Pinckney Recreation Area

Potawatomi Trail Revitalization Project Phase 1

Design-Build Request For Proposals

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Project Purpose/Background

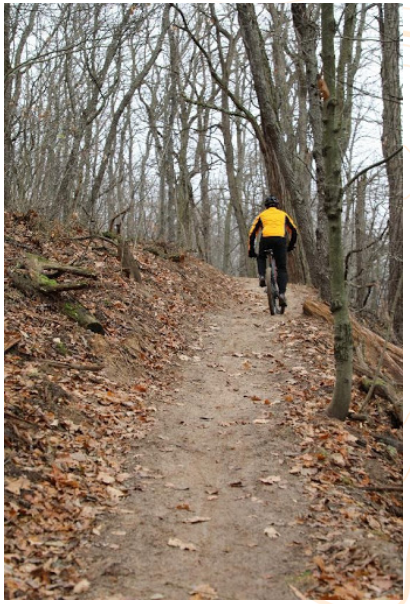
The Poto Revitalization Project or “Poto Project” is a multi-year project focused on enhancing the sustainability and user experience of the Potawatomi Trail. The Potawatomi Mountain Bike Association (Poto) has been working for 20 years on mountain bike and shared-use trails in and around Washtenaw, employing the highest standards of sustainable design and build natural surface singletrack trails that are low maintenance and fun to ride. Poto MBA is working closely with the MI DNR’s Pinckney Recreation Area and regional staff to ensure that the decisions that affect the Potawatomi Trail System are made in the best interest of both low-impact recreational use AND the preservation of landscape functions and values.

The 19+ miles of the Pinckney Recreation Area trail system (Silver, Crooked, and Potawatomi) were built approximately 50 years ago before the emergence of current commonly accepted sustainable building practices. Its ascents and descents were built on the topographic fall line (relatively straight up and down the area hills) or in flat, lowland areas- both locations where the construction was easiest. The result of these location choices include an extensive number of heavily eroded sections and poor-draining segments of trail that contribute to excessively muddy conditions.

The Poto Project is designed to retain the backcountry trail character. The revitalization work has improved existing trail tread within the existing corridor where possible, using heavy maintenance techniques, including:

- Armoring short segments of fall-aligned trails (before and after pictures, top):
- Recontouring existing trail to improve drainage (before and after pictures, bottom); and
- Adding many natural water management structures such as knicks and rolling grade dips (more sustainable solutions than water bars).

Where practical, Poto Revitalization activities are being implemented within the existing trail corridor. The projects here also removed geotextile fabrics from the forest.

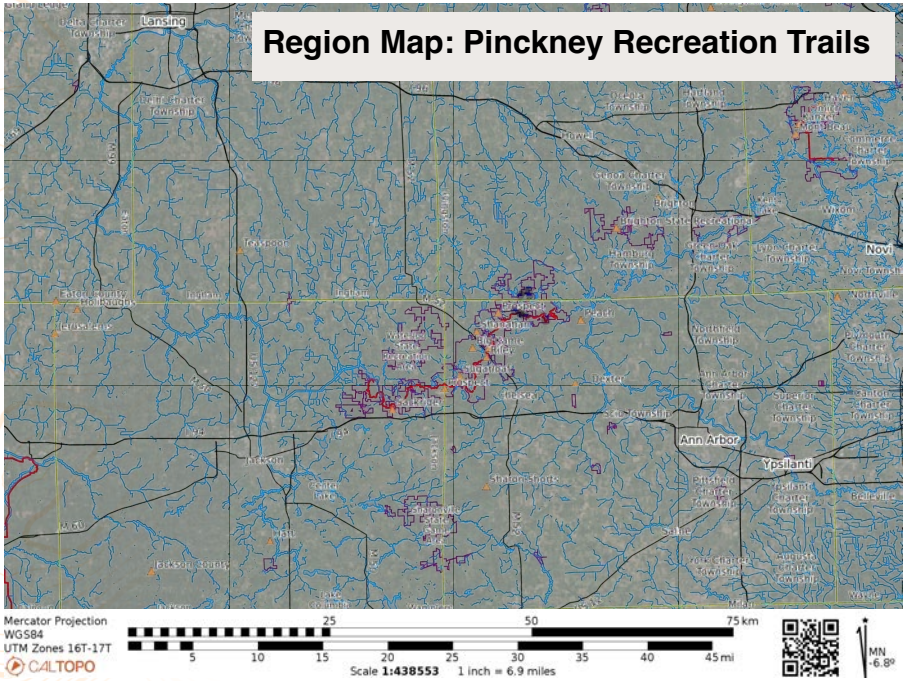


However, in many cases across the trail system, the steep, fall-aligned locations of eroding trail cannot be recontoured to better manage water and armoring needs would be too long to be practical. In some lowland areas, there is not a viable maintenance solution to reduce trail muddiness and the potential for adjacent impacts to water quality. In these situations, the only viable management alternative is a trail relocation that will result in a lower gradient, sidehill-located sustainable trail (See Specifications- rolling contour trail) that reduces natural resource impacts and provides a high quality recreational experience. As these trails have lower gradients than the trails they replace, the trail length increases (eg. 100' long trail segment with 20% grade becomes a 200' long trail segment when the grade is reduced to 10%.)

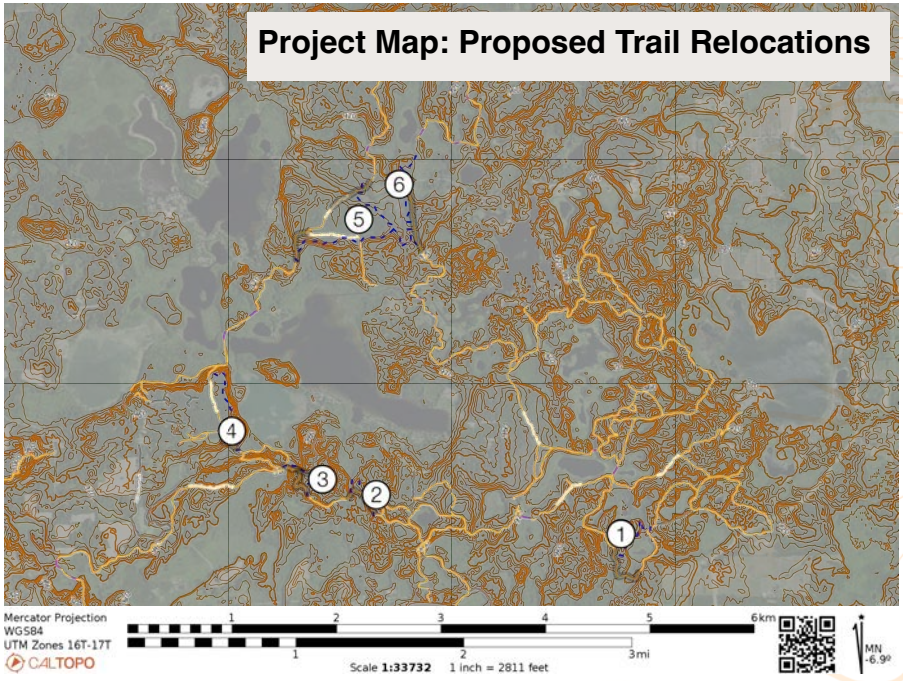
The proposed 6 trail relocations for Phase 1 of this project have similar characteristics. They are proposed for locations with:

- Significant length of trail that is located on the fall line or in low-lying areas and has experienced extensive erosion or muddiness that cannot be rectified through in-corridor activities;
- Available terrain in close proximity with slopes of 20-50% where rolling contour, sidehill-located trail can be constructed to naturally drain stormwater and/or snowmelt; and
- Continuity of the trail system related to typical use patterns can be maintained.

Region Map: Pinckney Recreation Trails



Project Map: Proposed Trail Relocations



Project Description

In total there are 3.85 miles of new sustainably designed and constructed trail along, 0.51 miles of heavy maintenance within the existing trail corridors, and 0.22 miles of trail restoration at new trail junctions. 3.52 miles of trail will be closed and removed from the Potawatomi trail system. These activities are proposed for 6 locations including:

1. 0.32-mile relocation with 20' of boardwalk to avoid trail impacting wetland, a 0.04 miles of trail restoration, and 0.10 miles of in-corridor trail reclamation including 20 linear feet of rock armored tread. 0.66 miles of trail will be closed and removed from the system. No mechanical activities into the 0.14 miles of trail through wetland are allowed in order to avoid potential habitat impacts to EMR, and the existing boardwalk will be removed by hand by DNR and/or Poto volunteers.

2. 0.40-mile relocation off of fall line with new 24' bridge crossing over Dead Creek (footings set 2' above banks). 0.03-mile trail closure/restoration, and approximately 60' of rock armored tread. 0.24 miles will be closed and removed from the system. No mechanical travel through the 0.02-mile Dead Creek wetland/riparian area in order to avoid habitat impacts to EMR.

3. 0.31-mile relocation of trail from fall line location. 0.03-mile restoration, and approximately 60 linear feet of rock armored trail tread. 0.32 miles of trail will be closed and removed from the system.

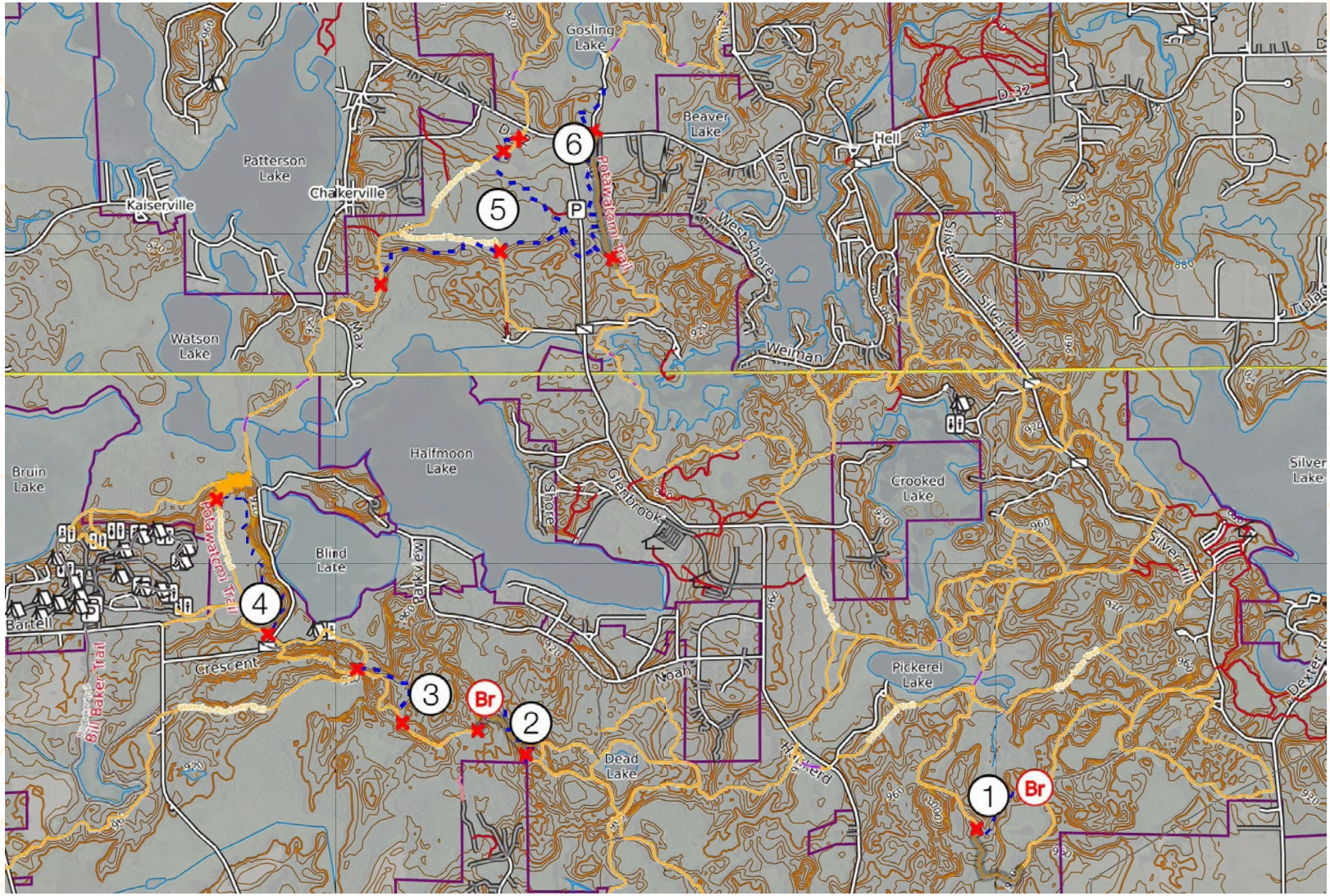
4. 0.65-mile trail relocation around upper hill slopes west of Blind Lake, 0.03 miles of trail closure/restoration, 0.4-miles of heavy maintenance within the trail corridor, and 0.14-miles of drainage maintenance within the trail corridor to the base of the slope, including 120 linear feet of rock armored tread. 0.88 miles of trail will be closed and removed from the system.

5. 1.18-mile relocation to consistent sidehill location from multiple fall line segments and seasonally wet swale crossing and 0.06 miles of trail closure/restoration. It also includes approximately 40 linear feet of rock armored trail tread. 1.09 miles of trail will be closed and removed from the system.

6. 0.89-mile trail relocation to move existing trail away from private property and onto more appropriate sidehill location for long-term sustainability, 0.03 miles of trail restoration, and 20 linear feet of rock armored trail tread. 0.33 miles of trail will be closed and removed from the system.

Proposed Potawatomi Trail Relocations

Proposed Potawatomi Trail Relocations. The 6 proposed relocations depicted below and on the subsequent pages total 3.85 miles of new trail construction and 3.74 miles of trail closure of which .22 miles are in wetland areas. There will be two bridges installed on the new trail (20' and 24').



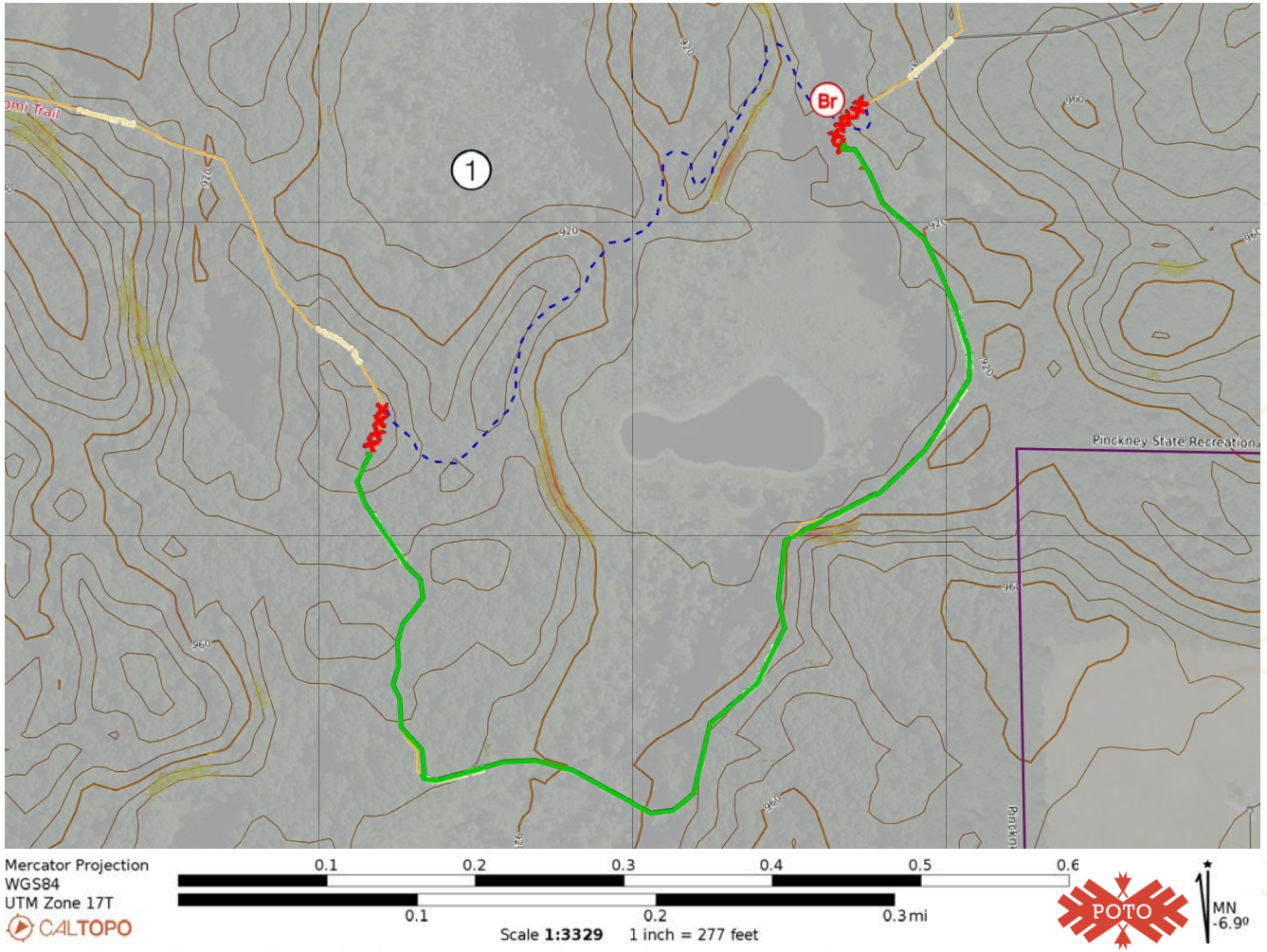
Potawatomi: Proposed Relocation 1

Relocation Description: Begin prior to top of hill, route trail through saddle to just above steeper slope, continue down to lower saddle, following just above steeper slope, turn south above steeper slope and descent to junction.
Project Alternatives: In-corridor fix considered for fall-aligned, eroded segment, but it would still cross and run adjacent to wetland where muddiness and habitat concerns exist.
Specific Activities: No mechanized equipment access in wetland. Before trail tread is established in proposed rerouted segments, the contractor will be required to clear the trail corridor with a leaf blower and/or rakes to remove all leaf litter and debris down to bare earth in order to ensure no EMR activity in the trail tread build out zone. Any downfall in the trail tread zone to be established shall be cleared by hand with chainsaw. The existing 75' boardwalk will be removed by DNR staff and/or volunteers.

Legend

Existing Trail	———
Relocation	– – –
Heavy Maint.	xxxxx
Restoration	xxxxx
Closure	———
Bridge	Br

Action	Miles
New Trail Construction	0.32
Heavy Maintenance	0
Restoration	0.04
Closure	0.66

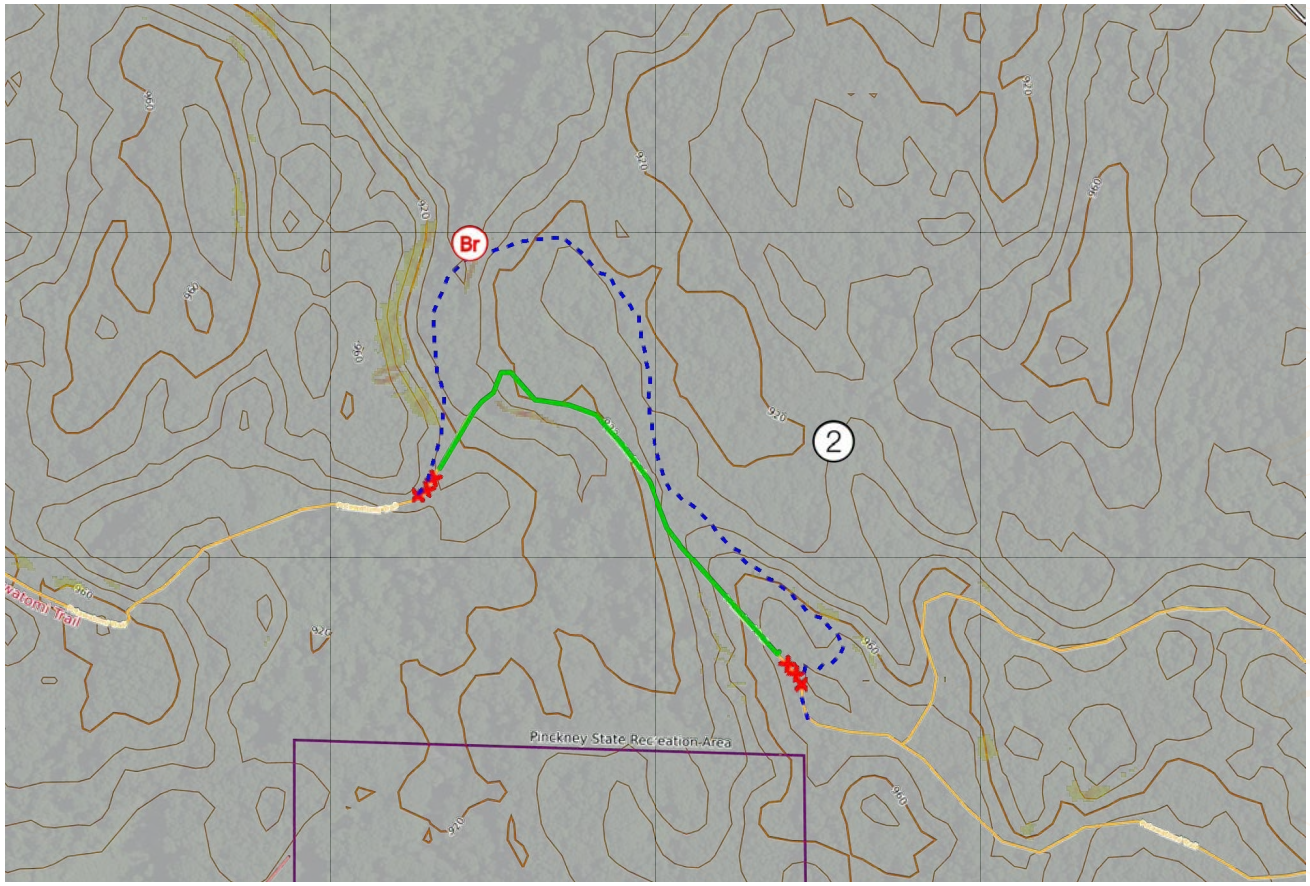


Potawatomi: Proposed Relocation 2

Relocation Description: Just prior to the descent, trail will be routed to the sideslope to allow for cross-trail water mgt, descending to the valley and crossing the drainage with a bridge at a narrow location, then traversing the lower valley below the steeper slopes.
Project Alternatives: Armoring the trail in the corridor was considered with "creative" drainage improvements, but the length of the treatments would be much more costly than the relocation and the impacts to the low-lying wet area would remain.
Specific Activities: Before trail tread is established in proposed rerouted segments, the contractor will be required to clear the trail corridor with a leaf blower and/or rakes to remove all leaf litter and debris down to bare earth in order to ensure no EMR activity in the trail tread build out zone. Any downfall in the trail tread zone to be established shall be cleared by hand with chainsaw. Existing bridge (pictured on table of contents page) will be removed by DNR staff and/or volunteers

Legend	
Existing Trail	———
Relocation	– – –
Heavy Maint.	xxxxx
Restoration	xxxxx
Closure	———
Bridge	Br

Action	Miles
New Trail Construction	0.40
Heavy Maintenance	0
Restoration	0.03
Closure	0.24

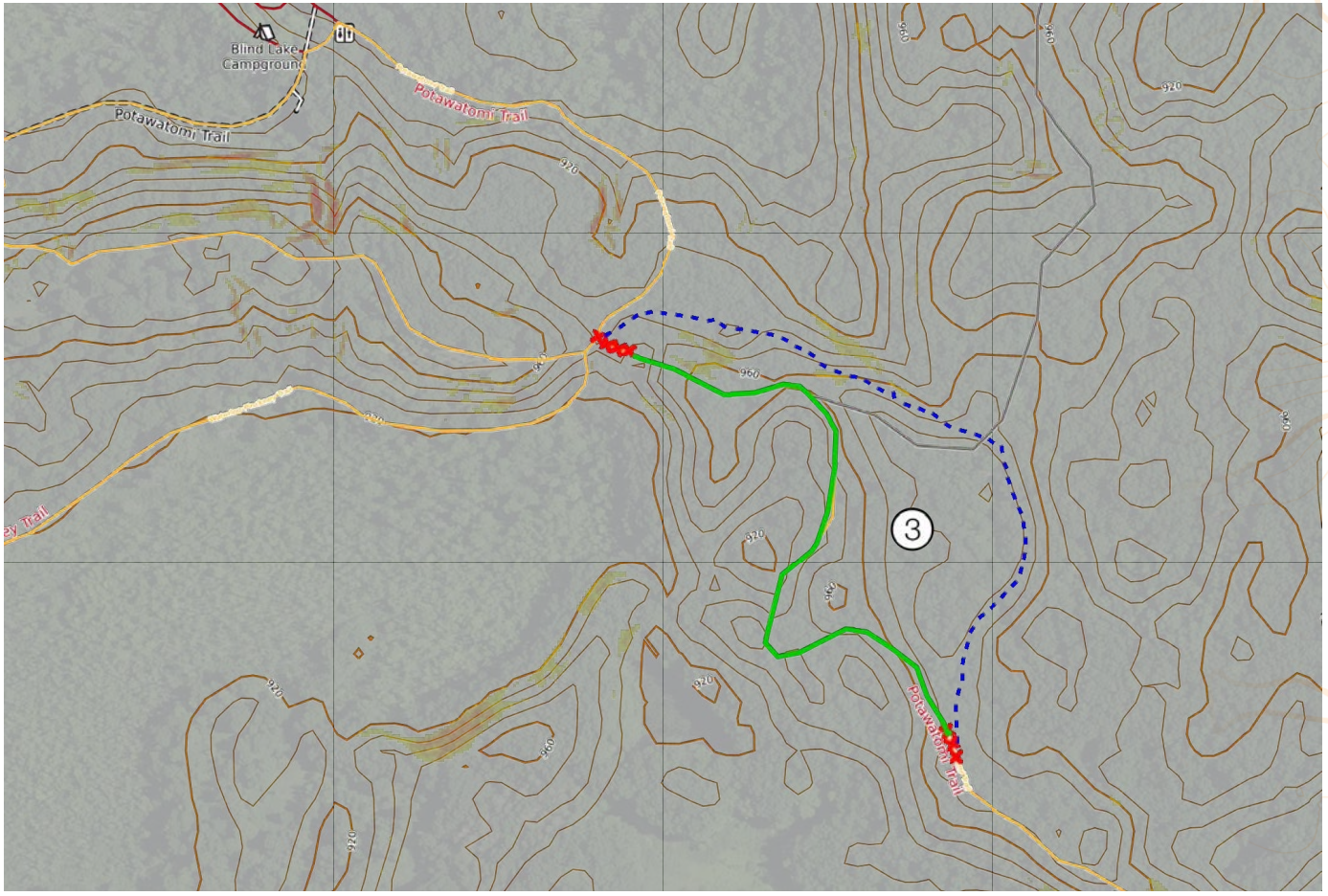


Potawatomi: Proposed Relocation 3

Relocation Description: Begin relocation at top of small climb and move trail to northern aspect of the slope, before descending gradually, cutting between steeper sloped portions of the hillside, and connect at existing 4-way trail junction.
Project Alternatives: Armoring of the existing trail tread, with intensive trail drainage solutions was considered, but would be more costly than new trail construction and closure/restoration of the eroded route. Campground connection at western terminus to be developed when campground infrastructure is updated.
Specific Activities: Before trail tread is established in proposed rerouted segments, the contractor will be required to clear the trail corridor with a leaf blower and/or rakes to remove all leaf litter and debris down to bare earth in order to ensure no EMR activity in the trail tread build out zone. Any downfall in the trail tread zone to be established shall be cleared by hand with chainsaw.

Legend	
Existing Trail	———
Relocation	– – –
Heavy Maint.	xxxxx
Restoration	xxxxx
Closure	———
Bridge	Br

Action	Miles
New Trail Construction	0.31
Heavy Maintenance	0
Restoration	0.03
Closure	0.32



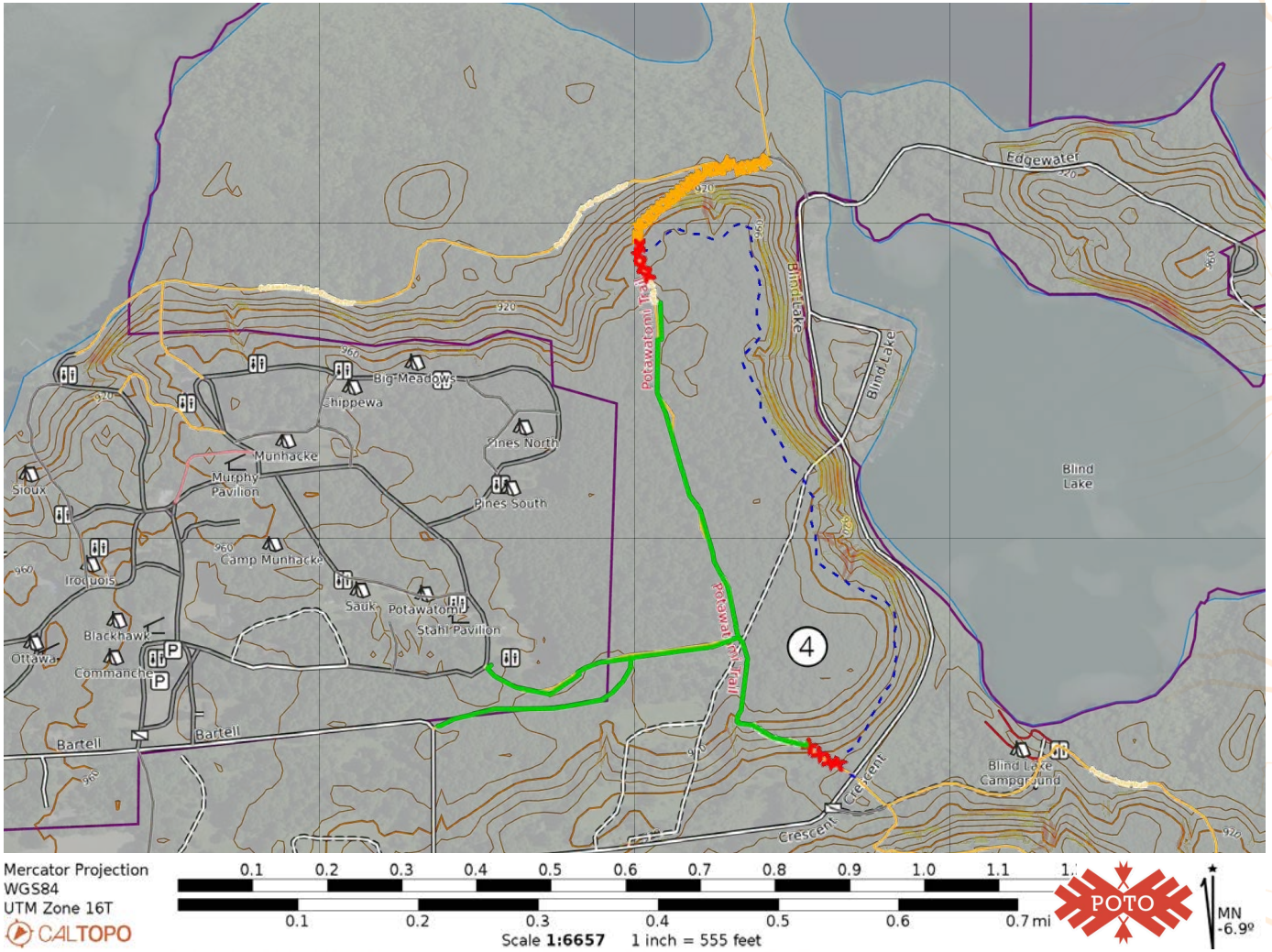
Potawatomi: Proposed Relocation 4

Relocation Description: Begin construction to north just after hill slope is encountered, gradually climbing to the grade break above the steep slopes, turning to the west to connect with the descending portion of the trail, where tread outsloping and rolling grade dips will be installed in-corridor down to the base of the slope. Trail relocation optimized to avoid high quality and old growth
Project Alternatives: The eroded portion has developed multiple tracks incised up to 3', and no in-corridor solution is possible.
Specific Activities: Before trail tread is established in proposed rerouted segments, the contractor will be required to clear the trail corridor with a leaf blower and/or rakes to remove all leaf litter and debris down to bare earth in order to ensure no EMR activity in the trail tread build out zone. Any downfall in the trail tread zone to be established shall be cleared by hand with chainsaw.

Legend

Existing Trail	
Relocation	
Heavy Maint.	xxxxx
Restoration	xxxxx
Closure	
Bridge	Br

Action	Miles
New Trail Construction	0.65
Heavy Maintenance	0.4
Restoration	0.03
Closure	0.88

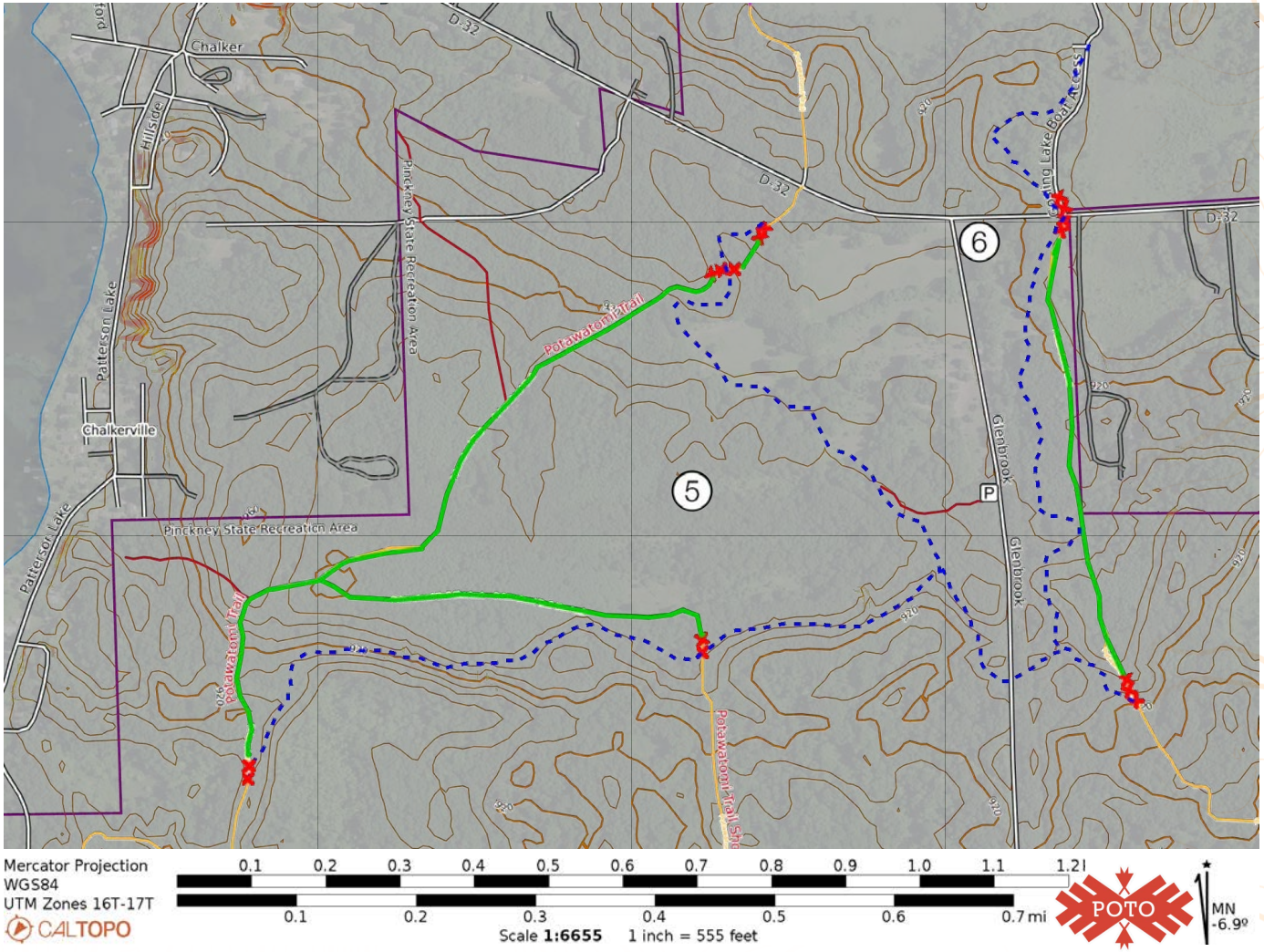


Potawatomi: Proposed Relocation 5 & 6

Relocation Description: Begin at base of eroded slope, climbing gradually to the top of the hill, then descending gradually east and then north (5). Relocate trail onto the sideslope away from private property.
Project Alternatives: Armoring the tread in the existing trail corridor in the 2 locations would be more costly than relocations (5) and leaving the trail adjacent to the private property disrupts the backcountry feel and creates unnecessary conflicts with a neighbor.
Specific Activities: Before trail tread is established in proposed rerouted segments, the contractor will be required to clear the trail corridor with a leaf blower and/or rakes to remove all leaf litter and debris down to bare earth in order to ensure no EMR activity in the trail tread build out zone. Any downfall in the trail tread zone to be established shall be cleared by hand with chainsaw.

Legend	
Existing Trail	———
Relocation	– – –
Heavy Maint.	xxxxx
Restoration	xxxxx
Closure	———
Bridge	Br

Action	Miles
New Trail Construction	2.07
Heavy Maintenance	0.11
Restoration	0.09
Closure	1.42



Stewardship Unit Review & Requirements

The stewardship team at DNR has reviewed the proposed trail relocation corridors and have provided internal approval of the scope of work. Prior to construction the stewardship team will review the Vendor's flagged trail corridors.

The proposed relocations will reduce potential interactions between trail users and Eastern Massasauga Rattesnakes through:

- In location 1, moving the trail out of the wetland and adjacent to the wetland and pond, will better remove recreational use in immediate vicinity of potential Eastern Massasauga Rattlesnake (EMR) habitat;
- Similarly in location 2, removing the broad trail crossing the low lying area and installing a bridge at a narrower crossing will similarly remove recreational use from a larger area of potential EMR habitat; and
- A prohibition on mechanical equipment in and adjacent to wetland areas, save for the bridge placement, will reduce the potential for interactions in the potential EMR habitat during the construction process.

Additional stipulations for resource protection include:

- At relocation 4, the approved trail corridor was altered to provide greater distance from older growth, high value trees;
- All equipment, footwear, clothing, and all other materials brought on site for this project must be completely clean and free of ALL plant material, organisms and soil (seeds, pieces of vegetation, chunks of soil, etc.) prior to arrival at each park location. This shall include both inside and outside of all vehicles. Power washing and/or similar methods shall be used as needed, for all undercarriages, metal and rubber tracks, tires (chained and unchained), and all other parts of vehicles brought on site to ensure they are clean and free of seed, plant materials and soil. These precautions are critical to preventing the spread of invasive plants, disease causing organisms and vectors as well as contamination of genetic material (seeds) from locations outside of each state park;
- No cutting of trees five inch or larger DBH from April 1 to September 30;
- No oak trees will be pruned or cut from April 15 to November 1. In the event that any oak tree is wounded or damaged during construction it will immediately be sealed with commercial tree paint. Even the smallest wounds must be sealed; and
- Staging areas for equipment on knolls will be prohibited due to potential cultural resource issues.

Best Management Practices & Communications Plan- EMR

Prior to working all project personnel, including contractors, Poto project supervisors, and DNR personnel will:

- Watch the DNR's 60 seconds with snakes EMR video or review the USFWS EMR fact sheet; and
- Report of any EMRs observed while project ensues and report any EMR deaths within 24 hours to park manager and Alicia Ihnken (ihnkena@michigan.gov).

At the onset of each individual trail relocation, the construction contractor will:

- All brush/sapling (anything <5" DBH) clearing during the active season of April 15 to October 15 must be done by hand cutting (chainsaw, loppers, etc.) only. No mechanical mowing (string trimmer, brush cutter, brush mower, forestry mower, Hydro-Axe etc.) or grinding equipment.
- In forested areas the trail corridor shall be cleared with a blower and/or rakes to remove all leaf litter and debris down to bare earth. Downfall shall be cleared by hand with chainsaw.
- In grass areas, the trail corridor shall be cleared by mowing prior to the active season (April 15th) to a 1-3-inch height.
- Grass height must be maintained under 6-inch height during the active season (April 15 – Oct 15). If the grass exceeds 6-inches at any time during the active season, it cannot be mowed until Oct 30.

Instructions To Bidders

1.1 Statement of Purpose

It is the intention of Potawatomi Mountain Biking Association ("Client") to solicit Proposals for a Trail Design-Build Vendor. Those receiving this Request for Proposal (RFP) are referred to as "Contractor."

THE Potawatomi Mountain Biking Association (Poto MBA) is a Chapter of the International Mountain Bicycling Association (IMBA) with its principal place of business in Dexter, MN USA. IMBA has Chapters across the U.S. and in many countries and territories around the world. Our mission is to maintain and develop mountain biking trails, promote and advocate for the sport of mountain biking and build the mountain biking community in Washtenaw, Lenawee, and Livingston counties.

1.2 Description of Work

Project Scope

Poto MBA is seeking bids from experienced trail contractors for the design-build of shared-use, backcountry-style singletrack trails in the 11,000-acre Pinckney Recreation Area near Pinckney, MI. The scope of work included in this RFQ is for:

- design-build of approximately 3.85 miles of backcountry, singletrack trail;
- Heavy maintenance/reconstruction in-place of approximately 0.51 miles of trail; and
- Restoration of approximately 0.22 miles of trail at new trail junctions.

Consequent to this new trail construction, there will be two puncheon-style bridges installed along with rock armoring with imported rock (Napoleon Sandstone) of seasonally wet or perpetually sandy trail segments. On-site glacial erratics can be incorporated into utilized the flagstone paving and should be utilized as anchors/guide structures at the termini of rock armoring work.

The work is not continual along the trail. Rather it is split into 6 sub-projects where degraded trail conditions require relocation and/or remediation. Maps and details for each sub-project can be found in the Project Description (pages 3-9).

Contractors are encouraged to visit the site prior to bidding.

Project Location

Pinckney Recreation Area, located outside Pinckney, MI.

Deliverables

Construction of approximately 3.85 miles of more difficult, backcountry singletrack trail, 0.51 miles of heavy maintenance/ reconstruction in-place, and 0.22 miles of trail restoration per the attached Specifications (Attachment A). The Vendor will be required to ribbon flag the immediate trail corridor for approval by MI DNR prior to initiating construction. The Vendor will be required to adhere to common natural surface trail construction best practices per the attached Construction Best Practices (Attachment B).

1.3 Poto MBA's Procurement Process

Procurement activities will be conducted in a nondiscriminatory manner with fair treatment given to all Contractors. The Poto MBA reserves the right to reject any and all offers for any reason whatsoever, to waive technicalities, and to pursue purchasing in a manner that is in the best interest of the organization

1.4 Client’s Obligations

Client incurs no obligation or liability whatsoever by reason of issuance of this RFP or action by anyone relative thereto.

1.5 Contractor’s Obligations

Contractor must analyze and respond to all sections of this RFP providing sufficient information to allow Client to evaluate the Proposal. Contractor, by submitting its Proposal, agrees that any costs incurred by the Client in responding to this RFP, are to be borne by Contractor and may not be billed to Client.

Contractor shall not use the names, logos, images or any data or results arising from the anticipated contract for advertising without Client's prior written consent.

1.6 Contractor Submission Requirements

1.6.1. Submission of Proposal:

Contractor will submit responses by email to Carl Loomis at president@PotoMBA.org.

1.6.2 Proposal Due Date

Proposals shall be delivered to Poto MBA on or before 5:00 pm ET April 15, 2024.

The Proposal should include:

- A statement of interest in serving as the Contractor, description of services to be provided, makeup of crew, machinery, and experience, and statement of qualifications describing the Contractor's experience in performing the requested services;
- A detailed plan, including a timeline, of how the Project Deliverables will be constructed to meet the specifications **prior to August 31, 2025**; and
- A fully executed quote, see Bid Worksheet (following page) for the proposed services. Also, provide an hourly rate for the above-described crew to perform in-corridor maintenance work as directed by the Client.

1.7 State of Michigan Prevailing Wage

For any state-funded project with a contract value of greater than $50,000, Contractor (and its Subcontractors) represents and warrants that 1) it pays all mechanics and laborers employed directly on the site of the work, unconditionally and at least once a week, and without subsequent deduction or rebate on any account, the full amounts accrued at time of payment, computed at wage rates not less than those stated in the advertised specifications as prevailing wages based on locality, regardless of any contractual relationship which may be alleged to exist between the Contractor or subcontractor and the laborers and mechanics, and 2) will post the scale of wages to be paid in a prominent and easily accessible place at the site of the work. County prevailing wage rates can be found at https://www.michigan.gov/leo/bureaus-agencies/ber/wage-and-hour/prevailing-wage.

1.8 Communications

Questions or expressions of interest regarding the proposal can be emailed to Carl Loomis at president@PotoMBA.org prior to 5:00 pm ET on April 5, 2024. Responses will be issued by 5:00 pm ET on April 8, 2024 by email to all respondents that have expressed an interest in bidding on the project.

Bid Worksheet

Sub-Project Number	Action	App. Length (Lin. Feet)	Unit Cost ($)	Subtotal ($)
1	Construction, Backcountry	1,690		
	Closure/Restoration	225		
	Puncheon/Bridge	24		
	Rock Armor*	20		
2	Construction, Backcountry	2,112		
	Closure/Restoration	150		
	Puncheon/Bridge	20		
	Rock Armor*	60		
3	Construction, Backcountry	1,637		
	Closure/Restoration	150		
	Rock Armor*	60		
4	Construction, Backcountry	3,432		
	Heavy Maintenance	2,112		
	Closure/Restoration	150		
	Rock Armor*	120		
5 & 6	Construction, Backcountry	10,930		
	Heavy Maintenance	580		
	Closure/Restoration	525		
	Rock Armor*	60		
			Total:	

* ***** Imported Napoleon Sandstone for tread with existing rock to supplement, where present

Additional Services	In-corridor maintenance	Labor/machinery	Hourly Rate	$

Appendix A: Specifications

SPECIFICATIONS

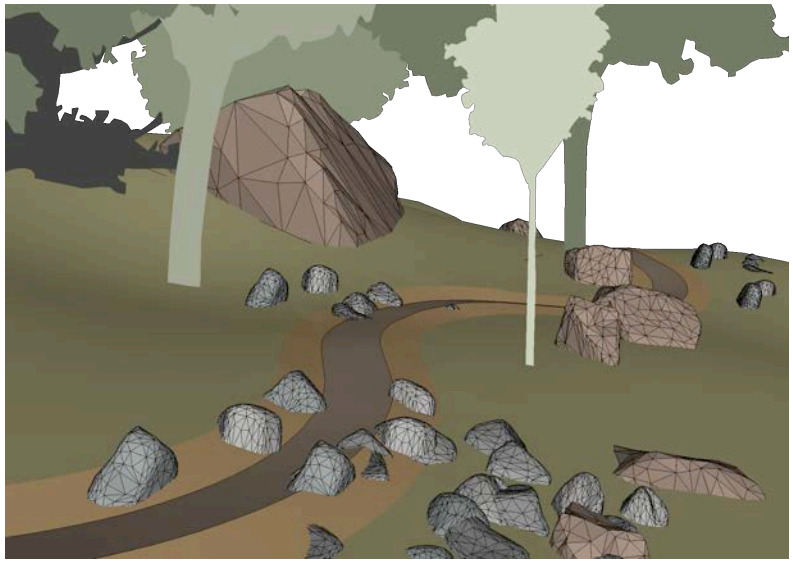
It is imperative that new natural surface trail construction is developed in the most sustainable manner to minimize maintenance needs over the long-term, as well as focusing the stewardship inputs on tasks that are mostly easily accomplished with a low level of trail-specific knowledge. The recognized best practice for the development of soft-surface trails that have minimal natural resource impacts and are manageable by stewardship coalitions are relatively narrow (1.5-4' 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.

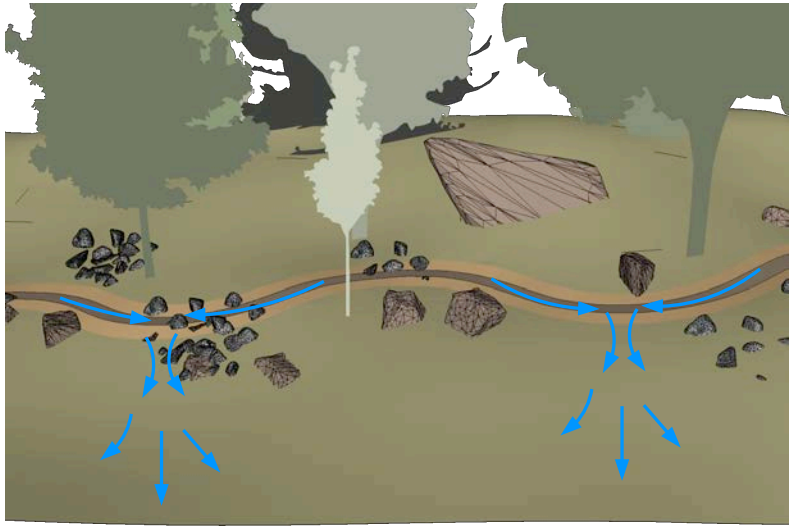
Along with the sidehill landscape position and full bench cut construction, the alignment should undulate up and down, termed rolling contour trail (see 1.1). This configuration breaks up potential stormwater drainage with frequent grade reversals (see 1.2) that will act as drains during periods of high 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.

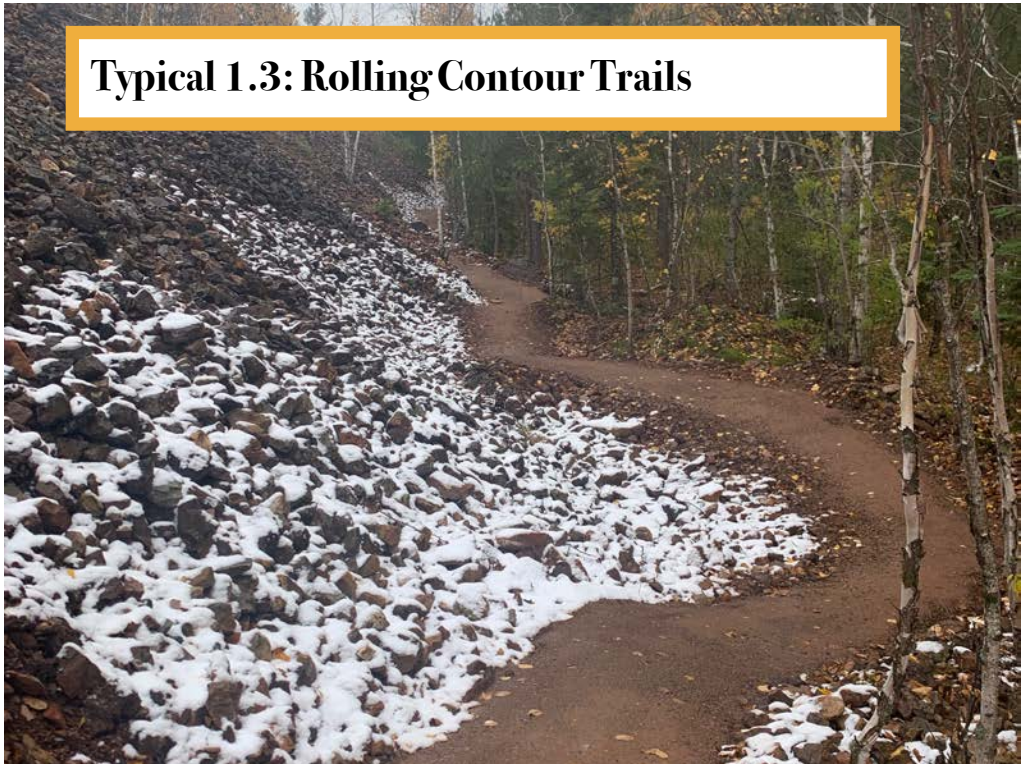
Typical 1.1: Rolling Contour Trail



Typical 1.2: Grade Reversals



Typical 1.3: Rolling Contour Trails



Trail Type Name: Backcountry Trail
Difficulty Rating: More Difficult

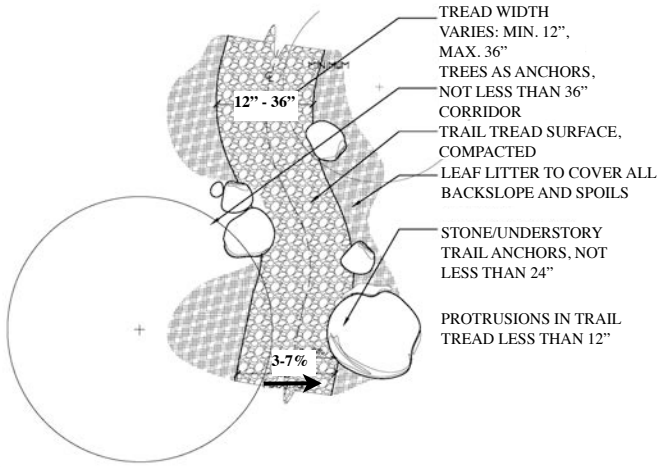
Typical Tread Width: 24" - 36"
Typical Corridor Width: 36"-48"
Tread Rugosity: Uneven, with regular rock and root protrusions, <12" above trail tread

Average Gradient: < 7%
Maximum Sustained Grade: 10%
Maximum Grade: 15%, 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, 48" minimum width

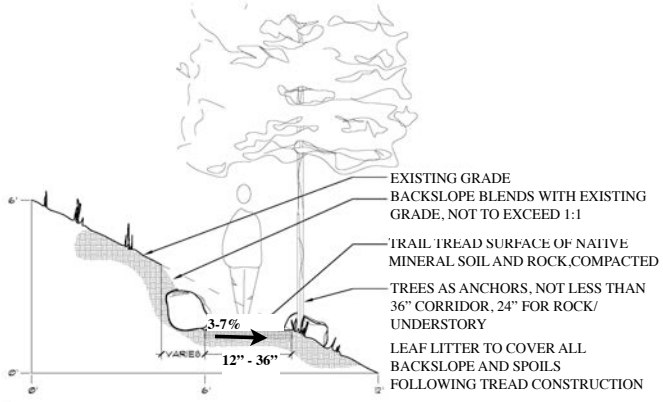
Wet Area Crossing Formality: Armored crossings at grade where possible, bridges less formal with low level engineering
Duty of Care: Low

Intended Experience: The backcountry-style trails will provide a tour of the property to highlight the landscape. 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.



3.1 N.T.S

PLAN DETAIL: BACKCOUNTRY TRAIL- TYP.

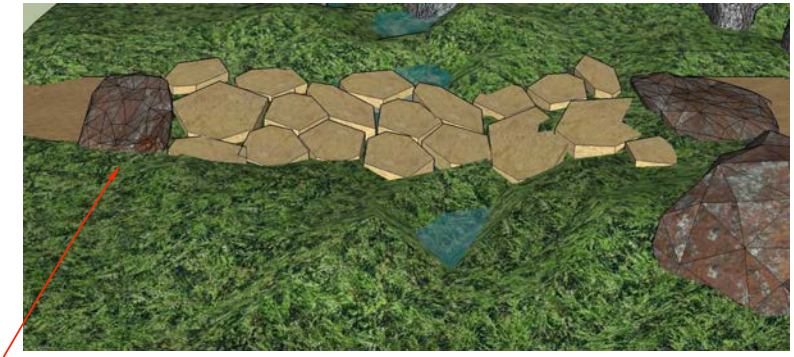


3.2 N.T.S

SECTION DETAIL: BACKCOUNTRY TRAIL- TYP.

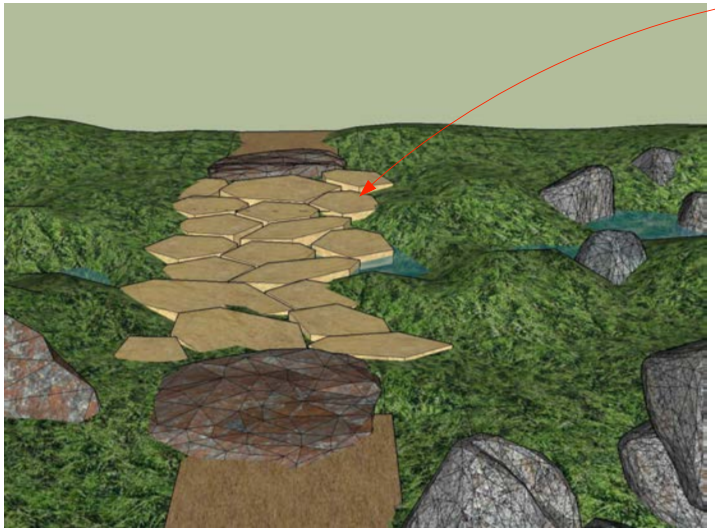
Typical 3.3: Backcountry Trails

Flagstone Armored Crossing



Anchor Stones

At Grade



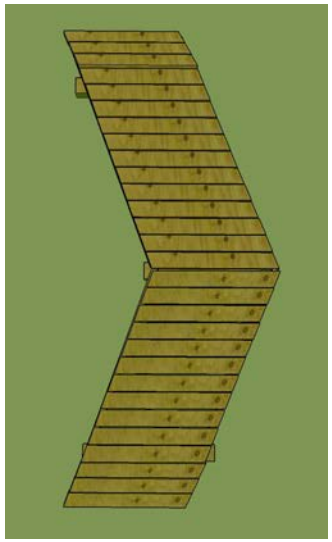
Notes:

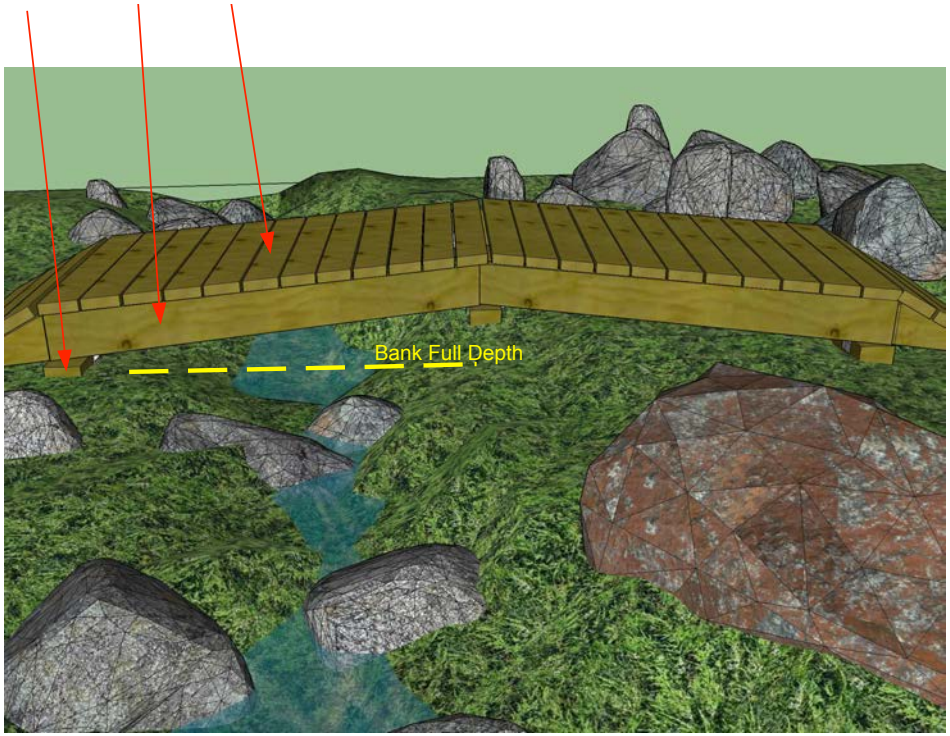
1. Remove all organic matter from area of armoring to a depth of thickest rocks
2. Armoring to extend at least 6' beyond indications of surface flow or to extent of saturated soils.
3. Anchor Stones are placed at each terminus, span the entire trail tread and extend deep into the mineral soil (2/3 of 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

Puncheon/Bridge

Top View





Bottom View

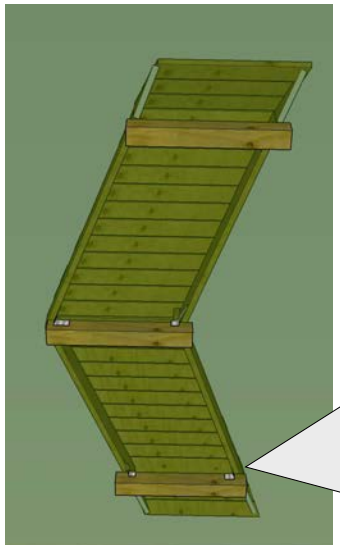


Figure 1.

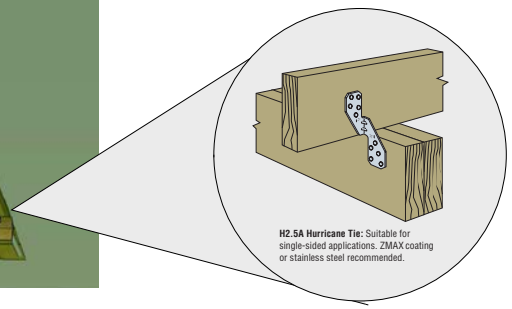
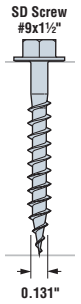
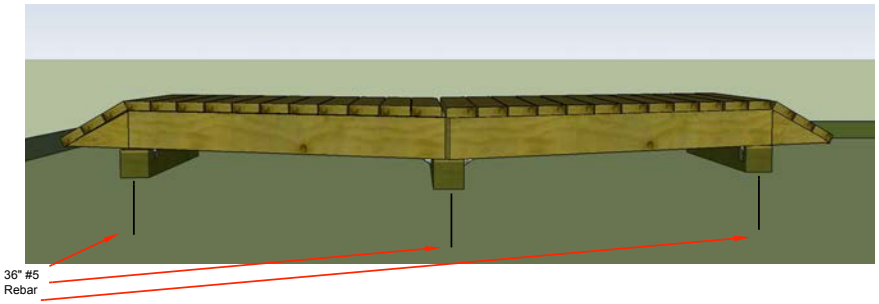


Figure 2.



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).

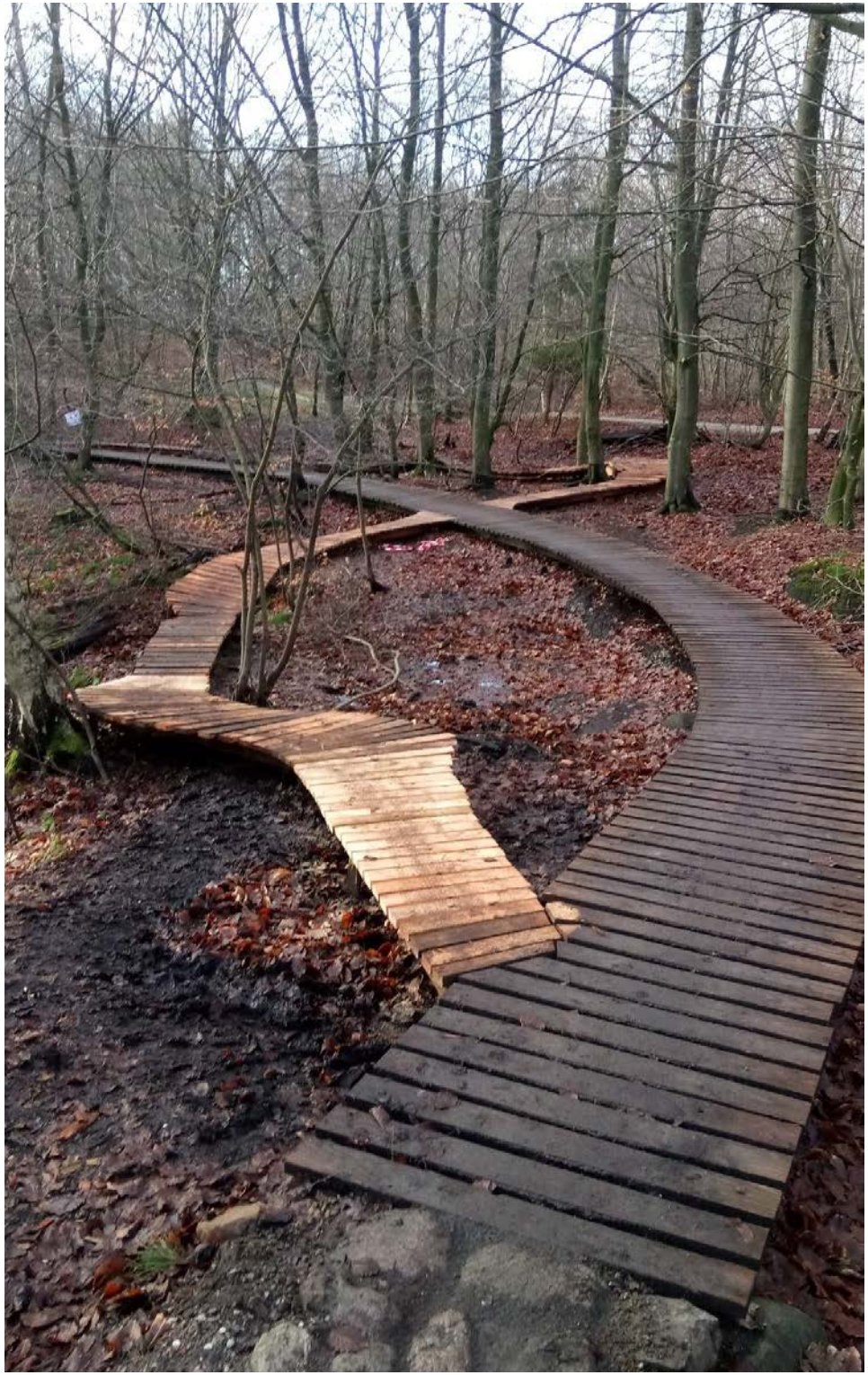
7. Decking is 2x6 rough cut durable hardwood or marine grade pressure treated, fastened with 3.5" decking screws and 30-degree 3" ring shank framing nails.

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.

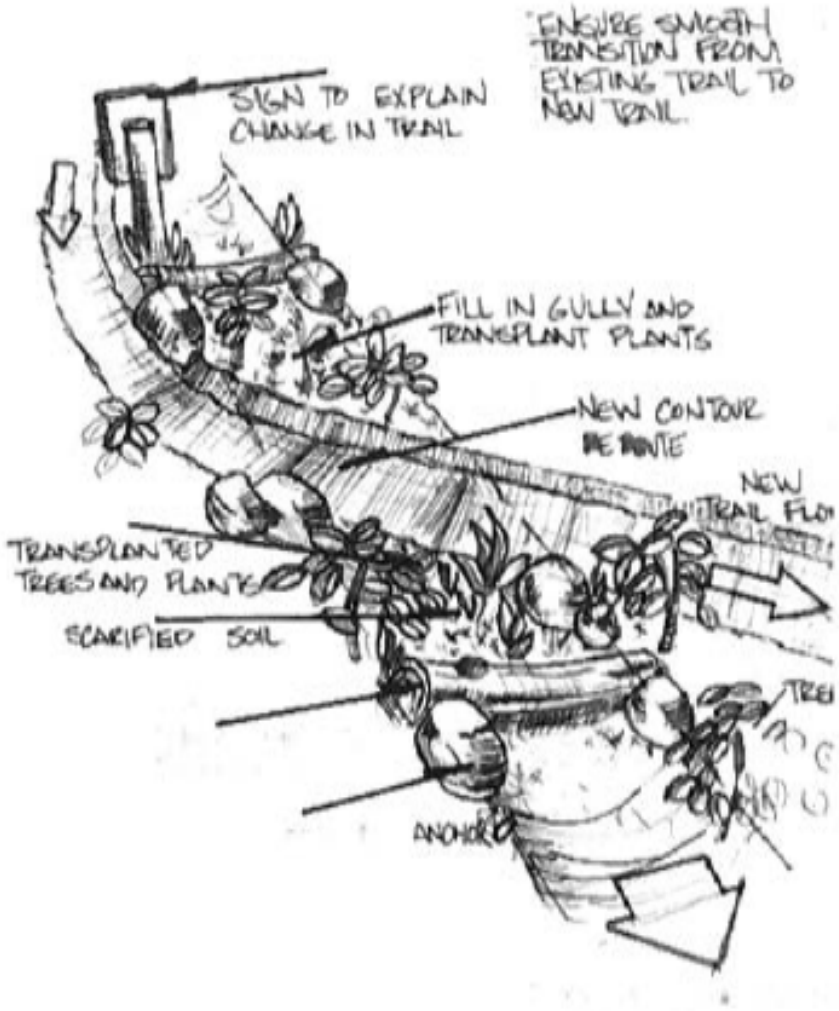
10. Curvilinear construction of puncheon to blend with surrounding topography when possible.

Typical 6.1: Puncheon/Bridge



Trail Closure/Restoration

Typical: Trail Closure Process



Courtesy of "IMBA Trail Solutions"

Detail: Check Dam Installation

Utilize existing logs rocks in vicinity of project

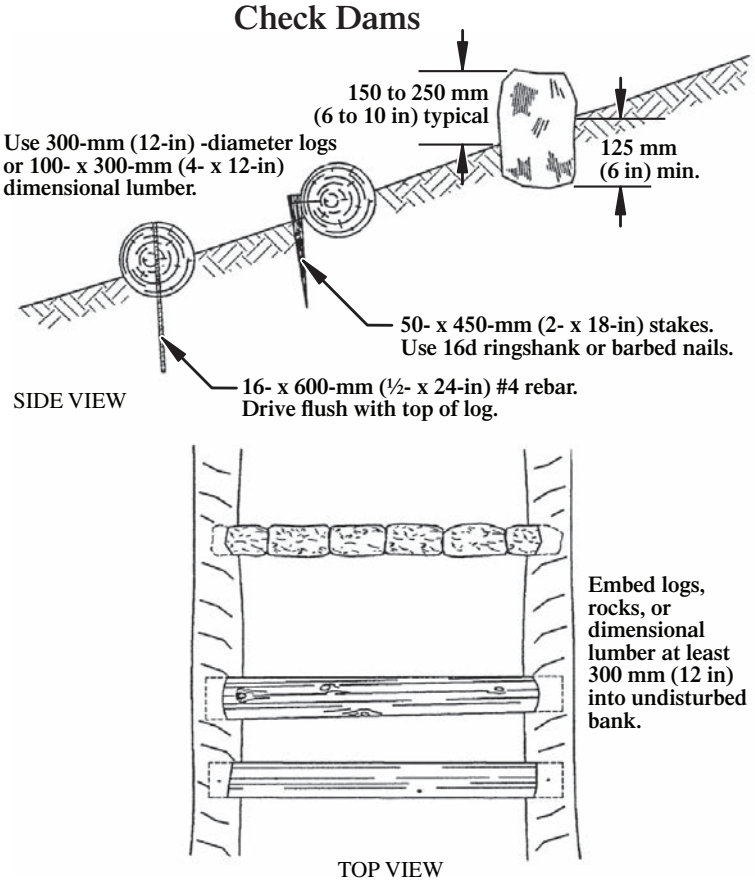


Figure 92—Check dams allow soil to rebuild on eroded trails.

Courtesy of "USFS Trail Construction and Maintenance Notebook"

Appendix B: Construction Best Practices

Best practices for the construction of natural surface trails include a variety of avoidance and minimization methods to prevent sediment from leaving the site, including pre-construction design considerations, low-impact construction techniques, and post-construction naturalization of the existing watershed hydrologic characteristics. The intent of the sum of these practices is to leave the forest in a minimally altered hydrologic condition.

Pre-construction design best management practices include:

- **Retaining an intact forest canopy.** The entire trail corridor will retain an unbroken forest canopy, including all riparian corridors.

- **Avoidance of water resources.** The trail has been designed to have avoided stream and wetland crossings. Where in proximity to water resources, the trail is designed with very low running gradients, perpendicular alignments to the water/wetland, and efficient ascents away from the water and/or riparian corridor.

- **Minimal trail grades.** The trails have been designed with gentle gradients, generally averaging 1-10%, below 15% for distances greater than 25 feet, and trail grades that do not exceed half the grade of the hillslope.

- **Contour trail location.** The trails have been located on sidehill locations or on sloped historic extraction routes, rather than areas that are flat. Combined with gentle trail gradients, these locations allow for natural sheet flow surface runoff to be retained during and following the construction process.

- **Continual grade reversals.** The trails have been designed and construction specifications indicate changes from downhill to uphill grades (for short distances) at an interval greater than every 100 feet in linear trail distance. Termed “grade reversals”, this constant undulation of the trail tread prohibits runoff from increasing in volume and velocity along the natural dirt surface.

Low impact trail construction best practices include:

- **Construction corridor minimization.** The average disturbance width for the trails is 4-6 feet for clearing and grubbing. Machines undertaking the construction activities should be limited to track widths of 48 inches or less. Minimal egress outside the established trail corridor is necessary by machines, retaining uncompacted native vegetation outside the linear construction area.

- **Mature tree avoidance.** Trees greater than 4 inches in diameter (dbh) should not be cut, and the trail should be routed around trees of this size or greater to protect the integrity of the canopy and root system. As possible, the trail should be located upslope and near the trunk where root interaction is minimized, rather than at the drip line of the canopy where nutrient uptake could be hampered by compacted soils.

- **Minimal compaction.** The resulting trail surface should be composed of native mineral soil and rock, retaining natural infiltration qualities.

- **Blended backslope.** The cut slope above the trail tread will be cut back to blend with the natural contour of the slope above the trail. This will allow surface runoff to remain in sheet flow as it approaches the trail.

- **Outsloped trail tread.** The trails will cant slightly (3-7%) down the hill, further encouraging surface runoff to retain sheet flow characteristics across the trail tread rather than allowing water to run down the trail.

- **Dispersed spoil materials.** The cut material created from trail construction should be broadcast off the trail tread and spread downslope of the trail at a depth not greater than 4 inches. This relatively uniform dispersal of materials will preserve natural forest understory vegetation by minimizing potential smothering while retaining the natural seed bank.

- **Limited disturbance.** Construction should be phased in a linear matter, laborers and machines are nearly always within 1,000 linear feet of trail. The construction process entails 1) trail corridor preparation by hand (manual and chain saws), 2) trail construction by machine and hand with soil moved minimally (1-4') beyond the downslope edge of the trail, 3) backslope and outslope development by machine and hand, and 4) spoils and natural mulch (gathered during the trail corridor development) dispersal implemented by hand crews. This process is completed in full on each day of construction, leaving a stabilized construction site that resists erosion.

Post-construction naturalization best management practices:

- **Vegetated filter strip.** Natural vegetation downslope of the trail tread is retained along the entire course of the trail with a minimum width of 25 feet from wetland or aquatic resources. Compaction of the corridor is minimized with only hand crew use in the area outside of the trail tread. Evenly dispersed soils/mulch with native seed stocks encourage rapid vegetative establishment following construction.

- **Backslope vegetation reestablishment.** With backslopes blended to the surrounding hill slope, not compacted following grading, and covered by native mulch and seed stock at the end of the daily construction process, vegetative reestablishment is encouraged. This reestablishment further reduces the area of exposed soil and further protects the trail tread from potential erosion through the creation of a narrow filter strip uphill from the trail.