Greater Goose Pond Forest
Trail Construction Specifications

Trail Spec A: Singletrack Cribbing

Rationale: Cribbing is used to elevate a trail out of a wet area or to maintain a specific trail grade. A turnpike is constructed of two parallel crib walls that elevate the trail tread. Crib walls and turnpikes can be constructed out of timber or stone and have the ability to allow walkers to cross intermittent wet areas or to maintain a sustainable grade.

Construction Specification:

Cribbing:

Material: Cribbing can be constructed out of timber or stone. Stone cribbing will last longer than timber cribbing. Stone can be harvested on site or imported. Large stones are the best building stones for crib walls.

Dimension: A crib wall retains the trail tread. That said, hikers and bikers should never have to walk on the crib wall as it is typically located far outside the designated trail.

Installation:
1. *Crib Wall:* The height of the crib wall is determined by calculating how high the trail tread needs to be in order to keep hikers out of the wet area or to maintain grade. Once height is determined, stones are chosen that match the height plus an additional 1/3 that is dug into the ground for stability.
2. *Drainage Stone:* The center of the crib wall is filled with 1 ½" crushed stone, leaving at least 4" for surfacing.
3. *Surfacing:* 3" (4-6" ideally) of natural surfacing caps the drainage stone.

Construction Specification:

Timber Turnpike:

Material: A timber turnpike is constructed out of rot resistant lumber (locust, cedar, hemlock, or PT) and is filled with 1 ½ " crushed stone and capped with 3/8" minus natural stone surfacing.

Dimension: The dimension of a timber turnpike should match the trail width of the existing trail. The timber turnpike should be constructed so that the useable trail tread is within the timber box structure.

Installation:
1. *Crib Box:* The timber box is constructed by attaching all 4 sections of the box to the ground with ½" x 3' rebar. The rebar should be pounded flush with the wood. Each additional course of timber is attached with rebar to the layer of timber below it. All joints should be staggered by at least 2 feet. This ensures structural integrity.
2. *Drainage Stone:* The box is filled with 1 ½" crushed stone. The stone should fill the box enough to leave 4" for the installation of surfacing.
3. *Surfacing:* 4-6" of natural surfacing caps the timber causeway.

Greater Goose Pond Forest
Trail Construction Specifications

Construction Specification:

Stone Turnpike:

Material: A stone turnpike is constructed using large building stone that is either harvested on site or imported. Building stones are typically 2-3' wide and 18-30"" deep.

Dimension: The dimension of a stone turnpike should match the trail width of the existing trail. The stone turnpike should be constructed so that the useable trail tread is within the stone turnpike structure.

Installation:
1. *Crib Wall:* Two parallel stone crib walls are constructed, allowing the trail width to fit in between. Each stone is set ¼ of its height into the ground. Each stone leans toward the center the trail no more than 1 foot of run per 3 feet of rise. This degree of lean is known as Batter.
2. *Drainage Stone:* The center of the two crib walls is filled with 1 ½" crushed stone, leaving at least 4-6" for surfacing.
3. *Surfacing:* 4" (4-6" ideally) of natural surfacing caps the stone turnpike.

Examples:

Stowe, VT - Stone Turnpike

Stowe, VT – Timber Cribbing

Greenfield, NH – Stone Cribbing

Greater Goose Pond Forest
Trail Construction Specifications

Trail Spec B: Bridges

Rationale: A timber bridge is used to cross either a gully or stream. The bridge should be constructed to match the use of the trail system and the character of the surrounding environment.

Construction Specification:

Material: Rot resistant lumber (ie cedar, hemlock, white oak, locust, or PT) should be used. Careful attention should be paid to the dimension of lumber and its relevance to the overall span of the bridge.

Dimension: The dimension of the bridge should match that of the trail system and the anticipated users. The bridges outlined in this report should be built to provide a 48" wide useable tread. This will allow hikers to cross comfortably and for the structure to span the 15-25' spans sustainably.

Installation:

1. *Abutments:* The abutment is the stonework that supports the banks on either side of the gully or stream. Abutments should be constructed using correctly sized building stones that are either harvested on site or imported.
2. *Sills:* The sills are the members of the bridge that support the stringers. They are 6x6 rot resistant lumber that are 6' in length. The sills are laid parallel with the stream or gully, triangulated to ensure squareness, and attached to the ground using ½" x 3' rebar pounded flush with the sill. Each sill requires 3 rebar. If able, drilling and pinning the sills to bedrock is preferred.
3. *Stringers:* For a clear span of 12' or 16', it is recommended to use 3 laminated stringers equally spaced 16" on center maximum. They should be constructed out of (2) 2x12 pressure treated timbers
4. *Blocking and Headers:* A header is placed at either end of the bridge and is nailed securely to the ends of each stringer. Blocking is installed between each stringer at a spacing of 5' on center.
5. *Decking:* It is recommended to use 5/4" x 6" Rough Sawn Black Locust as the decking boards. The decking should extend 1 ½" beyond the edge of the stringers on either side. There should ½" spacing on the decking. This will allow for sufficient water drainage and a longer lasting bridge structure.
6. *Railing:* 4 x 4 railing posts are installed every 5' along the outside joists. 2" x 6" mid rails and top rails add security.

Examples:

Georgia, VT

Hinesburg, VT

Greater Goose Pond Forest
Trail Construction Specifications

Trail Spec C: Stone Pitching

Rationale: Stone pitching is used to armor a trail section that succumbs to standing water and seasonal wetness. Stone pitching is an easy and effective method of elevating the tread and preventing erosion due to user impact.

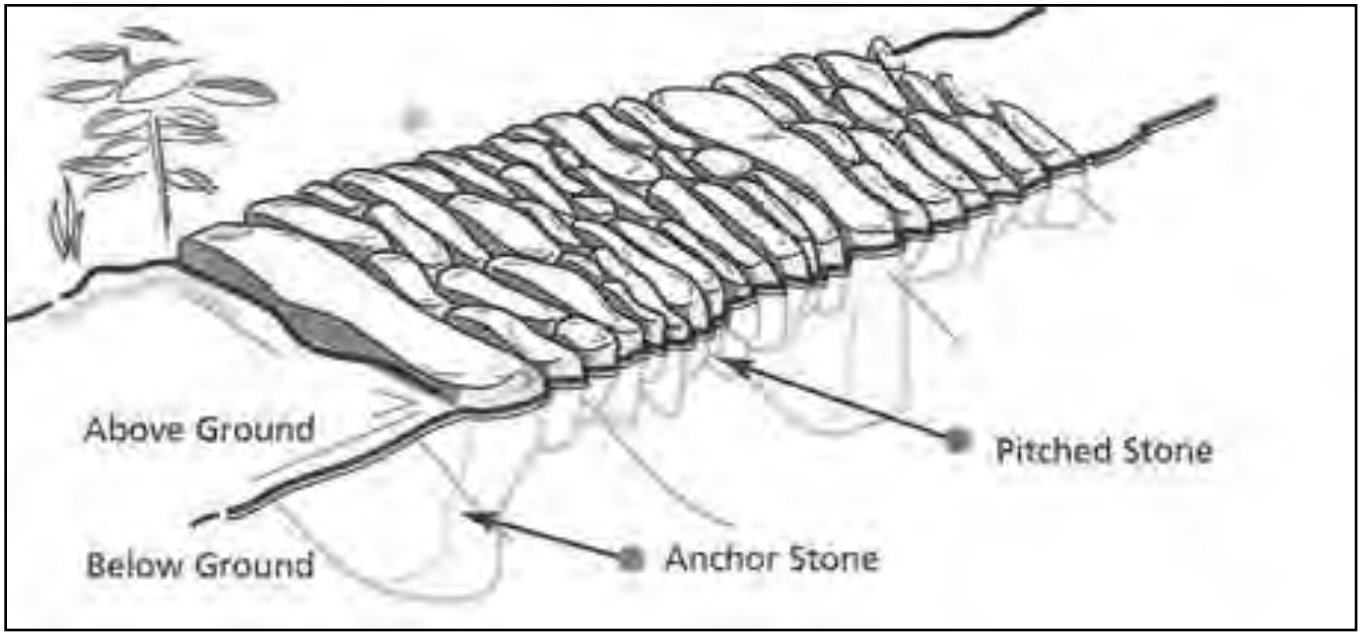
Construction Specification:

Material: Small stones are set within the ground and act as a hardened surfaced for riders and walkers. Stones can vary in size, but are typically 1-2 cubic feet in size.

Dimension: On the singletrack trails found along the trails of the Greater Goose Pond Preserve, stone pitching should be installed to a width of 18 – 36" This width will accommodate both bikers and hikers.

Installation:
1. *Material Gathering:* Stone should be harvested on site and moved to the site with either hand wheelbarrows or power wheelbarrows.
2. *Stone Setting:* Stone pitching should first be installed at the bottom of the swale and working upward. This will allow stones to work together as a unit and rest downhill upon each other. Stones are to be set 2/3 – ¾ of their total size with useable faces exposed upward.
3. *Gap Filling:* After the stones have been set, the gaps between the stones are packed with crushed stone. This can either be made on site or imported.
4. *Gargoyles:* Gargoyles, or guide stones, are placed to ensure entrance onto the structure. This will ensure users will not ride around the stone pitching.

Examples:



International Mountain Biking Association, 2004. Trail Solutions: IMBA's Guide to Building Sweet Singletrack. Boulder, CO.

Greater Goose Pond Forest
Trail Construction Specifications

Trail Spec D: Trail Brushing

Rationale: Brushing a trail involves trimming back branches that have grown into the trail corridor. This action is typically done as part of annual maintenance on a trail.

Construction Specification:

Dimension: The dimension of Trail Brushing is directly tied to the type of trail that is being cleared. A singletrack trail typically has a 4' x 10' wide corridor whereas a multi-use bike trail can have a corridor as large as 14' x 12'. The corridor for the Greater Goose Pond Preserve range between these two dimensions due to the variety of trail widths found on the property. In general, the trail should be cleared 2' to either side of the trail tread and a height of 10' so as to prevent branches from hanging down when laden with snow.

Installation Sequence:
1. *Branch Trimming:* Branches from trees that line the trail corridor should be removed with a purposeful hand. It is possible to remove too much during Trail Brushing. Hand saws and pole saws should be used to remove branches back to the collar. Cuts should not include damage to the bark of the tree's trunk.
2. *Tree Removal:* On occasion, an entire tree will need to be removed. Typically, this is reserved for small saplings that can grow and encroach on the trail tread. Should a tree need to be removed, the tree should be flush cut with the ground.

Examples:

Monroe Bridge, MA

Greater Goose Pond Forest
Trail Construction Specifications

Trail Spec E: Benching of Singletrack Trail

Rationale: Benching a trail involves excavating the vegetative layer in order to expose the impact resilient mineral soil. This is done either with hand tools or machinery. By benching a trail into the crosslope, the trail will shed water sustainably and the tread will not erode.

Construction Specification:

Material: Native materials are used while benching trails into the landscape. The goal is to expose the native material and sculpt that into a sustainable trail. The spoils from excavation are used to create the downslope support and the tread is composed of the parent soil. A majority of the soils found at the Greater Goose Pond Preserve are naturally well draining and compact well. This will aid in the construction.

Dimension: The dimension of a benched singletrack trail at the Greater Goose Pond Preserve should range between 10" and 24". This will allow for safe and sustainable trail for bikers and walkers.

Installation Sequence:
1. *Dig the Tread:* After the corridor has been cleared, dig the tread by removing the organic layer and exposing the mineral soil. This is typically done with either pick mattocks and pulaskis, or with a piece of machinery.
2. *Cut the Backslope:* To improve drainage and maximize sustainability, cut back the uphill side of the trail to an angle of 45 deg. This ensures sheetflow drainage across the trail and reduces sluffing of the uphill edge onto the tread.
3. *Outslope Tread:* Oustlope of a singletrack trail can range between 5-10%. This is achieved by using machinery or a Mcleod to smooth out the tread and leaving the uphill side of the trail higher than the downhill side. Depending on drainage structures, outslope and change to inslope (typically seen on turns.)
4. *Compact the Tread:* Compacting of the trail tread can be done with a Mcleod. This ensures that ruts do not form with repeated bike use.
5. *Finish the Tread:* The tread is finished only after the spoils from excavation have been broad casted and the edges of the trail have been naturalized with leaf litter.

International Mountain Biking Association, 2004. Trail Solutions: IMBA's Guide to Building Sweet Singletrack. Boulder, CO.

Examples:

Monroe Bridge, MA

Greater Goose Pond Forest
Trail Construction Specifications

Trail Spec F: Culvert Installation

Rationale: A culvert allows water to flow underneath the trail. Culverts are installed below the trail grade and are typically aligned perpendicular to the trail tread.

Construction Specification:

Material: All culverts along the Greater Goosepond Preserve should be 14-24" plastic culverts with a smooth interior lining. This size is imperative for adequately moving water from one side of the trail to the other.

Dimension: Culverts extend from one side of the trail to the other and below grade. Typically they are covered with at least 6-8" of compacted surfacing and have substantial stone headers to keep them in place. Given the stonework that is needed on entrance and exit of the culvert, it is best to plan on a culvert length 1-2 feet longer than the trail width.

Installation:
1. *Culvert:* The culvert is installed by digging a ditch that is 5-6" deeper than the diameter of the culvert. Align the culvert so that water will freely flow into one end and out the other. The culvert should have a 5% grade to ensure that water will flow without obstruction.
2. *Stone Headers:* Large building stones are installed at either side of each end of the culvert. The stone are placed securely against the culvert, leaning slightly into the trail.
3. *Drainage Stone:* 1 ½ - 2" drainage stone is installed around and over the culvert.
4. *Filter Fabric:* Ideally, non-woven geotextile fabric is installed over the drainage stone. This prevents the surfacing from migrating down into the drainage stone.
5. *Surfacing:* 1/2" minus crushed stone surfacing is imported and installed over the fabric. The surfacing should be installed at 6-8" as needed to maintain grades.

Example:

Culvert Imbedded in Causeway, Crotched Mountain, NH

Culvert Installation, Wilton, CT

Greater Goose Pond Forest
Trail Construction Specifications

Trail Spec G: Accessible Trail Surfacing

Rationale: When native soils are not suitable for trail surfacing or when the trail's intended use requires a hardened surface, it is necessary to import and install surfacing. Often this is the case when the trail will be deemed to be ADA compliant or when there will be extensive bike use. Typically, the cost per ton of crushed stone surfacing is reasonable. The cost for transporting the material is much higher. It is worth paying more to have the correct material transported from a longer distance than to use local material that is not sustainable.

Construction Specification:

Material: Trail surfacing typically conforms to a specific sieve analysis. Quarries produce crushed stone that conforms to a variety of sizes ranging from stone dust to small aggregates that are 3/8" in size. It is important to monitor the material as it is delivered from the quarry to ensure it complies with the intended sieve analysis.

Dimension: The size of the surfacing is often dependent on the quality of the parent stone that is crushed. The best material to use is a hard stone such as granite. The material is crushed to conform to a specific sieve analysis, or sizing chart. Please refer to **Figure 1** for a suggested sieve analysis for crushed granite.

Installation:

Step 1: Before the surfacing is installed, the trail tread is to be excavated and cleared of any vegetative material. All roots are to be clipped flush with the ground. The excavated material is piled on the edges of the trail, this will be used later to support the trail surfacing.

Step 2: The trail is then monitored for running grade. A naturally surfaced trail is most sustainable at grades that remain between 5-8%. This will prevent migration and erosion of surfacing. To maintain a sustainable running grade, 1 ½" washed crushed stone trail base may need to be installed to raise sections of the trail. This material should be installed and compacted to ensure the trails remains flat.

Step 3: A non-woven geotextile fabric should be installed on top of the excavated soil, as needed, and wherever 1 ½" crushed stone is installed. The fabric allows the trail to float on top of the mineral soil, spreads out the weight of the surfacing, and prevents the surfacing from mixing with the mineral soil and crushed stone.

Step 4: Trail surfacing is typically installed at a depth of 6-10". The surfacing is smoothed out using either hand tools or machinery. The surfacing's depth will vary on the terrain, but it should be no less than 4" in depth. While smoothing out the surfacing, it is important to maintain an outslope of 2%, ensure that grade reversals remain intact, and that the surfacing is flush with the top of stone walls to ensure proper drainage. (Please see Grade Reversal Construction Specification for more detail.)

Step 5: After the surfacing has been installed, it is compacted with a vibratory roller. It is most effective to compact the surfacing after a rainfall. At minimum, the surfacing should be moist. Outslope and crowning can be monitored using a smartlevel. Please refer to **Figure 2** for a detailed cross section of a naturally surfaced trail.

Greater Goose Pond Forest
Trail Construction Specifications

Figure 1: Crushed Stone Sieve Analysis for Naturally Surfaced Trail

3/8" Minus Crushed Stone

Sieve Designation	Percent Passing
3/8"	99%
No. 4	65-85%
No. 8	40-70%
No. 30	25-50%
No. 50	20-25%
No. 100	10-20%
No. 200	5-10%

Sources Include:

http://www.americantrails.org/resources/trailbuilding/BuildCrushFinesOne.html

Parker, Troy S. 1993. Open Space and Trails Program, Pitkin County, Colorado: Trails Design and Management Handbook. Boulder, CO: Natureshape.

Figure 2: Trail Tread Analysis

Greater Goose Pond Forest
Trail Construction Specifications

Trail Spec H: Grade Reversal

Rationale: Grade reversals are used to allow water to sheetflow off the trail in between two high points of a trail system. Grade reversals prevent water from running down a trail. As the water encounters a subtle rise in the trail, it will sheetflow off the downhill edge. Ideally, grade reversals are incorporated during the design phase of trail construction.

Construction Specification:

Material: Grade reversals are installed using native mineral soil found at the location of the installation. The installation of trail surfacing maintains these subtle dips and rises along the trail.

Dimension: A grade reversal has the same width of the existing trail system. A grade reversal typically extends down the trail as short as 8-10 feet long, or as long as 200 feet long. Ultimately, the length of the grade reversal is dependent upon the expanse of the existing topography.

Installation:
Once specific low points between two high points are identified, the trail tread is sculpted to allow the water to sheetflow towards the downhill edge. It is not necessary to build a drainage swale within the grade reversal. The water will migrate off the trail naturally, as it cannot flow uphill. Ultimately, the grade reversal should look like a natural response to undulating terrain. Bikers, walkers, and strollers should travel through the Grade Reversal with little knowledge that it is there.

Example:

Shoreline Greenway Trail, East Haven, CT

Dunbar Brook Trail, Monroe Bridge, MA

Greater Goose Pond Forest
Trail Construction Specifications

Trail Spec I: Boardwalk

Rationale: Boardwalks are another option for elevating a trail tread above standing water or intermittent wet areas. Boardwalks are constructed out of rot resistant lumber and typically match the character of the trail system and surrounding environment.

Construction Specification:

Material: The material for boardwalks should be rot resistant (cedar, hemlock, white oak, locust, or PT.) The framing members should be sized appropriately for the spans associated.

Dimension: The dimension of the boardwalk should match that of the trail system. The boardwalk suggested for the Greater Goose Pond Preserve should be 6' wide to match the existing trail's width.

Installation:

1. *Sleeper Foundations:* The sleepers of a boardwalk are similar to that of a sill for a bridge or puncheon. The sleeper is typically a 8 x 8 pressure treated timber. The sleeper has direct contact with the ground and is supported by 1 ½" crushed stone to assure stability and levelness. Sleepers can be installed on top of large stones that have been set at grade. Sleepers should be installed in respect to the stringers and the maximum span. These boardwalks should have a maximum clear span of 10' between sills.
2. *Stringers:* For spans of 10', and to support loads, it is recommended to use 3 x 8 pressure treated lumber. The stringers are spaced 16" on center and are nailed directly to the sleepers.
4. *Blocking and Headers:* A header is placed at either end of the boardwalk and is nailed securely to the ends of each stringer. Blocking is installed between each stringer at a spacing of 5' on center. The blocking will prevent the stringers from twisting and add tremendous strength to the boardwalk.
5. *Decking:* It is recommended to use 1 ½" x 6" rough sawn Black locust as decking. The decking should extend 1 ½" beyond the edge of the stringers. There should be not less than ½" spacing on the decking. This will allow for sufficient water drainage and a longer lasting structure.
6. *Bullrail:* These boardwalks are low to the ground. There is, however, a wide range of users who might stray to the edge of the boardwalk. A bullrail is a low railing that is rests only 2 inches off the decking. 4x4 Black locust or Cedar is attached directly to the decking and stringers. The bullrail is a visual and physical barrier to keep bikes, skiers, and small children on the boardwalk.

Examples:

Long Lake, NY

Jericho, VT

Greater Goose Pond Forest
Trail Construction Specifications

Trail Spec J: Cribbing, Causeway, and Uphill Crib Walls

Rationale: Cribbing is used to elevate a trail out of a wet area or to maintain a specific trail grade. A causeway is constructed of two parallel crib walls that elevate the trail tread. Crib walls and causeways should be constructed out of stone that is found along the layout of the trail or imported from a quarry.

Construction Specification:

Cribbing:

Material: Large stones should be used to create the stone cribbing. Each stone should be at least 1-3 cubic feet in size.

Dimension: A crib wall retains the trail tread. That said, hikers should never have to walk or bike on the crib wall as it is typically located far outside the designated trail. The crib walls of the trails are to be located beyond the 6-8 foot trail width.

Installation:
1. *Crib Wall:* The height of the crib wall is determined by calculating how high the trail tread needs to be in order to keep hikers out of the wet area or to maintain grade. Once height is determined, stones are chosen that match the height plus an additional 1/3 that is dug into the ground for stability.
2. *Drainage Stone:* The center of the crib wall is filled with 1 ½" – 4" crushed stone, leaving at least 6-8" for surfacing.
3. *Filter Fabric*: A non woven geotextile fabric is laid down on top of the drainage stone. The filter fabric will prevent the crushed stone surfacing from migrating into the crush. The filter fabric is essential for enhancing drainage. It must be installed at least 6 inches below the surfacing.
4. *Surfacing:* 6-8" of natural surfacing caps the drainage stone.

Construction Specification:

Stone Causeway:

Material: Large stone should be used to create the stone cribbing. Each stone should be at least 1-3 cubic feet in size.
Dimension: The dimension of a stone causeway should match the trail width of the existing trail. The stone causeway should be constructed so that the useable trail tread is within the stone causeway structure.

Installation:
1. *Crib Wall:* Two parallel stone crib walls are constructed, allowing the trail width to fit in between.
2. *Drainage Stone:* The center of the crib wall is filled with 1 ½" – 4" crushed stone, leaving at least 6-8" for surfacing.
3. *Filter Fabric*: A non woven geotextile fabric is laid down on top of the drainage stone. The filter fabric will prevent the crushed stone surfacing from migrating into the crush. The filter fabric is essential for enhancing drainage. It must be installed at least 6 inches below the surfacing.
4. *Surfacing:* 6-8" of natural surfacing caps the stone causeway. The surfacing should be 3/8" minus crushed stone.

Greater Goose Pond Forest
Trail Construction Specifications

Examples:

Stone Causeway, Wilton, CT

Stone Cribbing, Wolfeboro, NH

Greater Goose Pond Forest
Trail Construction Specifications

Trail Spec K: Benched Trail and Crowned Trail

Rationale: A naturally surfaced trail must lie within the surrounding environment and topography, instead of lying atop the existing terrain. By imbedding the trail into the landscape and crowing its surface, the trail is able to shed water by means of sheetflow instead of gullying. The edges of the trail are also supported by the edging created during excavation.

Construction Specification:

Benched Trail and Crowned Trail:

Material: Benching a trail into a hillside and crowning the surfacing only requires the ability to excavate a "trench" to lay the trail into and 1 ½" – 2" crushed stone as needed to maintain grades. Filter fabric and 3/8" minus trail surfacing is installed with a 2-5% crown to enhance sheetflow drainage.

Dimension: The Accessible Trail at Goose Pond should be 5' wide. The initial benching will 6' wide with the intention of narrowing the trail back to 5' during construction. This tactic yields and additional 6" of trail surfacing hidden on the edges to accommodate users that may wander towards the edges.

Installation:
1. *Benched Trail:* A trail is "benched" into a crosslope by excavating out a trench along the hillside that leaves a backslope of no greater than 45 degrees. The trench should be 6-10" deep depending on grades and hydrology. The spoils from the excavation are aligned on the downhill edge to support the trail surfacing and are smoothed out to ensure sheetflow drainage after installation of surfacing.
2. *Drainage Stone:* 1 ½" – 2" crushed stone is installed as needed to maintain grades, level out areas, and improve drainage.
3. *Filter Fabric*: A non woven geotextile fabric is laid down on top of the drainage stone. The filter fabric will prevent the crushed stone surfacing from migrating into the crush. The filter fabric is essential for enhancing drainage. It must be installed at least 4 inches below the surfacing.
4. *Surfacing:* 4-6" of natural surfacing caps the drainage stone. The surfacing for the Accessible Trail should be 3/8" minus imported crushed stone. **Please See Figure 1A and Figure 1B**

Examples:

Wolfeboro, NH

East Haven, CT

Greater Goose Pond Forest
Trail Construction Specifications

Figure 1A:

Figure 1B:

Greater Goose Pond Forest
Trail Construction Specifications

Trail Spec L: Stone Steps

Rationale: Stone steps are installed to prevent erosion on steep trails. The steps should be comfortable to walk up and down and built solidly to prevent movement over time.

Construction Specification:

Material: Stone steps are either harvested from on site or imported. Stone type should match the quality and character of the surrounding environment. Building stone should not have any visible cracks or obvious weak points. Construction will require the use of crushed stone as well as building stone.

Dimension: Stone steps have a rise that range between 6 to 8 inches tall and a run that ranges from 12 to 18 inches. This allows for a comfortable use by a range of hiking abilities.

Installation:
1. *Base stone:* The first stone step should be installed flush with the trail tread. This tactic is to prevent the compaction of the soil below the first step and the inevitable unsetting of the first step. This tactic also allows water to flow away from the stone staircase.
2. *Stacked Stones:* The next stone steps are installed with a 2 inch minimum overlap on the previous step. This solid contact prevents movement in the stone stairway. The stone steps are dug into the mineral soil and are checked to ensure they are level in all directions. If setting on crushed stone, it is important that each stone step has a minimum of 2 points of contact underside of the back edge. Once stone is stable and checked for level, install crush around all gaps and openings.
3. *Gargoyles:* After the installation of each stone step, gargoyles are to be installed. Gargoyles are large angular stones that guide hikers onto the stairway, prevent erosion of the soil around the steps, and are installed to provide a naturalistic look to the structure.

Examples:


Killington, VT


Bear Mountain, NY


Townshend, VT

TIMBER & STONE, LLC

Firm Overview

Since 2004, Vermont based Timber & Stone, LLC has provided technical advice and construction expertise to land managers seeking to build or improve recreational trails. Conservation Minded Construction is the adage that guides our work.

Our goal—sustainably built, multi-use trails that provide users with a safe and enjoyable outdoor experience. We work with a variety of clients and project sponsors—from municipalities to private landowners—on projects throughout the Northeast.

Timber & Stone, LLC is dedicated to providing clients with professional, customized trail design and quality, conservation-minded construction. Whether working independently or alongside volunteers, Timber & Stone, LLC is committed to making the trail construction process, from initial consultation to the final ribbon cutting, a rewarding experience for the entire community.

WHAT WE BELIEVE

Trails provide people with opportunities to recreate, educate, and contemplate.

They are an essential component of our culture. Trails offer a safe and sustainable way to access wild areas. They are also a vital part of building vibrant community; offering a recreational outlet to the public. With thoughtful, informed consideration paid to design and construction, trails enhance the intrinsic value of natural areas to the human community.

WHAT WE DO

Trail Design. Construction. Education.

For the last ten years, Timber & Stone, LLC has assisted clients—from municipalities to private landowners—in transforming their trail aspirations into reality. Our goal is to build safe, appropriately designed trails and pathways in a sustainable and efficient manner; trails that balance recreational needs while preserving the character and sanctity of the natural landscape.

Simply put, we build trails that stand the test of time.

Founded and based in Central Vermont, Timber & Stone, LLC has completed projects throughout the Northeast. We are available to work as a contracted crew or alongside volunteers, students, and stewards. With a keen eye to safety, we empower groups of volunteers by building skills and camaraderie while effectively managing the worksite to attain a high quality product.

WHO WE ARE

In addition to our team of employees, Timber & Stone, LLC is comprised of 3 dedicated trail designer/builders.

Josh Ryan

Principal Trail Designer and Builder

Josh has been recreating on and caretaking trails since the day his parents first laced up his hiking boots.

For over twenty years, Josh has worked on trails with a wide array of students, volunteers, and fellow trailbuilders both as a Crew Leader and as an independent contractor. Previous to founding Timber & Stone, LLC, Josh worked for the Vermont Youth Conservation Corps, Maine Conservation Corps, Student Conservation Association, US Forest Service, and completed his graduate coursework in Environmental Education at Antioch University in Keene, NH.

Josh makes his home in East Montpelier, Vermont with his wife, two daughters, and one gigantic Newfoundland pup. In addition to constructing trails, Josh has also taught courses in Trail Design and Construction at local Universities and Graduate Schools. He is an active member of the Professional Trailbuilders Association and the local East Montpelier Trails Committee. Josh also serves as a Committee Member for the annual Vermont Conference on Recreation and was appointed by VT Governor Phil Scott to serve on the Vermont Outdoor Recreation Economic Collaborative task force.

Gordon Adams

Trail Designer and Builder

After a two-year hiatus, we were pleased to welcome Gordon back to the trailbuilding team in 2015. Gordon was instrumental to the completion of numerous, multi-faceted trail projects during the 2011/2012 trail season.

Since last working for Timber & Stone, LLC in 2012, Gordon traveled extensively through the United States, taking time to work on various farms through the WWOOFer (Willing Workers on Organic Farms) program and thru-hiking the Appalachian Trail with his brother and his trusty dog companion, Jack.

Gordon brings a strong set of skills in fine woodworking, carpentry, traditional trailwork, and ecological inquiry to his work with Timber & Stone, LLC. In the past, Gordon has worked for Stauffer Woodworking, Vincent L. Adams Cabinetmakers, and Maine Coast Heritage Trust and pursued studies at the Dutchess Academy of Environmental Studies in Staatsburg, New York and Sterling College in Craftsbury, Vermont. A native of upstate New York, Gordon currently makes his home in East Montpelier, Vermont.

Pete Hiser

Trail Designer and Builder

Pete Hiser joined the Timber & Stone, LLC crew in 2016.

Pete graduated from the University of New Hampshire in 2014 with a B.S. in Environmental Conservation and Sustainability. This academic background combined with his many years of work in the landscaping industry are the perfect fit for the projects we have on tap for this season. Pete brings a variety of transferable skills from his experience working in the landscaping industry including: equipment operation and maintenance, site planning and layout, and technical stonework. A born and bred Vermonter, Pete's professional and personal aspirations give him ample time to adventure in the natural surroundings. He is an avid fly fisherman and enjoys camping, hiking, and skiing whenever he can. Pete currently resides in Burlington, Vermont.

Timber & Stone, LLC

Recreational Trail Design and Construction

Project Portfolio: Universally Accessible Trail Design and Construction

Barnes Camp Accessible Boardwalk (2017)
The Long Trail, Stowe, VT

Overview:
-600 foot elevated wetland boardwalk on a helical pile foundation system
-Multiple viewing platforms installed along this scenic section of the Long Trail

Contact:
Tasha Wallis, Executive Director
Lamoille County Planning Commission
tasha@lcpcvt.org or (802) 888-4548

Camp Smith Accessible Trail (2016)
Little River State Park, Waterbury, VT

Overview:
-1/2 Mile accessible trail system with interpretive overlooks for public engagement
-Meanders through a historically significant former Civilian Conservation Corps encampment

Contact:
Sue Bulmer, Northeast Parks Regional Manager
Vermont Department of Forest, Parks & Recreation
susan.bulmer@vermont.gov or (802) 476-0181

Bomoseen State Park Accessible Boardwalk (2016)
Bomoseen, *VT*

Overview:
-200 foot boardwalk supported by helical pile foundations and located within a sensitive wetland environment
-Decking and railing constructed of naturally rot resistant Black Locust and White Oak

Contact:
Frank Spaulding, Parks Project Coordinator
Vermont Department of Forest, Parks & Recreation
frank.spaulding@vermont.gov or (802) 522-0798

Mount A Accessible Trail (2014-2016)
Mount Agamenticus Conservation Area, York, ME

Overview:
-Design and construction of a one mile accessible trail that navigates granite ledges and rock outcroppings
-Installed multiple boardwalks, bridges, and a 30' circular observational platform

Contact:
Robin Kerr, Conservation Coordinator
robin@agamenticus.org or (207) 361-1102

Eshqua Bog Accessible Trail and Boardwalk (2014-2015)
Eshqua Bog Natural Area, Hartland, VT

Overview:
-Design and construction of a 460 foot accessible boardwalk supported by helical pile foundations
-Multiple viewing platforms allows for photography and appreciation of rare wetland flora

Contact:
Lynn McNamara, Director of Stewardship
The Nature Conservancy in Vermont
lmcnamara@TNC.org or (802) 229-4425

Shaftsbury State Park Accessible Trail (2015, 2017)
Shaftsbury, VT

Overview:
-Design and construction of 100' accessible boardwalk supported by helical pile foundations
-Upgrade of existing boardwalk to comply with accessible trail guidelines

Contact:
Lisa Thorton, Stewardship Forester
Vermont Department of Forests, Parks, & Recreation
lisa.thorton@vermont.gov or (802) 777-7480

Reservoir Accessible Trail (2010, 2015)
Waterbury Center State Park, Waterbury, VT

Overview:
-Constructed 1/4 mile accessible trail that allows access and viewing of the Waterbury Reservoir
-Installed connector paths allowing access to boat launch, swimming area, and picnic tables

Contact:
John Medose, Northeast Parks Facility Manager
Vermont Department of Forests, Parks & Recreation
john.medose@vermont.gov or (802) 426-3050

Entrance Bridge (2015/2016)
Birds of Vermont Museum, Huntington, VT

Overview:
-Design and construction of 100' accessible elevated boardwalk and bridge supported by helical pile foundations
-This custom built structure serves as main entry point to museum facilities

Contact:
Erin Talmage, Executive Director
Birds of Vermont Museum
museum@birdsofvermont.org or (802) 434-2167

Long Beach Boardwalk (2013)
Barnstable, MA

Overview:
-Construction of 350' accessible boardwalk that serves as public access to Long Beach
-Installed innovative foundation in beach ecosystem

Contact:
Rebecca Nickerson, Project Manager
Town of Barnstable
508-790-6316

Front Bay Park (2012)
Wolfeboro, NH

Overview:
-Design and construction of a one mile accessible trail system that borders Lake Winnipesaukee
-Design, construction, and installation of an accessible timber framed gazebo

Contact:
Rob Houseman, Former Wolfeboro Town Planner
robert.houseman@hanovernh.org or (603) 640-3212

Longwood Gardens Trail System (2008)
Kennett Square, PA

Overview:
-Served as member of specialized construction crew that designed and installed this accessible treehouse and elevated ramp system

Contact:
Eyrich Stauffer, Lead Design/Builder
Stauffer Woodworking
eyrich@staufferwoodworking.com or (802) 272-9535

Project Portfolio: Trail Assessment, Planning and Design

Overview: For nearly a decade, Timber & Stone, LLC has prepared comprehensive trail design plans and reports for dozens of organizations and municipalities for properties throughout the Northeast.

Each of the document titles below indicates the completion of extensive field work. Foot-by-foot analysis of a trail is required in order to generate thorough construction and/or maintenance specifications for each site.

Enders Falls Trail Design
Prepared for: Connecticut Department of Energy and Environmental Protection
Granby, CT (2018)

Raven Ridge Natural Area Accessible Boardwalk and Trail Design
Prepared for: The Nature Conservancy
Hinesburg, VT (2017)

Norwalk River Valley Trail Layout and Design
Prepared for: Friends of the Norwalk River Valley Trail (NRVT)
Ridgefield, CT Section (2018), Norwalk, CT Section (2017),
Redding, CT Section (2016) and Wilton, CT Section (2013)

Rock Point Trail Assessment and Design
Prepared for: The Rock Point Center
Burlington, VT (2017)

Pine Island Cemetery Trail Design
Prepared for: Norwalk Redevelopment Agency
Norwalk, CT (2017)

Ossipee Pine Barrens Accessible Trail Design
Prepared for: The Nature Conservancy
Ossippee, NH (2017)

Lubberland Creek Accessible Trail Design
Prepared for: The Nature Conservancy
Newmarket, NH (2017)

Marshall Conservation Area Trail Master Plan
Prepared for: Town of Conway, NH (2016)

Hawkins Brook Nature Trail Accessible Trail and Boardwalk Design
Prepared for: Town of Meredith, NH (2016)

> "The trail layout and design document Timber & Stone, LLC prepared was thorough; sufficiently so, that is has given funders the confidence to make substantial contributions and was used to successively support permit applications."
>
> -Pat Sesto, Chairperson
> Norwalk River Valley Trail

North Branch Cascades Trail Assessment and Design
Prepared for: The Vermont River Conservancy
Worcester/Elmore, VT (2016)

Mills Riverside Park Trail Assessment Plan
Prepared for: Jericho/Underhill Park District
Jericho, VT (2016)

Black Mountain Trail Assessment and Design
Prepared for: The Nature Conservancy
Dummerston, VT (2015)

Wiessner Woods Trail Management Report
Prepared for: Stowe Land Trust
Stowe, VT (2015)

Birds of Vermont Museum Accessible Trail
Prepared for: Birds of Vermont Museum
Huntington, VT (2014)

Shoreline Greenway Trail Maintenance Plan
Branford, CT (2014)

Eshqua Natural Area Accessible Trail Design
Prepared for: The Nature Conservancy
Hartland, VT (2013)

Burlington Multi-Use Trail Design
Prepared for: Burlington Parks and Recreation
Burlington, VT (2013)

Sustainability Academy Multi-Use Trail
Prepared for: Burlington Sustainability Academy
Burlington, VT (2012)

Front Bay Park Accessible Trail Design
Prepared for: Town of Wolfeboro
Wolfeboro, NH (2011)

Maple Street Park Multi-Use Trail Design
Prepared for: Essex Junction Recreation and Parks
Essex Junction, VT (2011)

Indian Brook Reservoir Trail Maintenance and Management Plan
Prepared for: Town of Essex
Essex, VT (2010)

> “Timber & Stone, LLC has been helping us to make our trail networks more durable, accessible, and enjoyable for the past decade. Their work is high quality and well designed. It reflects a clear understanding of what makes for a positive and memorable recreational experience for the range of user groups and abilities that frequent our trails. ”
>
> -Kristen Sharpless,
> Conservation Program Manager
> Stowe Land Trust

Joshua D. Ryan

4764 Center Road
East Montpelier, VT 05651

802-522-9856
timberandstonellc.com

Education

Antioch New England Graduate School, M.S. Environmental Studies, May 2005

University of Maine, B.S. Recreation and Park Management

University of Idaho, Resource Recreation and Tourism, Semester Exchange

Work Experience

Timber & Stone, LLC

Principal Trail Designer and Builder, 2003-Present

- Consult with land managers to develop trail design and management plans
- Facilitate trail design workshops for public, private, and non-profit land managers
- Design and build trail projects located in VT, NH, ME, MA, CT, NY, IL, MD, PA, NM
- Specialize in low impact and sustainable construction of timber and stone structures

Antioch New England Graduate School

Adjunct Faculty, 2005

- Created and instructed a weekend course entitled "Trail Design and Construction"
- Co-created and instructed a residential week-long course entitled "The Conservation Challenges of the Northern Forest"

Teaching Assistant, 2004

- Developed and taught lesson plans focused on interpretive trail design and construction

Peter S. Jensen & Associates, LLC

Professional Trailbuilder, 2000-2004

- Designed and constructed multiple-use recreational trails throughout Eastern US

Vermont Youth Conservation Corps

Conservation Program Manager, 1999-2004

- Responsible for the development and coordination of a summer youth development and conservation work program that served over 350 individuals
- Trained and supervised Crew Leaders and Crew Supervisors on technical trail construction skills, group leadership techniques, and backcountry living skills

Conservation Crew Leader, 1997-1999

- Co-led eight wilderness based and community based trail maintenance crews
- Taught community living, teambuilding, and conservation work skills to groups with diverse age, education, and socioeconomic backgrounds

Sugarloaf Outdoor Center, ME

Trailbuilder and Cross Country Ski Instructor, 1997-1998

- Constructed backcountry bridges and trails for use by cross country skiers

Maine Conservation Corps / Outward Bound, ME

Trail Crew Member, 1995

- Served on a 10 person backcountry trail crew over eight weeks

Student Conservation Association / United States Forest Service, NH

Resource Assistant, 1994

- Patrolled and maintained backcountry trails
- Developed environmental education programs for public staying at USFS campground

Volunteer Experience

Professional Trailbuilders Association - *Member, 2010 - Present*

Vermont Outdoor Economic Collaborative - *Task Force Member, 2017 - Present*

Vermont Recreation and Parks Association - *Committee Member, 2012 - Present*

East Montpelier Trails Committee - *Board Member, 2015 - Present*

"A mind that is stretched by a new experience can never go back to its old dimensions."
- Oliver Wendell Holmes