Maintenance of trails and signage (photo, near left) has not been adequate. Adjacent to the Davis & Elkins athletic fields, trails are often muddy and rutted due to their floodplain location (photo, below left).

The Darby Farm property is bisected by a stream valley and adjacent road, reducing the available acreage for trails. The property also has a number of off-highway vehicle routes (depicted in blue on map at bottom) that contribute to some erosion issues. With two buildings (Darby School and WV Autism Center), a barn, and greenhouse on the southwestern portion of the property, it is not immediately clear where a trailhead and associated parking would be developed and/or if some demolition would be necessary to provide safe public access on the property.

Connecting the properties via trail may be a challenge. There are a number of private parcels between Davis & Elkins campus and the DMH land to the west, and Darby Farm to the east. This connectivity is not crucial to the success of the overall trail system, as all three nodes of trails are easily accessible. That stated, interconnectivity would be ideal as it would reduce the need for driving to the trails and minimize additional traffic on Weese St. to access the Darby Farm.

None of these challenges are extremely daunting. Public outreach regarding the planned recreation improvements may help to answer some of the questions or open avenues to connectivity between the trail system nodes.



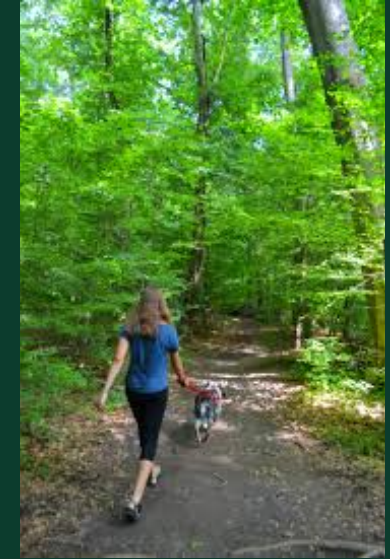
Potential Trail Facilities

Shared-Use Trails

Shared-use trails are ideal for providing recreation access to the broadest demographic of residents and potential visitors. Hikers, trail runners, and mountain bikers have long flocked to the nearby Canaan Valley area. As a gateway community and Mon Forest Town seeking to capture those visitors through in-town recreation and a lively town center, shared-use trails will cast the broadest net. Residents that do not currently recreate on natural surface trails will likely find the lowest barrier to entry through hiking.

In order to handle potentially high levels of trail use and bidirectional travel by pedestrians and mountain bikers in a in-town system, certain considerations need to be made in the trail design, construction, and maintenance processes. Trail widths should be somewhat wider (3-4') than typical singletrack (18"-3'). Trail grades should be moderate and the tread relatively smooth to accommodate the widest skill set of users. The alignment of the trail should roll up and down slightly to shed water and moderate trail speeds. Sight lines need to be kept open and the trail corridor maintained a bit wider than the trail tread to minimize potentially startling interactions between higher and lower speed trail users. Routes need to optimize the desires of some hikers more motivated by destinations with those of trail runners and mountain bikers motivated more by the journey.

The D&E property and Darby Farm have excellent shared-use trail potential. The larger land base at these trail system nodes allow for a diverse set of trail options to be developed. From half-hour "lunch walks" to options that link together longer routes that appeal to trail users with more time or stamina, trails at each property can be developed as valuable, high-quality, stand-alone systems.



Mountain Bike-Optimized Trails

Mountain bike-optimized trails cater to the skills progression, physics and motion of the bike and rider, and at times, the challenge of overcoming obstacles. These trails resonate with kids, as the diverse set of challenges provides tangible accomplishments based on fun and mastery. Mountain bike-optimized trails can often be integrated into smaller properties or areas with more limited natural appeal, and be developed at a density higher than a typical shared-use trail system. Because mountain bike-optimized trails encourage speed and jumping, they are most appropriately managed to not allow pedestrian use or uphill riding. As such, trail sinuosity and the amplitude of undulation can be exaggerated to enhance the riding experience and long sightlines do not have to be maintained. Trail grades are still generally moderate to reduce potential brake-induced erosion.

The Glendale Park and DMH property are ideal for mountain bike-optimized facilities. Glendale Park is an ideal location for a paved pump track that accommodates bikes, scooters, and skateboards along with a smaller tot track and skills development features that cater to younger riders. At DMH, moderate slopes and limited elevation offer the possibility of multiple gravity-oriented routes populated with berms, rollers, and jumps and short climbs back to the ridges that encourage riders to session trails multiple times. Additionally, a more advanced series of skills development features could be arranged in the flat valley

The Darby Farm trail system could incorporate a number of optional challenge features adjacent to the trails, as well as mountain bike-optimized trails of varying skill levels running the full descent from ridge top to valley bottom. These trails would become the preferred downhill routes for riders, thereby reducing use density and potential speed-associated conflicts on the shared-use trails.



All-Weather Opportunities

Maximizing access to trail opportunities throughout the year is a challenge in West Virginia's wet climate. Trails that are surfaced with aggregate/crushed stone can provide a non-muddy experience that does not degrade when used in wet conditions. These trails are typically relatively short in distance, located adjacent to a trailhead, and developed with a tread of 4 to 6 feet in width to handle higher levels of traffic. Minimizing erosion of the aggregate surface often requires slightly raising the tread above the surrounding land and retaining nearly flat trail grades. The combination of these specifications provides a trail that increases accessibility to outdoor experiences for very young children, trail users with mobility or vision challenges, and visitors recovering from injury/disease.

The Darby Farm and the D&E properties offer potential for high quality, high use all-weather trails. At Darby Farm, an approximately 0.25-mile trail could be developed bordering the open grass field and the creek that runs through the property. The trail could provide programming utility to both the WV Autism Center and the Randolph County Humane Society. On the Davis & Elkins campus, all-weather trails could be developed around the athletic fields as well as a short loop in the forest across the creek from the athletic complex. These trails would provide value for athletic teams, spectators, and students desiring to get outside during wetter periods.

At Glendale Park, a paved pump track and bike skills development area would provide another opportunity for all-weather trail use. These facilities help cyclists develop balance, stamina, and the bike-handling skills needed to progress into riding narrower, rougher, natural surface trails.



Trailheads

Trailheads are an important aspect of a high quality trail experience. Roadside navigation signage, easy ingress/egress to parking, intuitive signage, accurate and attractive maps, and clear communication of regulations all contribute to a positive beginning and end to an outing. With multiple trailheads serving a trail system, consistency across these elements creates a recognizable “brand”. Ample parking is necessary to minimize impacts to adjacent roads and neighborhoods.

In Elkins, the Allegheny Highlands Trail and city parking and bike/ pedestrian infrastructure provide access to the trail system and center activity downtown. Street parking on Sycamore St. and on Church Ln. (50+ spots) near Davis & Elkins, public Parking at Railroad Ave and 3rd St. (30+ vehicles), and Glendale Park (100 vehicles) provide large in-town capacity. At Darby Farm, 20-30 parking spots are currently available between the WV Autism Center and Darby School. The nearly 5 acres of flat grounds could provide a relatively large trailhead, with parking for 40 or more vehicles and water, restrooms, shade structures, benches, and other amenities that could be activated as a multi-purpose community space.

Peak trail system usage typically occurs on weekends and late weekday afternoons, which does not coincide with typical city parking volumes or D&E events. At these times it could be anticipated that maximum trail-related parking needs at Glendale Park would be approximately 15 vehicles, city-based parking would be approximately 20 vehicles, and Darby Farm with 30 vehicles. Events on D&E trails could utilize the large parking area adjacent to the athletic fields with College permission. Events at Darby Farm or Glendale Park could potentially utilize the available flat, grassy area adjacent to the trail facilities. Larger events at Darby Farm would require shuttles from larger in-town parking facilities to minimize traffic impacts of roadside parking.

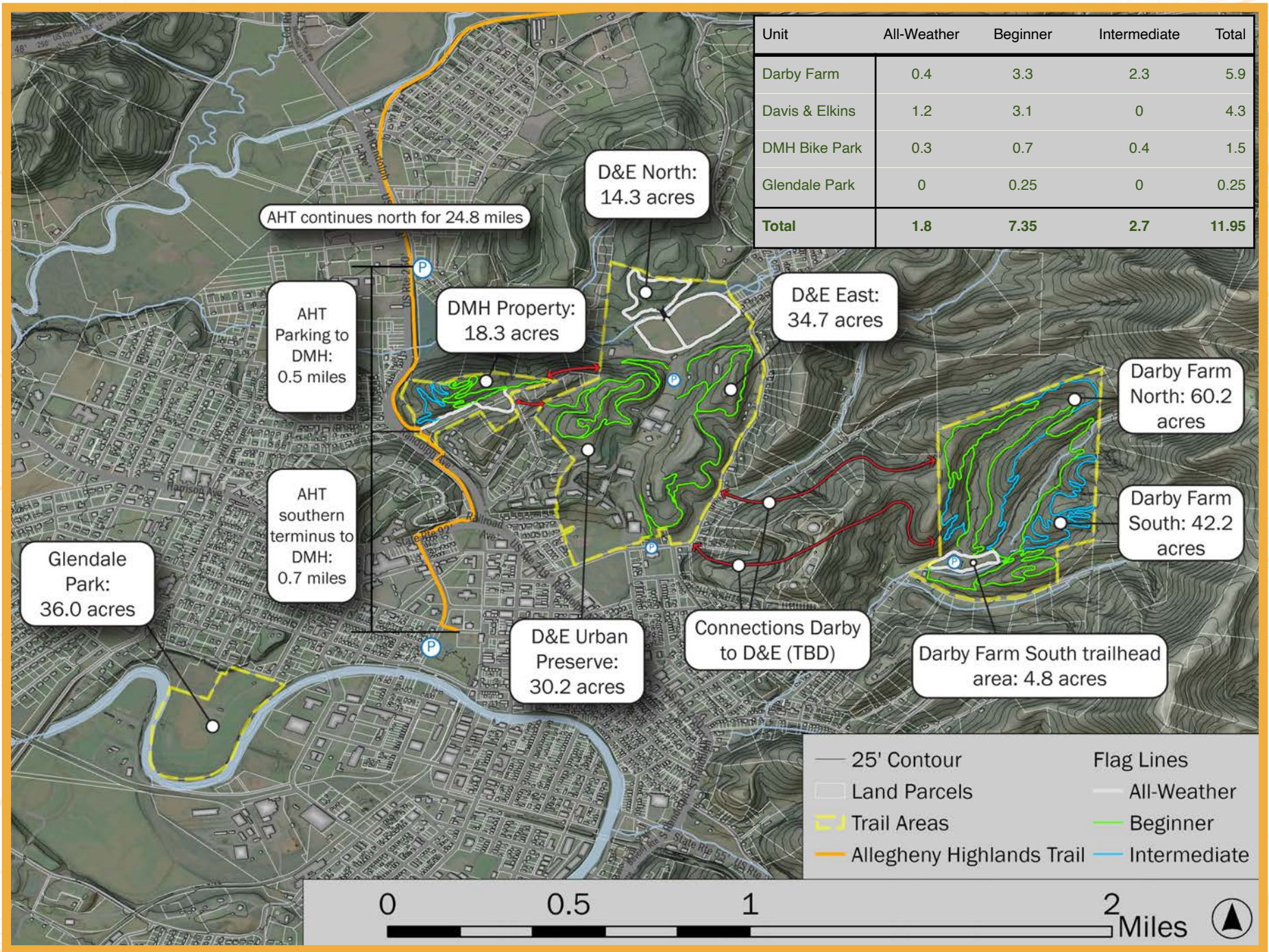


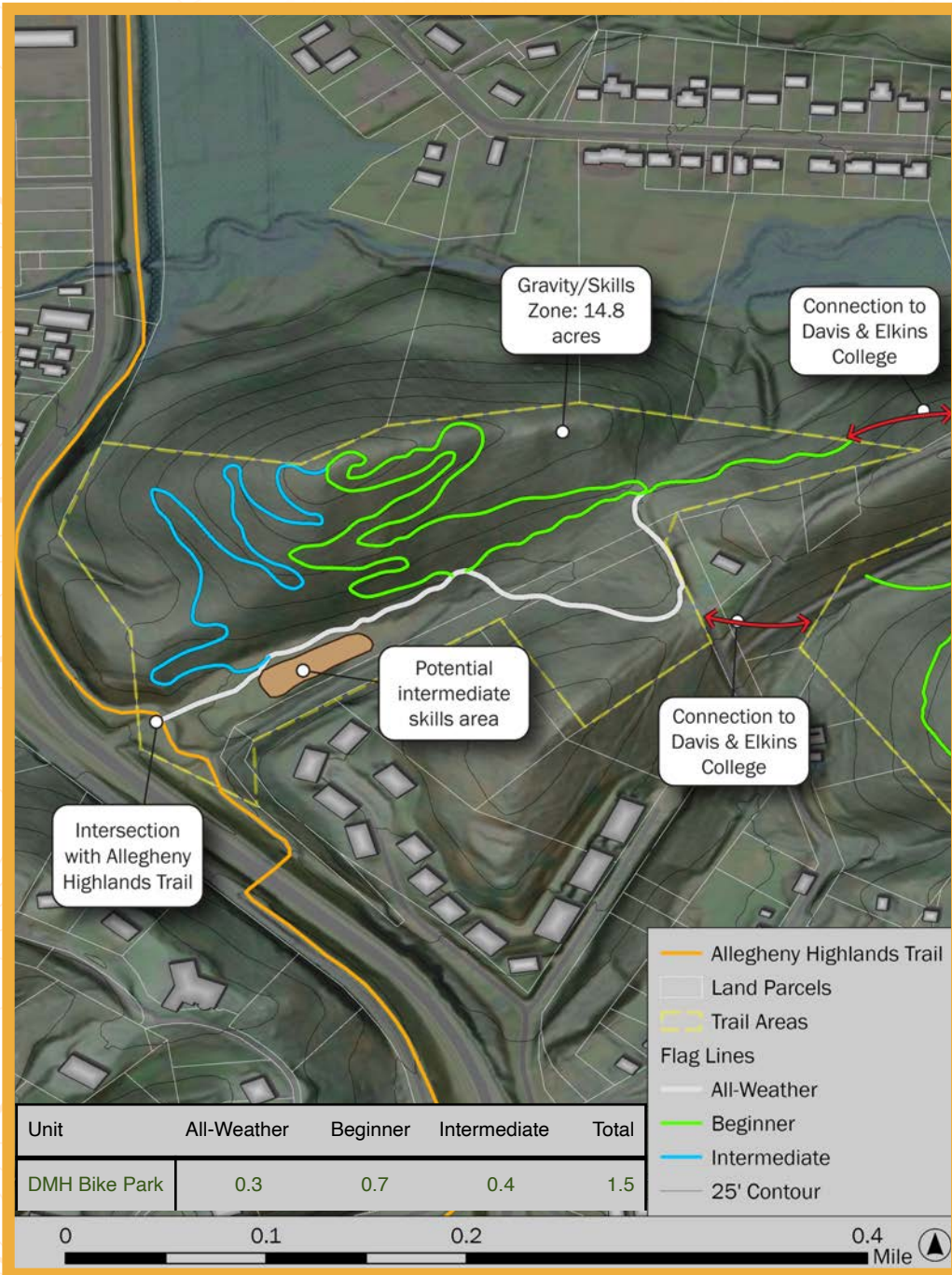
Elkins Trail System

The concept for a natural surface trail system in Elkins consists of four separate nodes of the trails- the DMH Bike Park, Glendale Park Skills Area, the Davis & Elkins College expanded trails, and the Darby Farm Trails. Each node will have a distinct assemblage of complementary experiences to provide maximum appeal and diversity of opportunities close to downtown. In total, approximately 11.7 miles of trails are possible on the four properties. If access across private properties is attained to directly link the four nodes, the mileage would increase moderately.

	DMH Bike Park	Glendale Park Skills Area	Davis & Elkins Trails	Darby Farm Trails
Acreage	18.3	36.0	79.2	100.3
Access	Allegheny Highlands Trail	Existing Parking Lot	Campus Parking, bike/ped infrastructure	New Trailhead
Shared-use Trails	No	No	Yes	Yes
Mountain Bike-Optimized Trails	Yes	Yes	No	Yes
All-Weather Trails	Yes	Yes	Yes	Yes
Designed Corridor Mileage*	1.5	N/A- Pump track, tot track, and skills trail	4.3	5.9







DMH Bike Park

Trails Description

An all-weather trail connects Patricia Avenue near the Davis & Elkins property in the east, as well as the AHT in the west, and continues up the valley bottom. Just above the moist valley floor, a mellow gradient climbing-only trail makes five turns to reach the ridge, with a continuation of the route to the east if D&E connectivity is negotiated. From the ridge, beginner and intermediate level, downhill-only trails twist back to the valley floor.

The beginner level downhill should focus on bermed turn and jumping skills, with 18-24" high rollers/roller doubles, 24-36" berms, and 3-4' high table tops with infinite landings. The intermediate level downhill should build on the amplitude, while adding a couple 2-3' drop features. The skills area should feature twisting, low-to-ground ladder bridges and 6-18" high rock obstacles.



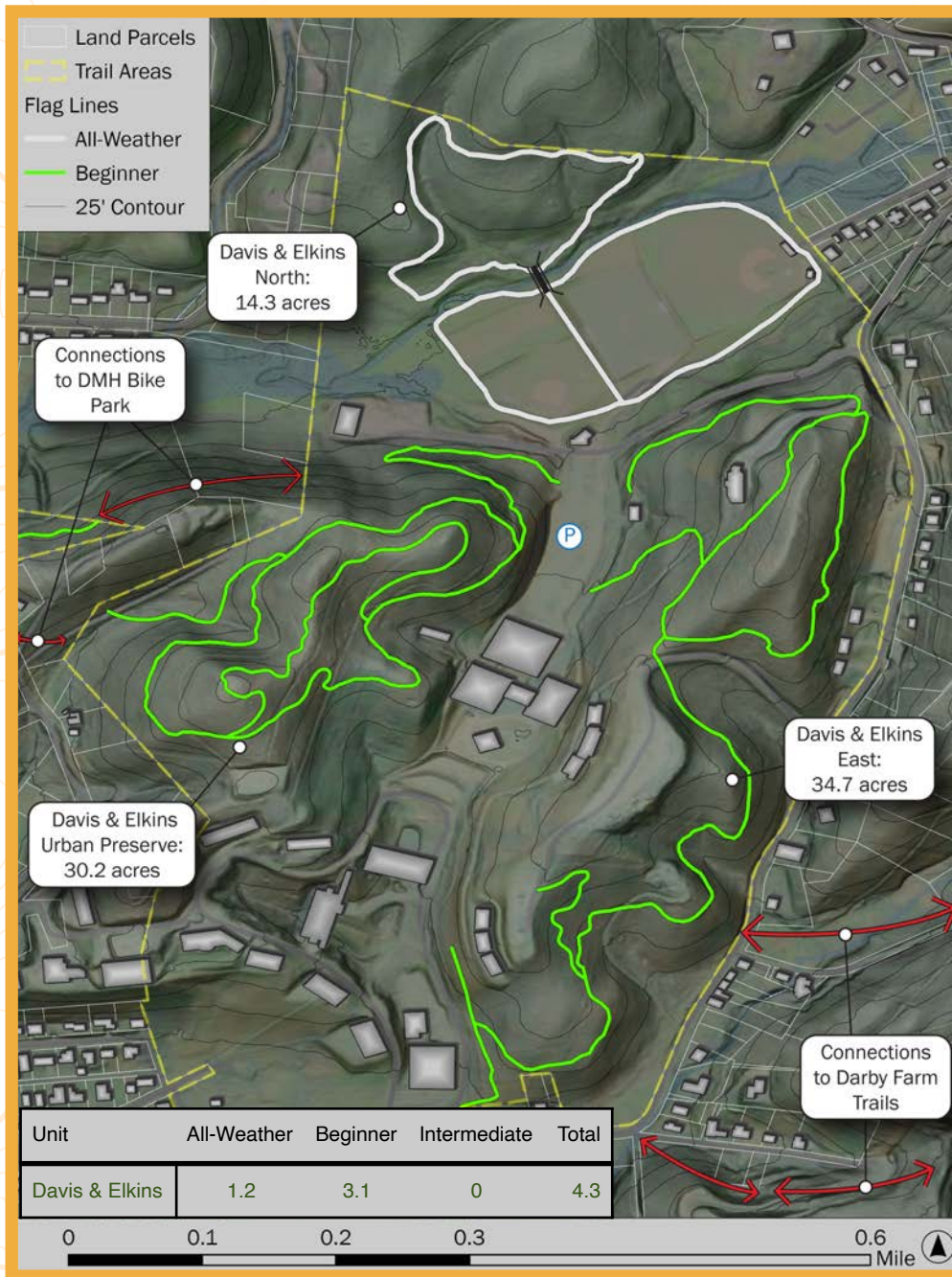
Glendale Park Skills Area

Trails Description

Just west of downtown Elkins, Glendale Park is accessible from the existing parking lot off Glendale Ave. or the pedestrian bridge from Riverbend Park. With an existing skate park, this flat, grassy floodplain park should be further developed with an asphalt pumptrack, shorter tot track, and skills development loop.

Adjacent to the parking area, the tot track should be developed with a rubberized surface and 3-9" high rollers and 6-12" tall berms suitable for strider bikes and small scooters. The 10,000 sq. ft. asphalt pump track should have 24-36" high rollers, 36-48" high roller doubles, and 48"+ bermed turns that are suitable for inexperienced users (i.e. bikes, skateboards, scooters) but also allow more experienced users to jump and transfer from one line to another. The skills development loop should have a series of low-to-ground balance and bike handling development features with a variety of side-to-side and up-down alignments.



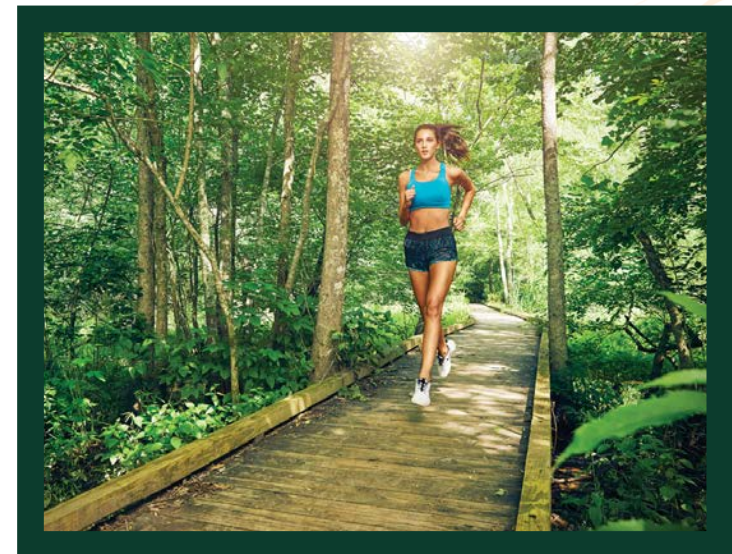


Davis & Elkins Trails

Trails Description

Accessed from campus parking lots, Elkins City Park, or city roads, an expanded shared-use trail system connects multiple portions of the D&E campus with recreational infrastructure. The Urban Preserve trail system has been redesigned to correct sustainability and routing as a 0.62 mile inner loop and 0.75 mile outer loop with 0.25 and 0.10 mile connecting segments to the athletic parking lot and the DMH Bike Park, respectively. On the east side of campus, 1.45 miles of trails connect north to south through forested slopes. Near the athletic fields, a 6' wide, 0.7 mile long all-weather trail encircles the athletic fields and a 3' wide, 0.5 mile long all-weather trail provides access to the forest across a relocated, new central bridge.

These trails should be developed with slight rolling contour and sinuosity to highlight the forest surroundings with tread wide enough for comfortable passing.

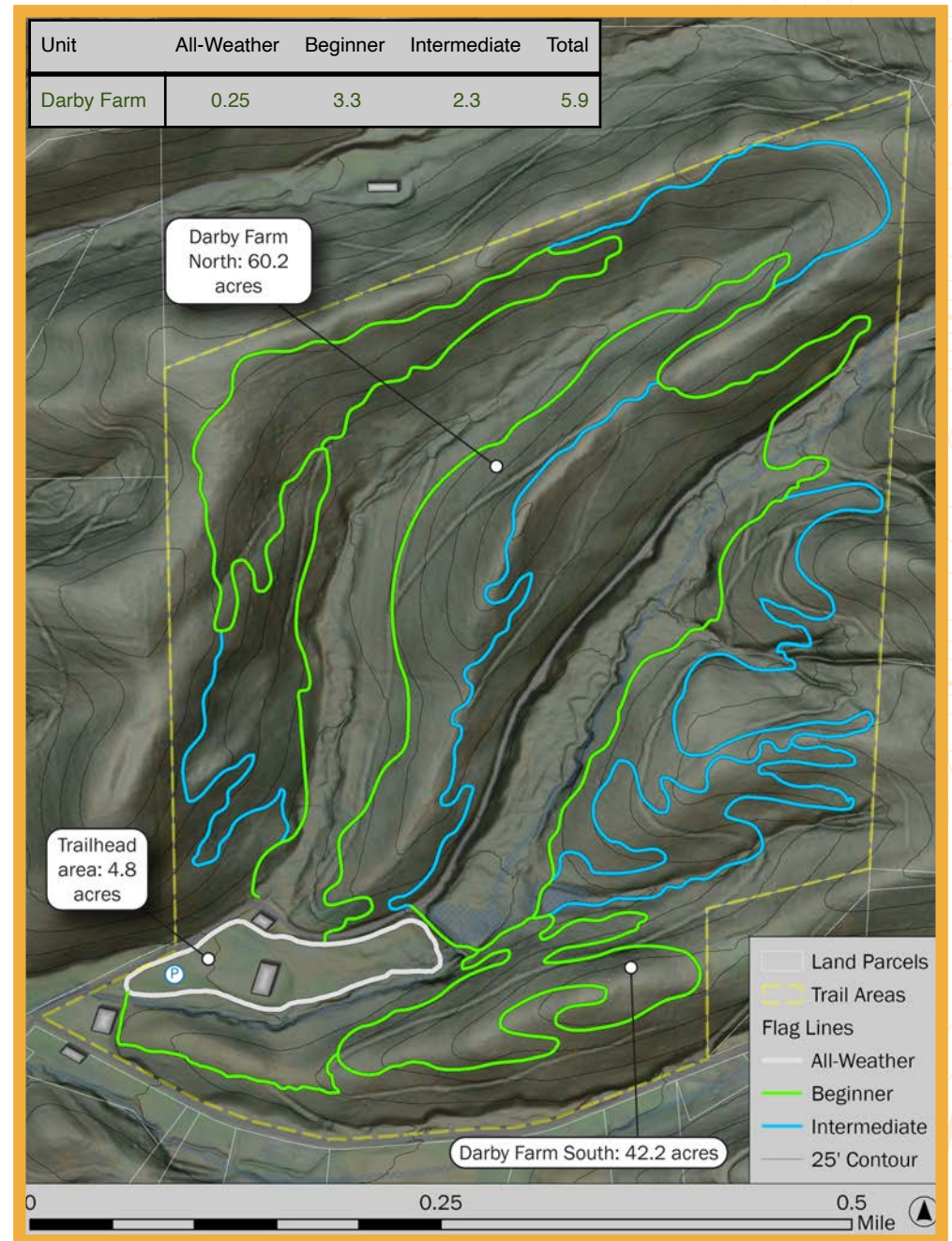


Darby Farm Trails

Trails Description

A 40 vehicle trailhead parking area, accessed from the WV Autism Center driveway, connects to the 0.25 mile all-weather trail that encircles the grassy floodplain. South of the trailhead a mellow gradient 1 mile loop climbs to the ridge. In the central portion a 1.33 mile beginner loop traverses slopes above the stream before crossing the road, ascending to the central ridge, and gradually descending to the trailhead. An additional 1.33 mile “lollipop” loop ascends/descends the northern valley and ridge. A number of 0.3 to 0.5 mile intermediate level segments provide loop options/extensions, narrower single track, and bike-optimized features.

The trails should highlight the ridges, valleys, and mature forest of Darby Farm. Widths should be 36-48” on beginner trails with 24-36” width and greater roll on intermediate trails.





Appendix A: Specifications

SPECIFICATIONS

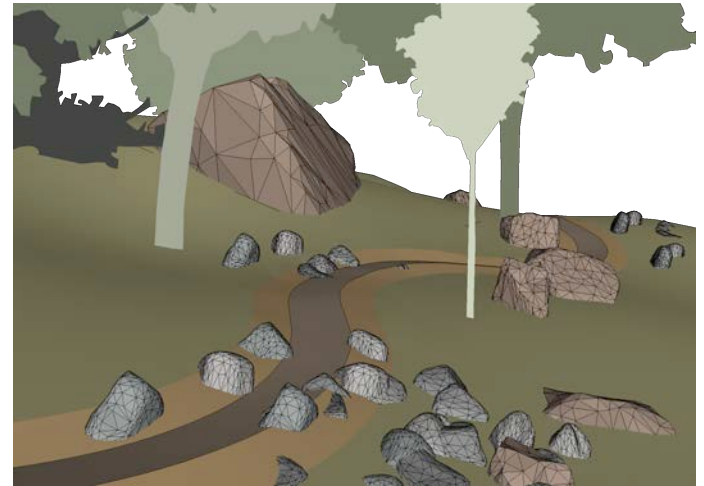
It is imperative that new natural surface trail construction is developed in the most sustainable manner to minimize maintenance needs over the long-term, as well as focusing the stewardship inputs on tasks that are mostly easily accomplished with a low level of trail-specific knowledge. The recognized best practice for the development of soft-surface trails that have minimal natural resource impacts and are manageable by stewardship coalitions are relatively narrow (2-5' wide) sidehill-constructed trails.

The trails are cut into the side of the hill in a full bench cut manner, rather than a partial bench cut with the outer half of the trail created from the fill. Especially with soils that do not readily bind together, high use trails receive far too much compaction stress to maintain a level tread with a partial bench cut.

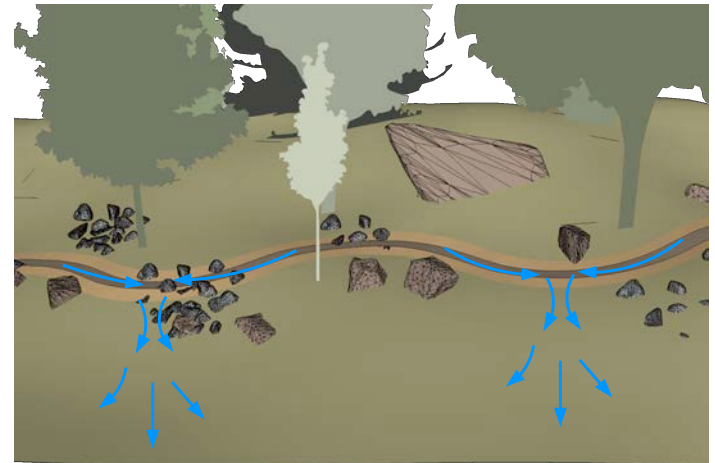
Along with the sidehill landscape position and full bench cut construction, the alignment should undulate up and down, termed rolling contour trail (see 1.1). This configuration breaks up potential stormwater drainage with frequent grade reversals (see 1.2) that will act as drains during periods of high flow. These three aspects, along with moderate trail grades and regular maintenance are the keys to the development of a sustainable natural surface trails.

Grade reversals should be moderately outsloped (7-10%) to encourage stormwater and loose sediments to carry off the trail tread. Over time, some of these reversals will flatten and start to hold sediment. At that point the reversals should be cleaned and an outslope reestablished. If the reversals are excessively muddy, then they should be armored with a slight out slope to assist water off the trail tread.

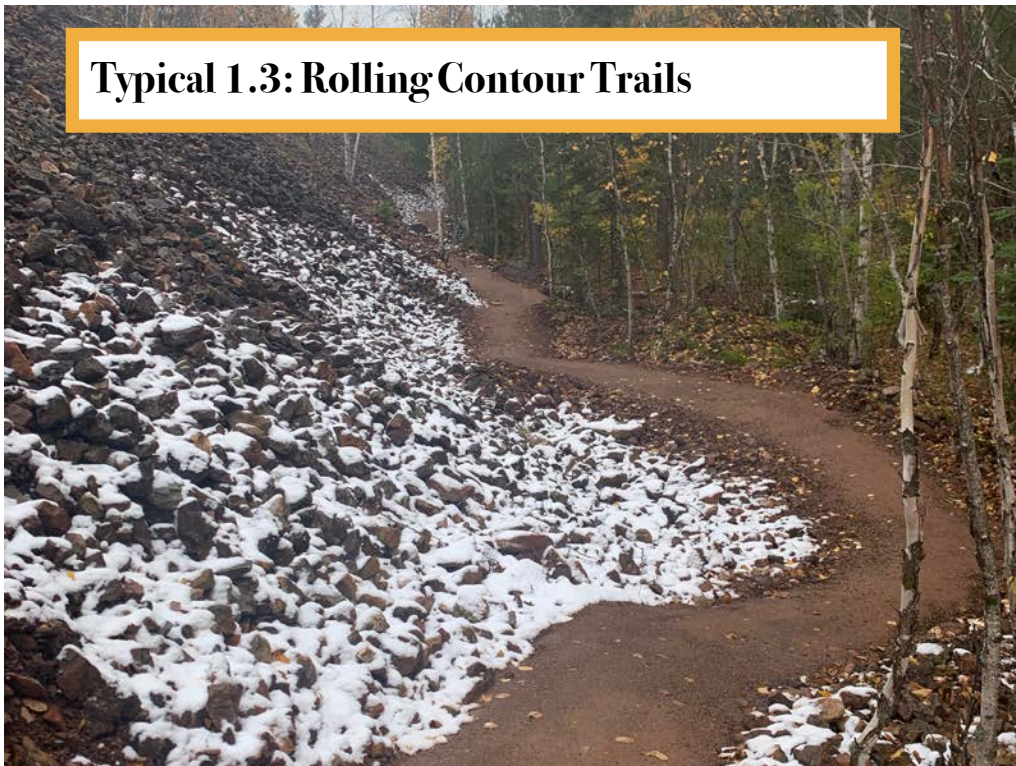
Typical 1.1: Rolling Contour Trail



Typical 1.2: Grade Reversals



Typical 1.3: Rolling Contour Trails



Shared-Use Trails

Trail Type Name: Frontcountry

Difficulty Rating: Less Difficult

Typical Tread Width: 48" (Sufficient clearance for mobility devices 36" wide at pinch points)

Typical Corridor Width: 60"-72"

Tread Rugosity: Smooth and even

Average Gradient: < 5%

Maximum Sustained Grade: 7%

Maximum Grade: 10%

Typical Tread Materials: Native soils with most large rock removed.

Sideslope Steepness: Flat to 45%

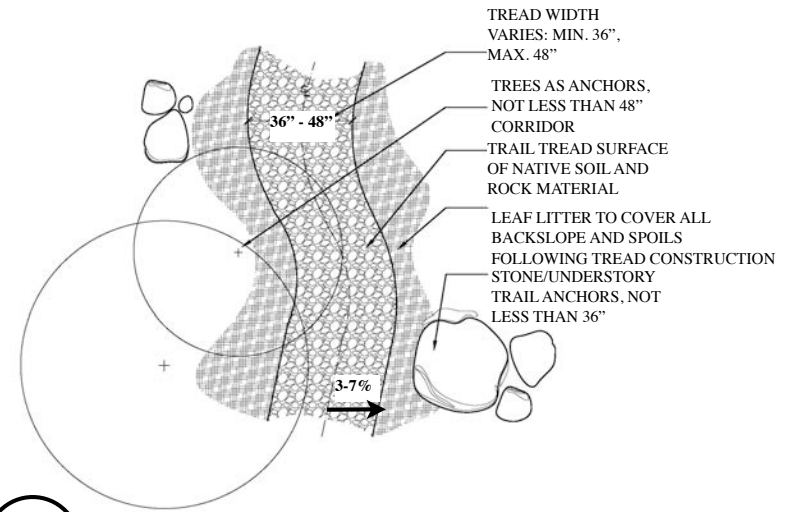
Turn Radius: Wide and open, 6-12' radius with flat (not cupped), low (12" to 24" high) berms

Trail/Structure Formality: Formal, 60" minimum width

Wet Area Crossing Formality: Formal bridges for channel crossings, rock armor where stormwater flow occurs without a defined channel

Duty of Care: Moderate

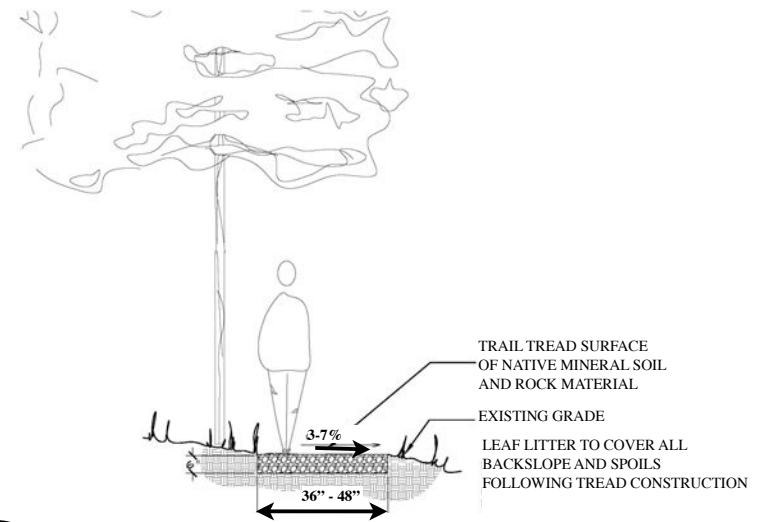
Intended Experience: The front country trail should provide a low-gradient, moderately sinuous trail experience that is narrower than a typical sidewalk but instills an intimate feeling with the surrounding landscape, with typically shorter distance experiences. Features will include low height, long wheelbase rollers and berms friendly to bikes but do not detract from pedestrian use. Obstacles such as rocks may be part of the trail tread but should not be sharp edged or greater than 6" above the surrounding tread. Optional skills development features may be located adjacent to the trail and no more than intermediate difficulty.



2.1

N.T.S

PLAN DETAIL: FRONTCOUNTRY TRAIL- TYP.



2.2

N.T.S

SECTION DETAIL: FRONTCOUNTRY TRAIL- TYP.

Typical 2.3: Frontcountry Trails



Trail Type Name: Backcountry Trail
Difficulty Rating: More to Most Difficult

Typical Tread Width: 12” - 36”
Typical Corridor Width: 36”-48”

Tread Rugosity: Uneven, with regular rock and root protrusions, <12” above trail tread

Average Gradient: < 10%

Maximum Sustained Grade: 15%

Maximum Grade: 20%, with armored tread

Typical Tread Materials: Mostly natural surface (native soils) with some rock armoring

Sideslope Steepness: Flat to 75%

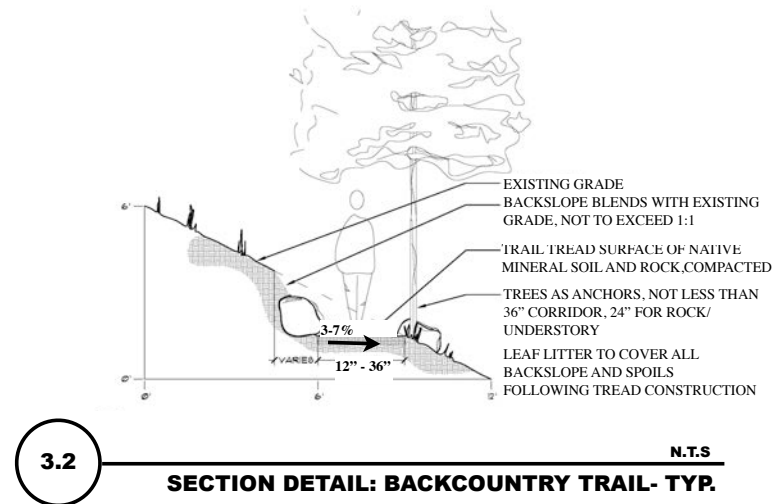
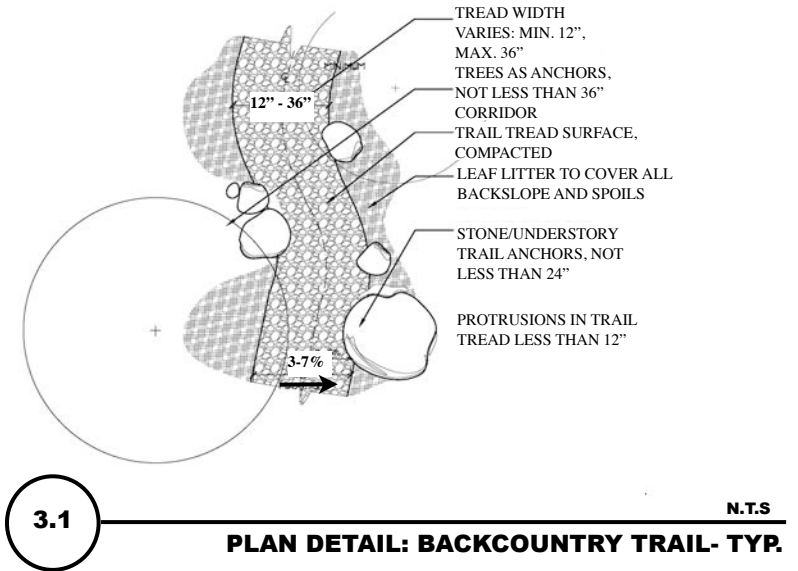
Turn Radius: Tight turns with possible switchbacks

Trail/Structure Formality: Low formality, 36” minimum width

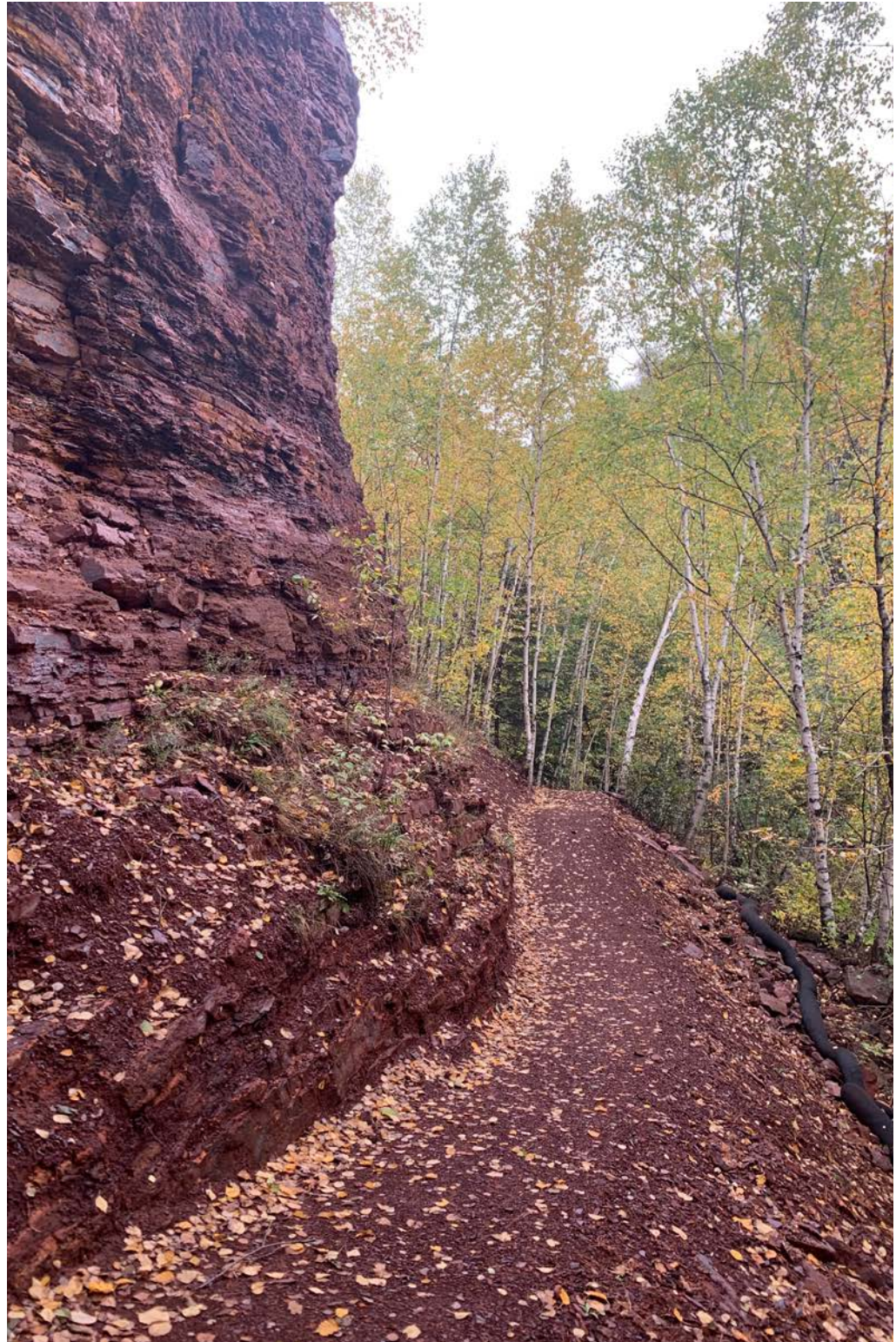
Wet Area Crossing Formality: Armored crossings at grade where possible, bridges less formal with low level engineering

Duty of Care: Low

Intended Experience: The backcountry-style trails will provide a tour of the property to highlight the diverse landscape, including narrow, incised intermittent stream channels and steeper slopes. The trail’s grade should be consistently reversing with moderate sinuosity that mimics the landscape. Tread will be moderately defined by the cleared corridor and presence of native understory and rock material. Excavated material will be utilized to super elevate the trail tread in poor draining locations along with periodic drainage features such as rock-armored grade dips/knicks, open-bottom arched culverts, and short bridges.



Typical 3.3: Backcountry Trails



All-Weather Trail

Trail Type Name: Aggregate Surface

Difficulty Rating: Less Difficult

Typical Tread Width: 6'

Typical Corridor Width: 10'

Tread Rugosity: Smooth and even

Average Gradient: < 5%

Maximum Sustained Grade: 5%

Maximum Grade: 8%

Typical Tread Materials: 1/2"-minus aggregate stone with fines, with ballast sub-base, as needed, in moist soil

Sideslope Steepness: Flat to 15%

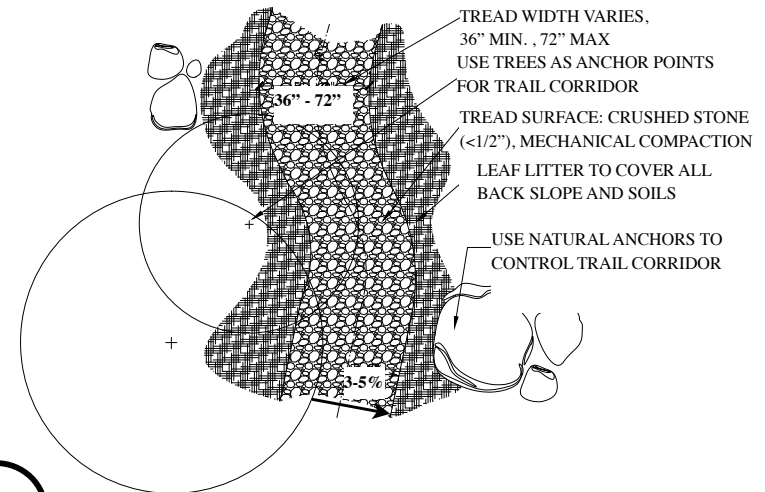
Turn Radius: No turns

Trail/Structure Formality: Formal, 6' minimum width

Wet Area Crossing Formality: Formal bridges, with a minimum width of 8'

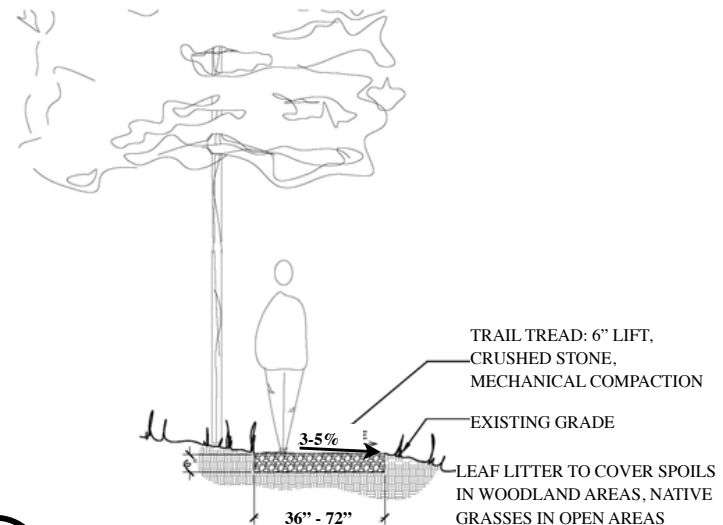
Duty of Care: High

Intended Experience: These improved surface experiences will allow for side-by-side pedestrian and wheeled mobility device use and two-way traffic, at minimum (6'). The trail will be installed sub-grade to be flush with adjacent ground and a slight outslope with gentle sinuosity to create a natural shape. Where developed in very flat or poorly draining locations, the tread will need to be raised 2-6" above the surrounding land with drainage installed at-grade.



4.1

PLAN DETAIL: GREENWAY TRAIL TYP.



4.2

SECTION DETAIL: GREENWAY TRAIL TYP.

Typical 4.3: All-Weather Trails



Mountain Bike-Optimized Trail

Trail Type Name: Mountain bike-optimized trail

Difficulty Rating: Less to More Difficult

Tread Width: 24-72"+ (active tread, fill for features will be wider)

Corridor Width: 1' wider (on each side) of final tread width

Tread Rugosity: Varies based on trail type specification and terrain

Average Gradient: 3-10%

Maximum Sustained Grade: 10%

Maximum Grade: 15%, Rock face riding features at natural grade

Typical Tread Materials: Natural surface, full bench cut where slopes > 30%. On less steep slopes, lift and tilt use of borrowed mineral soil material for trail feature development. All constructed features compacted in 6" lifts

Sideslope Steepness: Flat to 50%

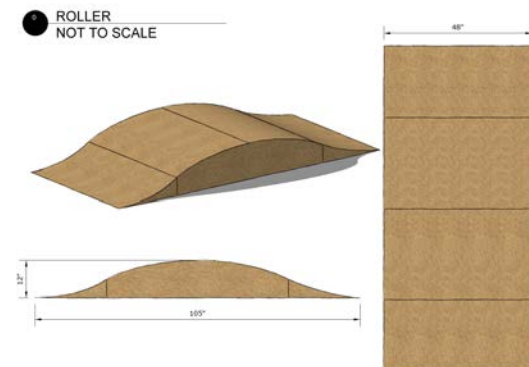
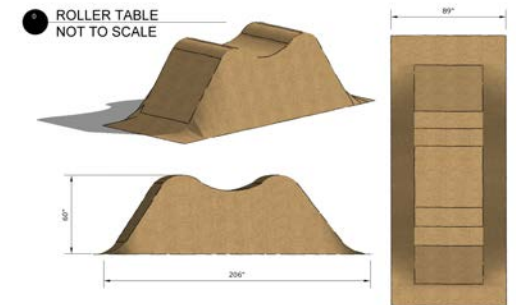
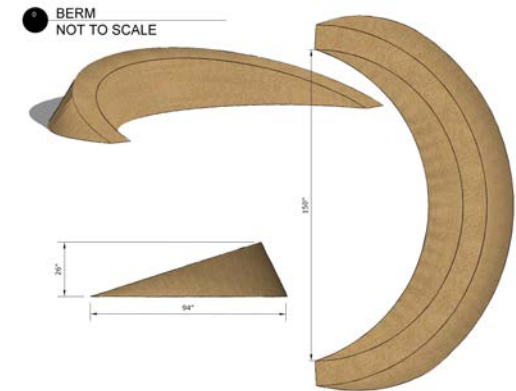
Turn Radius: Broad radius (8' - 15' radius), higher (24" - 48") cupped berms

Trail/Structure Formality: High formality, 36" minimum width, width minimum of 2X maximum height

Wet Area Crossing Formality: Armored crossings at grade, opportunity for constructed bridge riding feature

Duty of Care: High

Intended Experience: These mountain bike-optimized, one-way trails will be oriented for downhill directional use. Grade reversals will be larger and enhanced as rollers or roller tables with excavated or borrow materials. Sinuosity of the trail will be optimized for higher speeds. All turns will be insloped or superelevated and sized accordingly to keep riders on the trail. Trail features on blue trails will all be rollable on main riding line with alternate black level features adjacent to trail.

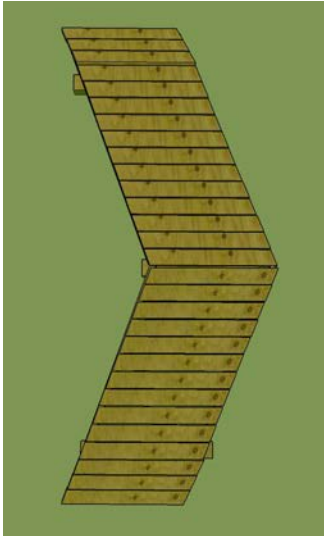


Typical 5.1: MTB-Optimized Trails



Puncheon/Bridge

Top View



Bottom View

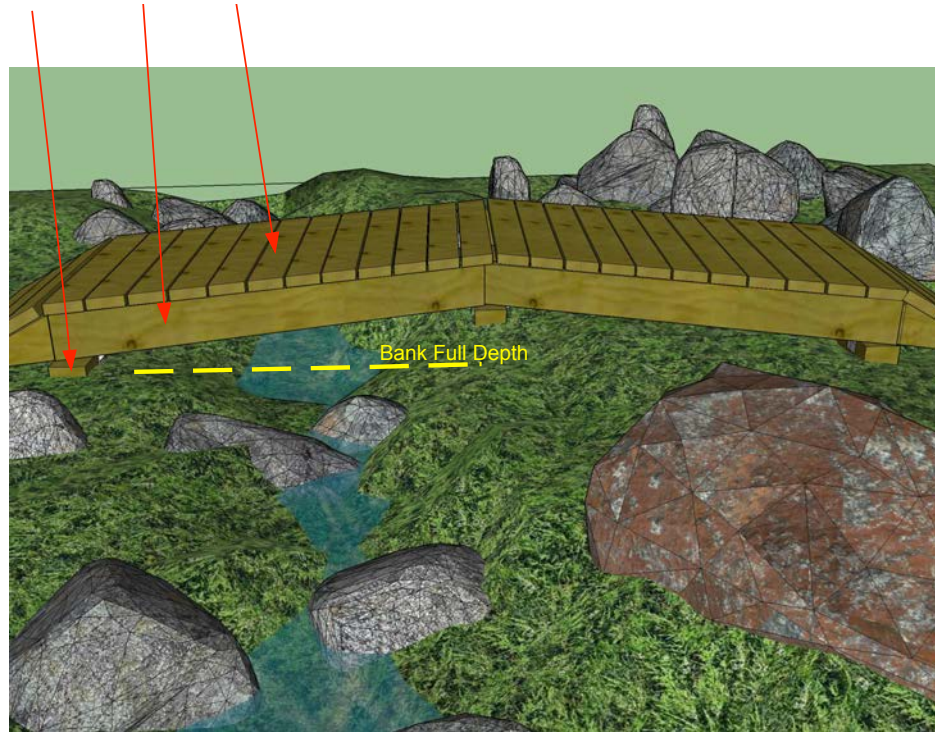
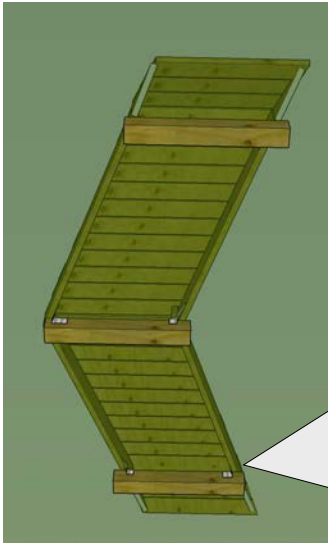


Figure 1.

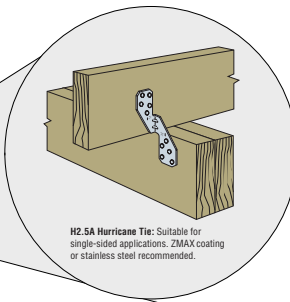
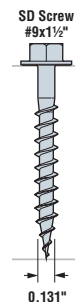
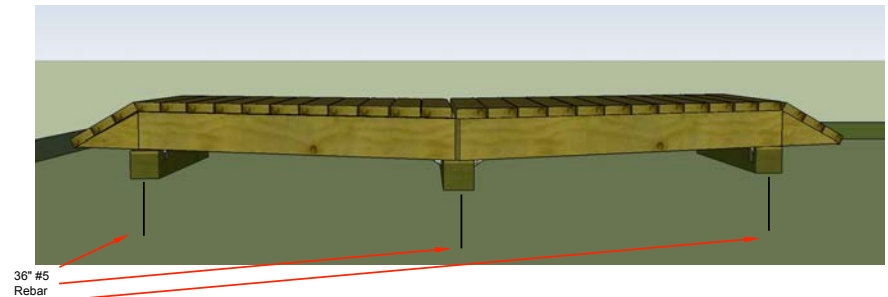


Figure 2.



Side View



Notes:

1. Bridges are specified for perennial streams with bed and bank structure equal to or deeper to 3 feet. Puncheons are specified for intermittent or lesser flowing streams. Construction process for bridges and puncheons are identical except for stringer size and footers. See notes 2, 4 and 5.
2. 6x6 ground contact sills, 1-2" above surrounding grade/height of potential flowing channel. 6" diameter 18" depth concrete footers for bridges greater than 18'.
3. 6x6 mud sills secured with 36" #5 rebar (~6" in from outside edge) and placed at locations above and lateral to channels or depressions.
4. Stringers will be set on 12" centers.
5. Stringers will be 2X10 for bridges less than 12'; 2X12 for bridges 12'-17'; Gluelam 2X16 for bridges 18'-23'. All pressure treated. For bridges, cross-bracing on 6' centers.
6. Hardware to connect stringers to mud sills: Simpson Strong Tie Hurricane Clips (H2.5 AZ) (Figure 1), Tie Plates (TP47), and #9 1.5" hex drive screws (SD9112MB) (Figure 2).
7. Decking is 2x6 rough cut durable hardwood or marine grade pressure treated, fastened with 3.5" decking screws and 30-degree 3" ring shank framing nails.
8. Edges of deck materials should not extend more than 3" from edge of stringers.
9. Fall zones cleared of woody and sharp debris 8' to all lateral surfaces of bridge.
10. Curvilinear construction of puncheon to blend with surrounding topography when possible.

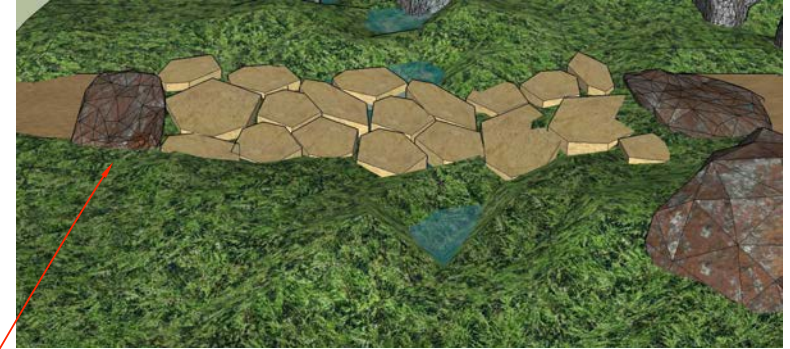
Typical 6.1: Puncheon/Bridge



Flagstone Armored Crossing



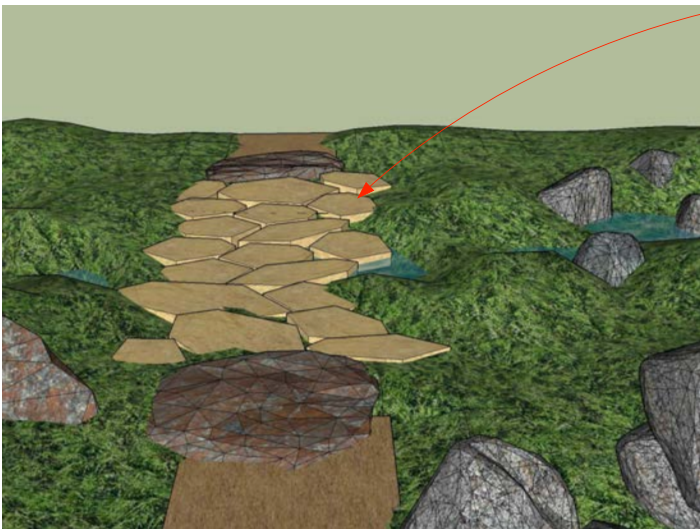
Anchor
Stones



At Grade

Notes:

1. Remove all organic matter from area of armoring to a depth of thickest rocks
2. Armoring to extend at least 6' beyond indications of surface flow or to extent of saturated soils.
3. Anchor Stones are placed at each terminus, span the entire trail tread and extend deep into the mineral soil (2/3 of rock must be buried).
4. Flagstones, large flat stones, are placed directly on mineral soil (or an aggregate foundation).
5. Flagstones are set at-grade to eliminate any potential obstruction to normal water flow.
6. Each stone must have 3 points of contact with other rocks and be locked into place.
7. Pore spaces between stones will be filled with smaller chock stones or crushed rock.
8. When complete, no rock in structure should move in any direction when significant pressure is applied.



Typical 7.1: Rock Armor



The background of the slide is a light beige or cream color, overlaid with a pattern of thin, wavy, brown lines that resemble topographic contour lines or a wood grain texture. The lines are more densely packed in some areas and more sparse in others, creating a subtle, organic pattern.

Appendix B: Cost Estimation

	DMH Bike Park	Glendale Park Skills Area	D&E Trails	Darby Farm Trails
Trailhead	\$0	\$0	\$0	\$75,000 - \$150,000
Signage, Shade, Amenities	\$5,000 - \$20,000	\$12,500 - \$20,000	\$2,500 - \$5,000	\$15,000 - \$25,000
Shared-Use Trails	\$0	\$0	\$90,000 - \$140,000	\$210,000 - \$310,000
Mountain Bike-Optimized Trails	\$118,000 - \$169,000	\$359,000 - \$500,000	\$0	\$0
All-Weather Trails	\$40,000 - \$55,000	\$0	\$200,000 - \$250,000	\$45,000 - \$55,000
Bridges *	\$10,000 - \$15,000 (1)	\$0	\$60,000 - 75,000 (1)	\$70,000 - \$105,000 (7)
Rock Armor/Culverts	\$48,500 - \$58,000	\$0	\$0	\$63,000 - \$96,000
Engineering/Permitting	\$5,000 - \$10,000	\$25,000 - \$35,000	\$25,000 - \$35,000	\$35,000 - \$50,000
Subtotal	\$226,500 - \$327,500	\$396,500 - \$555,000	\$377,500 - \$505,000	\$518,000 - \$798,500

Total: \$1,518,500 - \$2,196,000

* Number of bridges required in parentheses with estimates based on length for each bridge

The background of the slide is a light beige or cream color with a subtle, repeating pattern of thin, brown contour lines. These lines represent topographic features, with some areas showing more closely spaced lines (steeper slopes) and others showing more widely spaced lines (gentler slopes). The pattern is centered and covers the entire page.

Appendix C: Park-Specific Trail Segment Cost Estimates

DMH Trail Segments



Seg. #	Lin. Ft.	Trail Type	Unit Low	Unit High	Total Low	Total High
MH1	1,294	All-Weather	\$32.50	\$40.00	\$42,055	\$51,760
MH2	2,329	Intermediate	\$9.50	\$12.50	\$22,126	\$29,113
MH3	1,425	Beginner	\$8.00	\$11.00	\$11,400	\$15,675
MH4	1,576	Beginner	\$8.00	\$11.00	\$12,608	\$17,336
MH5	437	Beginner	\$8.00	\$11.00	\$3,496	\$4,807
MH6	471	Beginner	\$8.00	\$11.00	\$3,768	\$5,181
					\$95,452	\$123,872

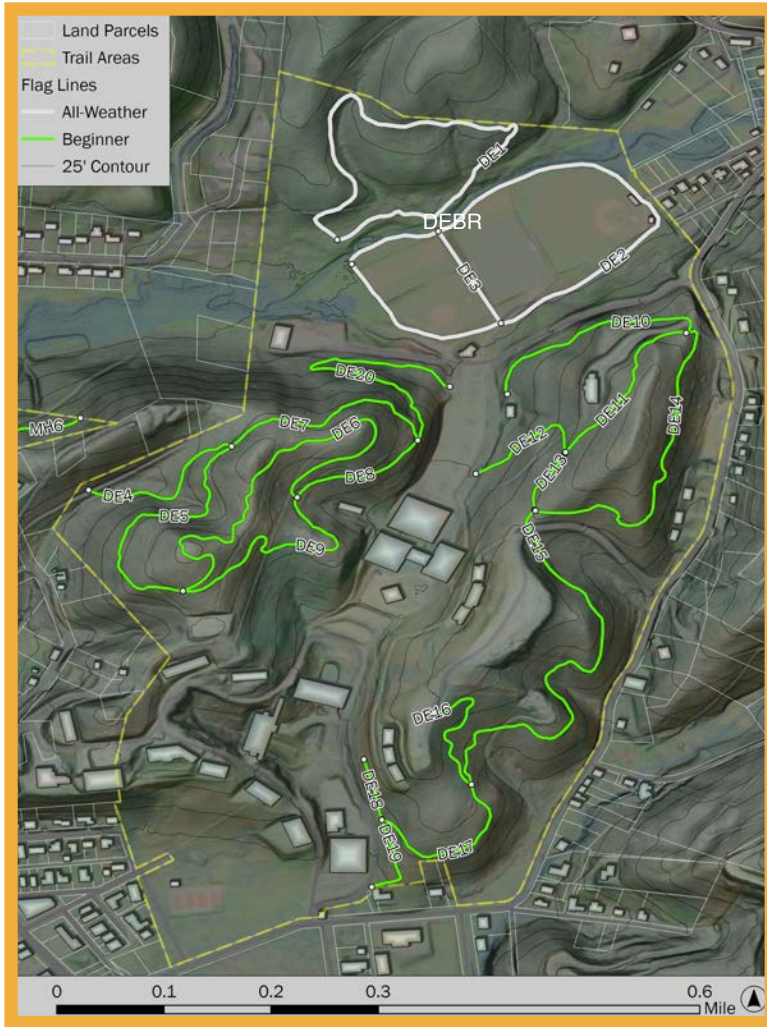
Additional Items	Unit	Unit Low	Unit High	Total Low	Total High
48" x 20' hdpe culvert	6	\$1750	\$2250	\$10,500	\$13,500
Imported flagstone rock	1,000 lin. ft.	\$35	\$55	\$35,000	\$55,000
16' x 4' puncheon	1	\$10,000	\$15,000	\$10,000	\$15,000
				\$55,500	\$78,500

Glendale Bike Park Trail Segments



Items	Unit	Unit Low	Unit High	Total Low	Total High
Skills Loop	1,320 lin. ft.	\$8	\$11	\$10,560	\$14,520
Skills features	8	\$4,500	\$6,000	\$36,000	\$48,000
Tot Track	2,500 sq. ft.	\$25	\$35	\$62,500	\$87,500
Pump Track	10,000 sq. ft.	\$25	\$35	\$250,000	\$350,000
				\$359,060	\$500,020

D&E Trail Segments



Seg. #	Lin. Ft.	Trail Type	Unit Low	Unit High	Total Low	Total High
DE1	2,629	All-Weather	\$32.50	\$40.00	\$85,443	\$105,160
DE2	3,071	All-Weather	\$32.50	\$40.00	\$99,808	\$122,840
DE3	512	All-Weather	\$32.50	\$40.00	\$16,640	\$20,480
DE4	728	Beginner	\$5.50	\$8.50	\$4,004	\$6,188
DE5	1,225	Beginner	\$5.50	\$8.50	\$6,738	\$10,413
DE6	2,112	Beginner	\$5.50	\$8.50	\$11,616	\$17,952
DE7	939	Beginner	\$5.50	\$8.50	\$5,165	\$7,982
DE8	575	Beginner	\$5.50	\$8.50	\$3,163	\$4,888
DE9	1,146	Beginner	\$5.50	\$8.50	\$6,303	\$9,741
DE10	967	Beginner	\$5.50	\$8.50	\$5,319	\$8,220
DE11	817	Beginner	\$5.50	\$8.50	\$4,494	\$6,945
DE12	555	Beginner	\$5.50	\$8.50	\$3,053	\$4,718
DE13	325	Beginner	\$5.50	\$8.50	\$1,788	\$2,763
DE14	1,529	Beginner	\$5.50	\$8.50	\$8,410	\$12,997
DE15	2,106	Beginner	\$5.50	\$8.50	\$11,583	\$17,901
DE16	685	Beginner	\$5.50	\$8.50	\$3,768	\$5,823
DE17	795	Beginner	\$5.50	\$8.50	\$4,373	\$6,758
DE18	305	Beginner	\$5.50	\$8.50	\$1,678	\$2,593
DE19	422	Beginner	\$5.50	\$8.50	\$2,321	\$3,587
DE20	1,258	Beginner	\$5.50	\$8.50	\$6,919	\$10,693
					\$292,580	\$388,637

Additional Items	Unit	Unit Low	Unit High	Total Low	Total High
DEBR 50' x 8'	1	\$60,000	\$75,000	\$60,000	\$75,000
				\$60,000	\$75,000

Darby Farm Trail Segments



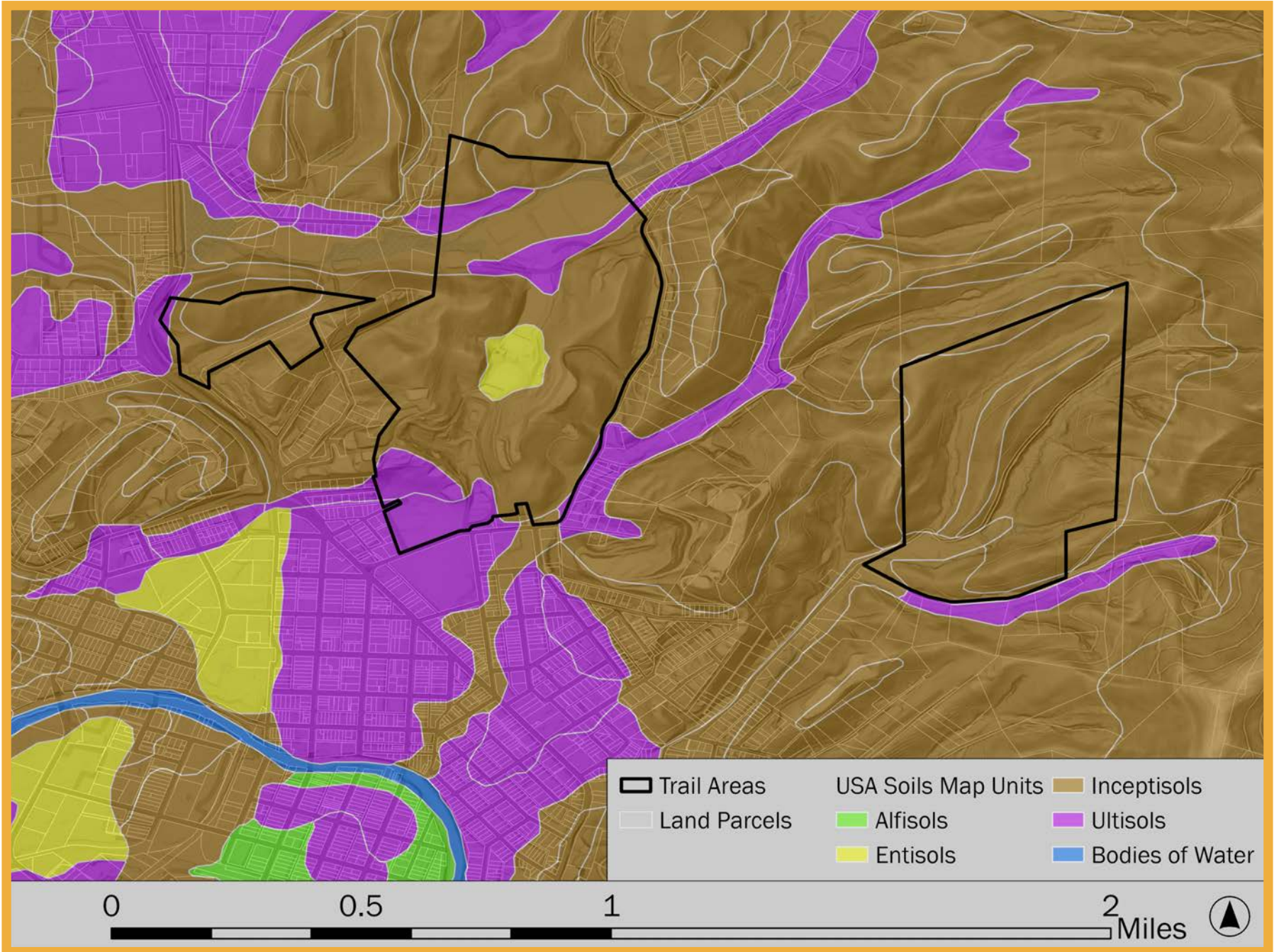
Additional Items	Unit	Unit Low	Unit High	Total Low	Total High
48" x 20' hdpe culvert	6	\$1750	\$2250	\$10,500	\$13,500
Imported flagstone rock	1,500 lin. ft.	\$35	\$55	\$52,500	\$82,500
16' x 4' puncheon	7	\$10,000	\$15,000	\$70,000	\$105,000
Trailside Features	25	\$1200	\$1600	\$30,000	\$40,000
				\$163,000	\$241,000

Seg. #	Lin. Ft.	Trail Type	Unit Low	Unit High	Total Low	Total High
DF1	1,320	All-Weather	\$32.50	\$40.00	\$42,900	\$52,800
DF2	914	Beginner	\$5.50	\$8.50	\$5,027	\$7,769
DF3	2,902	Beginner	\$5.50	\$8.50	\$15,961	\$24,667
DF4	780	Beginner	\$5.50	\$8.50	\$4,290	\$6,630
DF5	173	Beginner	\$5.50	\$8.50	\$952	\$1,471
DF6	232	Beginner	\$5.50	\$8.50	\$1,276	\$1,972
DF7	1,452	Beginner	\$5.50	\$8.50	\$7,986	\$12,342
DF8	1,725	Intermediate	\$6.75	\$9.75	\$11,644	\$16,819
DF9	1,328	Beginner	\$5.50	\$8.50	\$7,304	\$11,288
DF10	3,081	Beginner	\$5.50	\$8.50	\$16,946	\$26,189
DF11	2,525	Intermediate	\$6.75	\$9.75	\$17,044	\$24,619
DF12	138	Beginner	\$5.50	\$8.50	\$759	\$1,173
DF13	1,546	Beginner	\$5.50	\$8.50	\$8,503	\$13,141
DF14	1,689	Intermediate	\$6.75	\$9.75	\$11,401	\$16,468
DF15	1,886	Intermediate	\$6.75	\$9.75	\$12,731	\$18,389
DF16	2,762	Intermediate	\$6.75	\$9.75	\$18,644	\$26,930
DF17	1,806	Beginner	\$5.50	\$8.50	\$9,933	\$15,351
DF18	905	Beginner	\$5.50	\$8.50	\$4,978	\$7,693
DF19	1,300	Beginner	\$5.50	\$8.50	\$7,150	\$11,050
DF20	1,520	Intermediate	\$6.75	\$9.75	\$10,260	\$14,820
DF21	441	Beginner	\$5.50	\$8.50	\$2,426	\$3,749
DF22	40	Beginner	\$5.50	\$8.50	\$220	\$340
DF23	203	Beginner	\$5.50	\$8.50	\$1,117	\$1,726
					\$219,448	\$317,391

The background of the page is a light beige or cream color, overlaid with a pattern of thin, brown contour lines. These lines represent topographic features, with some areas showing more closely spaced lines (steeper slopes) and other areas showing more widely spaced lines (gentler slopes). The lines are irregular and organic in shape, typical of a natural landscape's elevation changes.

Appendix D: Soil Mapping Resources

Soils Map Units



Soil Hydrologic Group

