



Shady Rill Picnic Area

Floodplain Restoration Design

SUBMITTED TO:

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Introduction and Project Overview

Martins Brook, a tributary of the Winooski River, has been impacted by encroachment and development and has responded by showing signs of incision and aggradation. One of the impacted reaches flows through the Shady Rill Picnic Area in Middlesex, Vermont. The picnic area offers a recreational benefit to the community including access to Martins Brook. Visitors to the park enjoy the picnic sites, grills, picnic tables, and a mix of open and wooded areas for recreation. The park is owned by the Vermont Department of Environmental Conservation (VT DEC) and controlled by the VT Dam Safety Program.

Martins Brook is a one-mile long tributary that meets the North Branch of the Winooski River just above the Wrightsville Reservoir in Middlesex, VT. The picnic area is approximately 1.25 miles north of the dam and has a drainage area of approximately 12.5 mi² (Figure 1).

However, along the reach, evidence of uncontrolled access is apparent, resulting in compacted, unvegetated surfaces and erosion, specifically along and above streambanks. The access drive to the recreational area is also constraining the stream and is located well within the optimal riparian buffer zone of Martins Brook.

Watershed Consulting Associates, LLC (Watershed) is pleased to submit this final report detailing the Final design process for the Shady Rill Picnic Area Floodplain Restoration. This project involved updating the 30% designs completed during the previous phase of this project (also completed by Watershed) to the 100% design level. This plan focuses on riparian buffer enhancement, design of hardened access points, restoring streambank integrity, and reducing sediment and nutrient transport while improving water quality. This design seeks to balance the site's recreational needs and appeal with the improved water quality, reduction in fluvial erosion, and improvement to riparian habitat.

Funding was obtained for the final design work by the Winooski Natural Resources Conservation District (NRCD) through a VT DEC Clean Water Block Grant. Project partners include representatives from the Town of Middlesex Selectboard, Town Conservation Commission, Town Road Crew, the Wrightsville Beach Recreation District, the VT DEC Dam Safety Program, and the VT DEC Watershed Management Program.

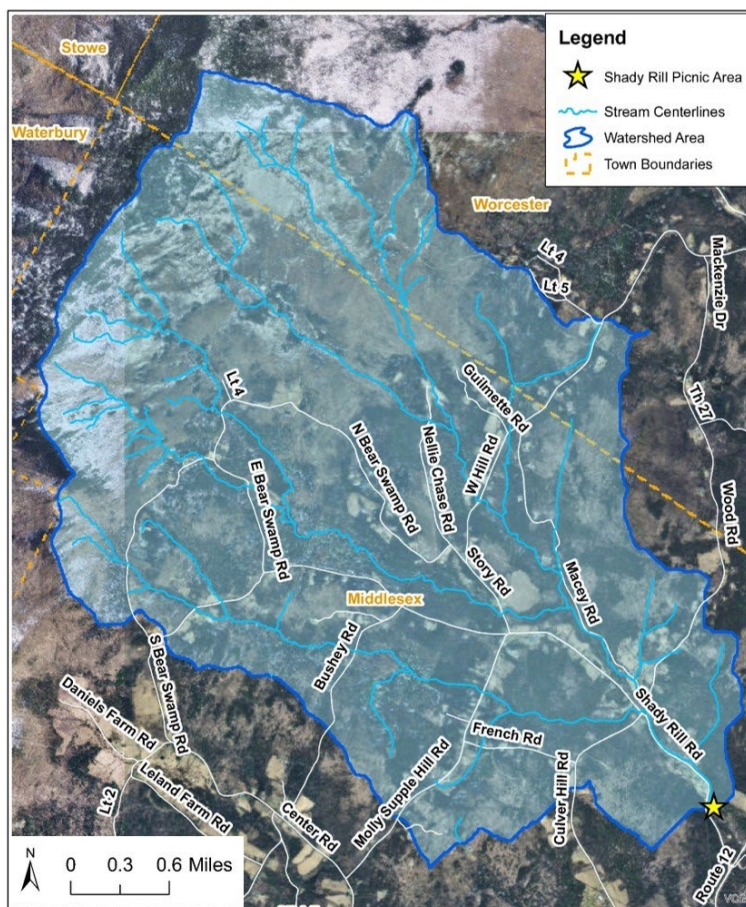


Figure 1. Martins Brook flows southwest through the Shady Rill Picnic Area.



Design Process

| *Alternatives Analysis*

During the initial 30% design process an alternatives analysis was completed to determine the design elements that should be included in the conceptual engineering design. Three alternatives were evaluated as part of the design process. Each scenario consisted of several individual activities, though many of these individual design elements were consistent between the three alternatives. Each of the plans note the need for designated access points to the river and riparian buffer plantings.

The first alternative was the least intensive and offered the smallest water quality benefit while the third alternative involved the most intensive design elements considered and was in turn the most costly alternative. The second alternative balanced the water quality benefits with the projected cost estimates while preserving many of the recreational benefits offered at the site. The three alternative designs can be found in Appendix A. The alternatives are detailed in the 30% design final report, which is included as Appendix B.

| *30% Design*

The preferred alternative, alternative two, was selected for 30% design following review and approval by the Winooski NRC and the Middlesex Conservation Commission on June 29, 2018. Key elements of this design included riparian planting, hardened access points, removing a sediment plug, road relocation, and revegetating the existing road footprint.

Riparian buffer plantings recommended along Martins Brook were a key part of this design. A mix of native trees, shrubs, and wildflower and low-mow grass mix were recommended for the site. As a part of this riparian restoration, it was recommended that the access drive to the site, which closely parallels Martins Brook (at some points the road is as close as ~10 ft from the stream), be relocated away from the brook and be reconstructed along the western edge of the open field area. Currently, vehicles that access this site often park to the east of the access drive along the streambanks. In addition to allowing for a more robust riparian buffer restoration, this road relocation will also prevent additional compaction along Martins Brook from vehicles driving on the road and parking along the stream bank.

A sediment plug was noted during site visits in the lower end of the park site. It was recommended that this plug be excavated in order to allow better floodplain access in this area. This lower area floods primarily when there are backwater conditions at the Wrightsville Reservoir.

Additionally, a pavilion that provides shelter to park visitors and stores picnic tables in the off season is currently located within 30 ft of the stream bank. The pavilion is currently located is well within the riparian restoration area, and as such the design includes relocation of the pavilion away from the stream. The 30% design, the final report, a site visualization, and a plan showing planting recommendations for the riparian buffer can be found in Appendix B.

| *100% Design*

Stakeholder Input

At the commencement of the 100% design process, a meeting was held with project stakeholders on Monday May 6, 2019 at the Winooski NRC offices in Berlin, VT. Stakeholders in attendance included



representatives from the Winooski NRC, the VT DEC, the VT Dam Safety Program, the Wrightsville Beach Recreation District, the Middlesex Road Crew, a Town of Middlesex resident, and Watershed. During this meeting the 30% design was reviewed and any concerns or suggestions for the 100% plan were discussed. Recommendations and comments included (but were not limited to):

1. The loop road that continues after the main park area should be cut off for vehicular access for the southern loop section. Parking should be removed in this area and the spur should also be closed off. These roads should be retained as walking paths only.
2. It was noted that people have in the past driven around the gate to the access the picnic area when the gate was closed. This could be solved by placing a few boulders to the side of the gate to prevent this activity.
3. Stakeholders suggested improvements to the park's entrance. Currently, visibility when pulling out onto Shady Rill Rd is a concern. Also, there is not an easy way to park outside the gate and access the area when the park gates are closed.
4. It was suggested that the access point designed to be handicap accessible be the southernmost access point as the grade is the least steep in this area.

The complete minutes, which include all stakeholder comments and other meeting discussion topics from this meeting, can be found in Appendix C.

Design Updates

Following stakeholder feedback and further site investigations, the 30% concept design was modified. Updates included:

1. Modified entrance into and exit from the park.
 - The northern entrance will be removed and revegetated.
 - The southern entrance will be reconfigured to allow for bidirectional traffic and provide a better sightline when exiting the park. Currently, a large pine tree blocks the view of traffic to the south on Shady Rill Rd. This reconfiguration will eliminate the need for removal of this tree for safety reasons.
 - One parking spot will be created where the northern entrance will be discontinued and two spots will be created to the south of where the new access drive meets with Shady Rill Rd to allow for parking in an organized manner when the park gates are closed or when all parking spots within the park are occupied. This will also allow these cars parked outside of the gates to leave the park easier without driving over the vegetated areas.
2. Improved parking within the park.
 - Twelve designated parking spots will be located within the park (in addition to the three parking spots outside of the park gate). This will prevent park visitors from parking along the streambank and further compacting the soil. It will also maximize the recreational area of the remaining park.
3. Access drive relocation.
 - The access drive for the park currently parallels Martins Brook. During implementation phase of this project, the road will be relocated to the western side of the park along the tree line in the grass area. This will allow for a larger and more impactful buffer



enhancement along the site as well as a reduction in both foot and vehicular traffic along the stream bank.

- The current access drive will be discontinued. The gravel will be removed, and this area will be included in the footprint of the buffer restoration area.
4. Buffer restoration.
 - The stream buffer along Martins Brook will be revegetated with native plants. A complete planting plan is included in Appendix D. Where possible, the buffer will be extended to 50 ft from the stream bank. It should be noted that no large trees will be planted along the Green Mountain Power right-of-way. The buffer will cover approximately 0.7 acres.
 5. Four designated stream access points.
 - Four stream access points will be located along the length of the main park.
 - One of the access points (southernmost access) will be designated as a limited mobility access path. While this path does not comply with the Americans with Disabilities Act (ADA) requirements for handicap access due to the constraints of the existing topography, it will include a hardened surface (geo-grid porous pavement system) and a sloped surface absent from stairs. This path will allow park visitors with mobility issues to access the brook more easily.
 - The remaining three access points will include granite stairs to the brook.
 6. Bioengineered bank stabilization.
 - An area of streambank along the southern section of the main park is actively eroding due primarily to park use. As a part of the plan, this section of bank will be stabilized using bioengineering practices to prevent future erosion.
 7. Restrict vehicular access to southern extents of park.
 - Large boulders will be placed south of the restrooms across the access drive to restrict vehicular access to the loop road and spur south of this point. The road will not be removed but will be transitioned to an unmaintained walking path. A gravel turnaround for vehicles will be located just north of the restrooms.
 8. Relocate grill sites and pavilion.
 - Currently, the grilling sites and picnic shelter are located along the stream bank, further concentrating recreational activities along the vulnerable stream bank. The shelter will be located on the western side of the relocated access drive to keep the greenspace open for other more active recreational activities.
 - The grill sites will likewise be relocated away from the stream and outside of the stream buffer restoration area.
 9. Removed the reference to excavating and removing the sediment plug.
 - Through repeated site visits during the Summer of 2019 and comparison to site photos and surveyed information collected in 2018, it was noted that much of the sediment plug that was observed in 2018 had been redistributed. The sediment plug is no longer completely restricting the brook's access to the side channel, likely due to the extremely wet weather observed in the Spring of 2019. As the plug was partially dislodged in this



active area, it was determined that removing the plug with heavy equipment was not as valuable for stream health as previously thought and removal would incur added expense that would not be justified by the water quality benefits.

The 100% design plans, which detail each of the design details listed above, can be found in Appendix E.

Pollutant Load Reductions

To understand existing condition pollutant loads and pollutant load reductions associated with the proposed retrofit, the using the Source Loading and Management Model for Windows (WinSLAMM) was used. First, the annual TSS and TP loading from the main recreation area only (as the lower area will largely remain unchanged) was calculated. Then, the pollutant loads were modeled using the proposed conditions on site. This modeling yielded expected pollutant removal loads (lbs) and rates (%). These reductions are shown in Table 1. Overall, more than 7 lbs of TP and 1,800 lbs of TSS will be mitigated annually by implementing the restoration design.

Table 1. Pollutant load reductions for the floodplain restoration design.

<i>Existing Annual TP Load (lb)</i>	<i>Proposed Conditions Annual TP Reduction (lb)</i>	<i>Proposed Conditions Annual TP Reduction (%)</i>	<i>Existing Annual TSS Load (lb)</i>	<i>Proposed Conditions Annual TSS Reduction (lb)</i>	<i>Proposed Conditions Annual TSS Reduction (%)</i>
7.95	7.2	91%	2011	1817	90%



Cost Estimate

Costs estimates were developed for completion of the Shady Rill Picnic Area Floodplain Restoration Design. These cost estimates include all the elements of the restoration plan. These cost estimates are divided into several sections so that in the event that construction of the project needs to be completed in phases, cost estimates are available for each phase. In the event that more than one phase of the project is completed at the same time, mobilization costs may be lowered from those estimated below.

The relocation of the access road entrance and addition of parking spaces outside of the gate was considered as one phase of the project. This phase is estimated to cost \$31,580. Costs are shown in Table 2.

Table 2. Cost estimate for the access road entrance relocation are shown below.

Access Road Entrance Reconfiguration					
<i>Location</i>	<i>Item</i>	<i>Amount</i>	<i>Unit</i>	<i>Amount</i>	<i>Total</i>
Sitewide	Mobilization	1	LS	\$ 5,000.00	\$ 5,000.00
Access road	Asphalt	106	Ton	\$ 150.00	\$ 15,900.00
Access road	1-2 CY Boulders	15	EA	\$ 250.00	\$ 3,750.00
20% Contingency					\$ 4,930.00
Construction Engineering					\$ 2,000.00
				Subtotal	\$ 31,580.00



The relocation of the access road, picnic areas, and picnic shelter away from the stream was considered as a phase of the project. This phase is estimated to cost \$42,097. Costs are shown in Table 3.

Table 3. The relocation of the access drive, picnic sites, and shelter away from the stream are shown below.

Relocate Access Road and Sites Away from Brook					
<i>Location</i>	<i>Item</i>	<i>Amount</i>	<i>Unit</i>	<i>Amount</i>	<i>Total</i>
Sitewide	Mobilization	1	LS	\$ 5,000.00	\$ 5,000.00
Shelter	Move shelter	1	LS	\$ 5,000.00	\$ 5,000.00
Site perimeter	Silt fence	300	LF	\$ 4.05	\$ 1,215.00
Site perimeter	Barrier fence	1800	LF	\$ 1.65	\$ 2,970.00
Access road/paths	crushed gravel - fine	140	CY	\$ 45.00	\$ 6,300.00
Access road	Woven Geotextile - Mirafi 500x	1150	SY	\$ 2.51	\$ 2,886.50
Sitewide	Mass excavation	218	CY	\$ 35.00	\$ 7,612.50
Access road	bankrun	54	CY	\$ 45.00	\$ 2,430.00
20% Contingency					\$ 6,682.80
Construction Engineering					\$ 2,000.00
				Subtotal	\$ 42,096.80



Construction of the four access paths to Martins Brook were considered a separate phase as well. Costs for this phase are estimated as \$34,740. See Table 4 for this estimate.

Table 4. Estimated costs for construction of the four river access paths are shown below.

Access to River					
<i>Location</i>	<i>Item</i>	<i>Amount</i>	<i>Unit</i>	<i>Amount</i>	<i>Total</i>
Sitewide	Mobilization	1	LS	\$ 5,000.00	\$ 5,000.00
Path	Geogrid	65	20"x40" square	\$ 15.40	\$ 1,001.00
Access road/paths	crushed gravel - fine	140	CY	\$ 45.00	\$ 6,300.00
Access road/paths	crushed stone - 3/8" to 1/2"	3	CY	\$ 45.00	\$ 135.00
Access paths	Granite stairs	1	LS	\$ 6,300.00	\$ 6,300.00
Sitewide	Mass excavation	218	CY	\$ 35.00	\$ 7,612.50
Slope	Type III stone	17	CY	\$ 55.00	\$ 935.00
20% Contingency					\$ 5,456.70
Construction Engineering					\$ 2,000.00
				Subtotal	\$ 34,740.20

Streambank bioengineering along the eroded section of Martins Brook was considered a separate phase of the project. Costs for this phase are estimated as \$4,754. See Table 5 for this estimate.

Table 5. Costs estimates associated with streambank bioengineering are shown below.

Streambank Bioengineering					
<i>Location</i>	<i>Item</i>	<i>Amount</i>	<i>Unit</i>	<i>Amount</i>	<i>Total</i>
Planted slopes	EC blanket - SC250	65	SY	\$ 3.00	\$ 195.00
Planted slopes	EC blanket - SC150 BN	100	SY	\$ 3.00	\$ 300.00
Planted slopes	Coir logs	360	LF	\$ 5.00	\$ 1,800.00
20% Contingency					\$ 459.00
Construction Engineering					\$ 2,000.00
				Subtotal	\$ 4,754.00



The cost of buffer plantings was estimated with specified species and quantities included in the planting plan (Appendix D). For the costs summarized in Table 6, these plant costs are included in three categories as lump sums. The complete buffer planting estimate including the cost of individual plants is included in Appendix F. It should be noted that the cost estimate and quantities provided represent a robust buffer planting with contracted installation. These costs may be lowered by soliciting volunteers or contracting with organizations such as the Vermont Youth Conservation Corps (VYCC) for installation.

Table 6. Cost estimates for the buffer plantings and installation are shown below.

Buffer Planting					
<i>Location</i>	<i>Item</i>	<i>Amount</i>	<i>Unit</i>	<i>Amount</i>	<i>Total</i>
Buffer Area	Wildflower Meadow Seed Mix	2	lbs	Varies	\$ 45.00
Buffer Area	Trees & Shrubs	323	Plants (varies)	Varies	\$ 3,740.00
Buffer Area	Herbaceous Perennials	185	Plant Plug	Varies	\$ 4,846.00
Buffer Area	Compost	60	yards	\$ 88.00	\$ 5,280.00
Buffer Area	Biodegradable straw matting	8	roll	\$ 98.00	\$ 784.00
Buffer Area	Labor & Machinery	1	LS	\$ 8,600.00	\$ 8,600.00
20% Contingency					\$ 4,659.00
Construction Engineering					\$ 2,000.00
				Subtotal	\$ 29,954.00

Assuming the full cost for buffer installation and separate phases with separate mobilization costs, the complete project cost estimate totals \$143,125. See Appendix F for all cost estimation tables.

Permitting Review

A thorough review of the potential permitting hurdles for implementation of the restoration project was completed. A summary of the permits that were reviewed are included below.

Stormwater Permitting:

Operational Stormwater Permit:

As this is a voluntary project, the site does not have more than 3 acres of unpermitted impervious cover, and the site is not associated with a prior stormwater permit there is no requirement for an Operational Stormwater Permit.

Construction General Permit:

This site will qualify for a Low Risk Construction General Permit (CGP) as it disturbs less than one acre of soil and will be stabilized within 14 days of initial disturbance (temporary or final). A completed CGP Appendix A, which classifies this site as a Low-Risk Site, is included in Appendix G. The Low Risk Notice of Intent (NOI) form is also included as Appendix G. This form will need to be completed when final



implementation funding has been secured. At this time, both forms, a check for permitting fees, and the plans and associated locator map should be submitted to the address indicated on the NOI. The NOI must also be posted with the Town Clerk. See Appendix G for these permit documents.

Act 250:

The site is not currently subject to an Act 250 permit and the proposed retrofits would not require an Act 250 review.

Wetlands:

The project site was reviewed by the Wetlands Ecologist for the region, Shannon Morrison, during a site walk on May 16, 2019. During the site walk Shannon noted suspected wetlands between the western side of the existing grass recreation area and Shady Rill Rd. Following this visit, Matt Montgomery of Vermont Compliance Monitoring, LLC was contracted to delineate this wetland area. He did so on June 4, 2019. It was determined that all retrofit activities were outside of the delineated wetland, but portions of the relocated access drive are within the wetland's 50ft buffer. After conferring about the site observations and wetland delineations with Matt, Shannon confirmed that this wetland area is designated as a Class III wetland. As such, the design elements within the 50ft buffer would be allowed without a wetlands permit. A wetlands permit does not need to be obtained prior to construction of this project. Email confirmation of this wetland designation can be found in Appendix G.

Stream Alteration:

As the four stream access points will disturb more than 10 yd³ in this perennial stream, a stream alteration permit will be required for implementation of this design. Jaron Borg, River Management Engineer with the VT DEC Rivers Program, was consulted about this site. He confirmed that a permit will be required. He also noted that this permit requires a 14-day public notice period of the approval and that these stream access areas will not qualify as improved property, meaning that only minimum repairs will be allowed. Bank armoring or channelizing of the stream to protect their structures would not be allowed. The permit application is included in Appendix G.

Floodplain:

The site was assessed for floodplain impacts and Ned Swanberg, Regional Floodplain Manager with the VT DEC, was consulted. He noted that the project should be reviewed under the Floodplain General Permit under the category of "restoration projects to restore natural floodplain function including berm removal, natural channel design, floodplain excavations, wetland habitat improvements and dam removal". Ned Swanberg's email and the permit application are included in Appendix G. Ned notes that there is no fee for the permit application. His draft decision and the application will be posted publicly on the Environmental Notice Bulletin for a 14-day period for comments. Following that, a 30-day appeal period is commenced. This completed permit application should be submitted following the acquisition of implementation funding.

Local Zoning:

Mitch Osiecki, the Middlesex Zoning Administrator, was consulted to ensure that local zoning regulations were adhered to. Mitch noted that the project does not involve the construction of new structures, only reconfiguration of the recreational amenities and stabilization of streambanks and stream buffering. Mitch confirmed that the Middlesex Selectboard has no oversight role for this project as long as the appropriate State agencies have signed off on the proposed restoration. Email confirmation of this determination is included in Appendix G.



Green Mountain Power Utility Right of Way:

The Winooski NRCD interfaced with Lauren Kelley, a representative from Green Mountain Power (GMP), to ensure that the proposed restoration plan would not interfere with the existing power line right of way that crosses the Shady Rill site. A draft plan was sent to GMP for review and approval. GMP requested that no tall trees be planted along the right of way. GMP has requested a site walk at the conclusion of the final design for the site to ensure that the restoration activities will not impact the right of way. This site visit has been scheduled for early September 2019.

United States Army Corps of Engineers Section 408 Permit:

As the Shady Rill site is controlled by the State of Vermont Dam Safety Program, a United States Army Corps of Engineers (USACE) Section 408 permit may be required. Benjamin Green, a Professional Engineer in the Facilities Engineering Division of the Dam Safety Program, inquired with the USACE regarding this permit. The Dam Safety Division required review by the engineering and environmental divisions. The engineering division determined that the permit was not needed from their perspective. Review from the environmental division has not yet been completed but has been submitted for review. If the environmental division determines that this permit is required, the application should be submitted following the acquisition of implementation funding.

O&M Agreement

An operation and maintenance (O&M) agreement was drafted for this project to ensure that the implemented practices continue to function properly throughout their useful lives and continue to improve water quality, riparian health, and aquatic habitat of Martins Brook. The agreement includes items such as inspection and repair of hardened access points as funding is available, routine road maintenance following road relocation, removing trash and sediment that is hindering plant growth, and other activities related to the continued functionality of the project. The O&M agreement is included as Appendix H.

Educational Sign

In order to inform park visitors about the restoration activities implemented at the site and encourage park visitors to keep to the designated access points and not trample buffer plantings, an educational sign was developed. This sign should be installed following project implementation. Stakeholders suggested that multiple copies could be installed, perhaps in the designated parking areas and near the stream access paths. The sign, provided in both In Design (native format) and Adobe PDF format are included in Appendix I. The example illustrations used on the sign can be updated with actual site photos following project implementation.

Bid Documents

As part of this submittal, we have prepared Bid Documents for the project. These documents have been filled out to the best of our ability at this time. Certain details, such as construction overseer (engineer or other firm selected to provide any construction oversight services or bid process handling) will need to be filled in once selected. Additionally, any sections requiring dates and times have been left blank at this time. See Appendix J for the Bid Documents.