

NC DEQ Project Contract Number: 8054

Project Title:

Mills River Pollutant Reduction Project

FINAL REPORT

Submitted by: Maria Wise, Executive Director

Mills River Partnership



Period of the Project:

January 1, 2020- December 31, 2022

Approved by:

319 Grant Program
Nonpoint Source Planning Branch
Water Planning Section
Water Resource Division
Department of Environmental Quality

EXECUTIVE SUMMARY

PROJECT TITLE: Mills River Pollutant Reduction Project

PROJECT START DATE: January 1, 2020

PROJECT COMPLETION DATE: December 30, 2022

FUNDING: This section must include the:

Federal amount allocated: \$200,000

Match amount required: \$520,000

Federal amount expended: \$199,341.

Match amount contributed: \$544,187.

SUMMARY

The Mills River Pollutant Reduction project began with a large focus on agricultural best management practices. Several key ag bmps were designed and completed during the project but stream restorations became the real solution to impressive sediment reduction in the Mills River. Our engineering partners modelled two stream restorations that saved over 500 tons of sediment from entering the Mills River per year. A respectable reduction in Nitrogen: 343 lb/year and 14 lbs. Phosphorus were also reduced. Stream restoration can be quite costly, but with additional federal funding partners, three major stream restorations were achieved during the contract period. With 5000 linear feet of streambank restored, some of the deliverables shifted from agriculture BMPs to restoration. This was partially necessary due to Covid virus limitations. Meeting with older farmers and landowners to develop ag bmp projects was far more difficult than working with two or three major landowners who had considerable linear feet of riverbank.

Mills River Partnership also had some positive surprises related to the pandemic. Although several festivals and educational events were cancelled, we found that we were able to offer outdoor, distanced volunteer activities and workshops throughout the pandemic. Planting riparian buffer and doing invasive management work does not require groups to gather closely, so we were able to hold many events for those comfortable with being outdoors with small groups. We found that the community was truly hungry for activities that normalized their lives and gave a sense of purpose. We ended up shifting some 319 funds to outreach and education events as we saw the need.

FINAL REPORT

Mills River EPA 319 Pollutant Reduction Project 2020-2023

1. INTRODUCTION

The Mills River is a source water body providing drinking water to approximately 85,000 people. Furthermore, it provides habitat for native fish populations, giant salamanders and mussels identified as species of critical concern and an endangered mussel species. Sediment has been identified as a major stressor to the habitat for these species. Two stretches of stream have been 303d listed for many years. The Mills River Partnership has shown success in addressing these issues by installing agricultural best management practices (BMPs), riparian buffer, restoring streams, stabilizing streambanks, and educating the public.

This 3-year project addressed the sediment and 303d listed concerns with a multi-angle approach that was both targeted and broad. Mills River Partnership worked with landowners in the watershed to address specific sediment and erosion problems on their farms and properties by increasing riparian buffer, sloping damages stream banks, managing invasive plant species, fencing livestock out of streams, improving eroding farms roads and stock trails, and installing grassed waterways in fields. Furthermore, the Partnership held many workshops for the public on how to stabilize streambanks and on the importance of planting native trees and shrubs. We taught hundreds of local school children about water quality and their role in being stewards of the water. River clean-ups, watershed tours and festival events reached several thousand people with educational materials and knowledge regarding the importance of the Mills River watershed.

2. PROJECT OBJECTIVES, GOALS, DELIVERABLES, AND ACTIVITIES

2.1 Project Objectives, Goals and Deliverables

-20 acres riparian buffer added -3000 feet of grassed waterway -7000 feet of field border -500 feet of stock trails -2 culverts -6 watering tanks -Ag Chemical Handling Facility
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-Observable improvement in Elk Toe Mussel population verified by N.C. Wildlife Commission within ten years - Observable improvement in Hellbender Salamander population verified by N.C. Wildlife Commission within ten years
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-Observable improvement in fish populations verified by N.C. Wildlife Commission and Trout Unlimited within ten years -7 livestaking events -2 stream restoration workshops -3 environmental education events with our partners -12 tabelling outreach events (festivals, fairs, DuPont Forest Day, etc)
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-2 rain gardens and workshops
-6 elementary and middle school events

2.2 Project Activities Completed

Actual Completed Deliverable:

<ul style="list-style-type: none"> -9 acres riparian buffer added. Fewer acres planted than planned due to calculation issues. However, 30% more linear feet were actually planted than expected. -1000 feet of grassed waterway -2000 feet of field border. Less field border was planted than expected because half of the planned border became stabilized farm roads that addressed more erosion and sediment run-off than the field border. -2500 feet of stock trails -2 culvert and one stream crossing -2 livestock watering tanks -Ag Chemical Handling Facility
<ul style="list-style-type: none"> -Observable improvement in Elk Toe Mussel population verified by N.C. Wildlife Commission within ten years (Tagged Slipper shell mussels relocated to the Mills by US Fish and Wildlife) - Observable improvement in Hellbender Salamander population verified by N.C. Wildlife Commission within ten years (6 hellbenders found in 300 feet stretch of river during a survey led by NC Wildlife Commission 2021)
<ul style="list-style-type: none"> -Observable improvement in fish populations verified by N.C. Wildlife Commission and Trout Unlimited within ten years (Tangerine Darters relocated to the Mills by NC Wildlife Commission) -12 livestaking volunteer events -10 stream restoration workshops -11 environmental education events with our partners -12 tabelling outreach events (festivals, fairs, DuPont Forest Day, etc) -3 Bird walks -2 Foraging workshops -1 Hemlock workshop -1 Macroinvertebrate Workshop
-6 elementary and middle school events

2.3 Evaluate the Success of Measures Implemented.

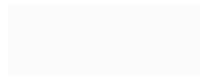
Impaired benthos was the major impairment concern in the watershed. We know from models that implementing these best management practices and restoration projects will improve water quality over time. There is already evidence of that improvement. A biologist with the US Fish and Wildlife Service shared some findings with Mills River Partnership. "Tangerine Darters were introduced in 2020 and they seem to be maintaining. The success rate has led us to reintroduce more in May. I am very optimistic about the Tangerine Darter reintroduction. Over the last few years, we've had pretty good Appalachian Elktoe detections compared to 5-7 years ago, so I think they are trending in a better direction." The update from Fish and Wildlife concerning Appalachian Elktoe mussel is particularly exciting, as that is an endangered species.

3. BEST MANAGEMENT PRACTICES (BMPS) INSTALLED AND ASSOCIATED LOAD REDUCTOIN

3.1 BMP INSTALLED

BMP Type	Number Installed	Unit of Measure	Implementation Date	Drainage Area Name and HUC12	BMP Cost	Grid Coordinates (Lat/Long)
Riparian Buffer	9	acres	2020, 2021, 2022	Mills River 060101050403,	\$38,000	35.400845, -82.590124
				Mills River,060101050403		
Grassed Waterway	2500	Feet	2021	Mills River, 060101050403	\$25,000	35.397650, -82.590223
Field Border	2000	Feet	2021	Mills River 060101050403	\$4000	35.400845, -82.590124
Stock Trails & Farm Road	2500	Feet	2022	Mills River 060101050403	\$81,000	35.396758, -82.587841
Culverts	2	each	2021, 2022	Mills River 060101050403	\$12,000	35.400845, -82.590124
Watering Tanks	2	each	2022	Mills River 060101050403	\$11,000	35.400845, -82.590124
Ag Chem Handling	1	each	2020	Mills River 060101050403	\$33,000	35.393048, -82.61385
Stream Restoration	5000	Feet	2020, 2021, 2022	Mills River 060101050403	\$530,000	35.400845, -82.590124

(Add rows as needed)



3.2 DRAINAGE AREA, POLLUTANTS AND LOAD REDUCTION

Drainage area and HUC12	BMPS	Pollutants*	Load Reduction Amount	Load Reduction Date	Pollutant Load Reduction Estimation Method
060101050403	Riparian Buffer	Sediment	180	8/2022	Chesapeake Bay Protocol for Stream Restoration Load Reductions:
060101050403	Grassed Waterway	Sediment	2.3		Chesapeake Bay Protocol for Stream Restoration Load Reductions:
060101050403	Field Border	Sediment	4.8		Chesapeake Bay Protocol for Stream Restoration Load Reductions:
060101050403	Stock Trails & Farm Roads	Sediment	3.3		RUSEL2
060101050403	Culverts	Sediment	Unknown		
060101050403	Watering Tanks	Sediment	2.5		RUSEL2
060101050403	Ag Chem Handling	Pesticides & Fertilizer	Unknown		
060101050403	Fencing	Sediment	4.2		RUSEL2
		Bacteria (Fecal coliform)	Unknown		
060101050403	Stream Restoration	Sediment	320		Chesapeake Bay Protocol for Stream Restoration Load Reductions
		Nitrogen	343		Chesapeake Bay Protocol for Stream Restoration Load Reductions
		Phosphorus	21		Chesapeake Bay Protocol for Stream Restoration Load Reductions

(Add rows as needed)

4. MONITORING RESULTS (IF APPLICABLE)

Note the improvement in NH3-N, NO3-N, PO4 and especially turbidity from 2020 to 2022.

VWIN Monitoring Data provided by Environmental Quality Institute.

site name	month	day	year	NH3-N	NO3-N	PO4	Turb	TSS	Cond	Alk	pH
North Fork Mills River	2	15	2020	0.03	0.2	0.04	1.4	6.8	11.4	6.0	6.7
South Fork Mills River	2	15	2020	0.03	0.2	0.03	1.4	5.2	9.3	6.0	6.6
Mills River at Hwy 191	2	15	2020	0.03	0.2	0.04	2.2	8.8	11.3	7.0	6.6
Mills River at Hooper Lane	2	15	2020	0.04	0.2	0.03	2.5	5.2	12.7	5.0	6.6
North Fork Mills River	11	19	2022	0.02	0.1	0.01	0.3	1.2	14.4	6.0	6.8
South Fork Mills River	11	19	2022	0.03	0.1	0.02	0.3	2.0	11.6	4.0	6.8
Mills River at Hwy 191	11	19	2022	0.03	0.2	0.04	0.6	2.0	14.7	6.0	6.8
Mills River at Hooper Lane	11	19	2022	0.03	0.1	0.05	0.7	1.6	16.6	5.0	6.8

5. PUBLIC INVOLVEMENT AND COORDINATION

- Provide the list of organizations and their role in the project (if any)

a. State Agencies

N.C. Wildlife Commission- Permitting and Monitoring

NC DEQ, Department of Water Resources- Funding

b. Federal Agencies

U.S. Fish and Wildlife- Funding, Volunteers, Permitting and Monitoring

Natural Resource Conservation Service- Funding and Technical and Engineering

USDA- Funding

c. Local Governments

City of Asheville- Funding

City of Hendersonville- Funding

Henderson County Soil and Water Conservation District- Technical and Engineering, Education

Town of Mills River- Funding

Henderson County- In-Kind and Volunteer

d. Industry, Environmental, and Other Groups, Public at Large

Sierra Nevada Brewing-Volunteers

Trout Unlimited-Volunteers

Farm Bureau- In-Kind

Conserving Carolina-In-Kind, Volunteers

Mills River Ag Advisory Board, In-Kind

Mountain True- In-Kind, Monitoring, Volunteers

Jennings Environmental- Engineering, Volunteers, Education

Penrose Environmental- Monitoring, Education

6. LONG TERM IMPACT IN TERMS OF HUMAN BEHAVIOR CHANGE, STREAM/LAKE QUALITY, GROUND WATER QUALITY AND/OR WATERSHED PROTECTION CHANGES

The long-term effects of development, intensive farming and climate change could potentially degrade this watershed without continued protection. Severe weather events, especially increased flooding,

coupled with impervious surfaces of development are causing higher rates of erosion. Every BMP installed through this grant will minimize those negative effects. Without

continued support, water quality will become poorer for drinking, for recreation and for habitat. Education efforts made through this 319 project have made a difference in the community and the watershed. Shade Your Stream Workshops we hosted have been popular and we see the positive effects in residential areas. Each year, we receive many calls from the public asking where to purchase livestakes to plant on their streambank. Once we were gifted left over materials from a small streambank stabilization project a local family did after attending our workshop. Farmers have asked us if we can bring volunteers onto their property to plant livestakes because of erosion concerns.

7. RECOMMENDED NEXT STEPS

- a. In coming years, we would like to focus more efforts on the remaining undeveloped parcels within the Brandy Branch system. Several stream restorations and/or riparian buffer opportunities remain. This would address benthos health. We plan to work with Department of Water Resources and local regulators to pinpoint what sources of pollution remain in that watershed.
- b. Continue successful work with partners to offer educational opportunities and workshops. This outreach has magnified the mission of Mills River Partnership and that of EPA 319.
- c. Focus EPA funds on residential properties where there are not as many sources of funding. Mills River continues to see growth and as more of the farmland is converted, there are more opportunities for major improvements that were not always available when in farmland.

8. LESSON LEARNED

1. It is rarely possible to plan all projects at the beginning of a grant. Flexibility is necessary as project objectives, timelines, landowners and even land uses change.
2. Obtaining pollutant reduction estimates should be provided before and after project completion by engineers and designers. It is a detailed time-consuming task and will be easier to produce accurate estimates if designers are aware they will be asked these numbers at the on-set.
3. Matching funds come from many different sources and grants and become part of the overall picture throughout the life of the 319 grant. Most of the matching funds came from local and state sources.
 - City of Asheville: \$90,000
 - City of Hendersonville: \$105,000
 - Town of Mills River through DWR funding: \$161,189
 - US Fish and Wildlife: \$35,000
 - NRCS RCCP: \$152,998

9. BUDGET

There was significantly more match provided by the end of this project. The budgeted 319 Funds did not show significant discrepancies. Slightly

More funding was given to education and outreach than originally budgeted. The overage in education came from the Ag BMP budget.

Final Budget at end of Project.

Local and state sources of funding made up 65% of the overall match amount.

Description	Cumulative Federal 319 Expenditures	Cumulative Match Expenditures
Salary and Benefits	\$31,982.37	\$65,746.45
Travel	\$328.68	\$474.28
Equipment	\$169.95	\$274.90
Supplies	\$533.18	\$766.36
Education	\$10,500.64	\$18,550.14
Construction	\$123,018.57	\$418,181.30
Contractual Services	\$32,207.00	\$39,594.50
Other	\$600.00	\$600.00
Total Request For Reimbursement	\$199,340.39	\$544,187.93

10. REFERENCES

[Environmental Quality Institute Monitoring Data](#)

<https://jenningsenv.com/2022/05/12/elementor-1383/>

11. Provide before and after photos (See next page)

Agricultural Best Management Practices:



Lugo Before: Erosion in pasture leading to the Mills River.



Lugo After: Grassed waterway to carry water and empty to the Mills River without erosion in the field or at the outfall.



Lugo After: Farm road rutted and eroding with steep slope at top, now stabilized with filter cloth and thick gravel, saving sediment from entering the river.



Over 800 feet of livestock fencing installed to protect Foster Creek and the riparian buffer.



Foster Creek Restoration addressed 1 mile of eroding streambanks with natural stream channel design methods, including bank sloping, meanders and log vanes, planting over 10,000 riparian plants and widening the buffer by 25 feet or more in most areas. Notable diversity of plant communities makes this restoration more resilient and useful to pollinators and other inhabitants of this



Volunteers transplanting Juncus to the banks of the newly restored Foster Creek for a quick jump on stabilization with hardy roots.





Volunteers plant live stakes during the winter months, soon after the stream work was complete. These dormant sticks will send out roots in early spring and hold the banks in place. This is the best form of erosion control.



Working with the N.C. Wildlife Commission ahead of Foster Creek restoration to monitor hellbender populations and ensure that the restoration will not negatively impact this species found in the Mills River.



Baseline macroinvertebrate sampling ahead of Foster Creek

Restoration. This monitoring continued during and after the

Project was complete to show project efficacy.



Riverbank repair on the South stem of the Mills River. Weeks residence.



Streambank Repair Certification class in partnership with NC Cooperative Extension.



Mills River Park Riverbank Restoration Live Stake Planting Volunteer Day

Outreach and Education



Birds of Mills River Audubon Walk



Invasive Removal Workshop with Pisgah River Rangers and Sierra Nevada



Middle School Students learn about water quality at "Careers in Agriculture" day. North River Farm



How to identify and key macroinvertebrates with Franklin School of Innovation



River Clean Up 2022



Educational signage installed at Mills River Park.

Important Links

<https://www.millsriverwater.org/>

[Mills River Facebook](#)

[Mills River Watershed and Source Drinking Water Management Plan](#)

