

UT Little Phoenix Creek Stream Restoration



Sponsored by:
The National Committee for the New River

**Funds from Fiscal year 2004
Awarded and spent in FY 2007-2008**

**NPS 319 Contract #711
December 15, 2007 to August 31, 2008
for the amount of \$65,400**

**Project Coordinator: Lynn Caldwell
Restoration Director, NCNR**

September 23, 2008

Acknowledgements

This project was funded under an EPA Section 319 Grant

Partners in this project:

Lynn Caldwell and George Santucci of
The National Committee for the New River

Barbara and Percy Eason, landowners

Steve Tedder of NCDENR Department of Water Quality

George Smith of NCDENR Department of Water Quality

Glen Sullivan and Joe Mickey of Foggy Mountain Nursery

Trish MacPherson of the DWQ Biological Assessment Unit

The Honorable Cullie Tarleton, NC House of Representatives

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Abbreviations and acronyms

DWQ—Division of Water Quality

FMN—Foggy Mountain Nursery

NCDENR—North Carolina Department of Environment and Natural Resources

NCNR—National Committee for the New River

USDA—United States Department of Agriculture

UT—Unnamed tributary

Executive Summary

Background

During the summer of 2007, approximately 85 acres were cleared on the headwaters of an unnamed tributary (UT) to Little Phoenix Creek in Ashe County. The watershed of the UT is approximately 116 acres or 0.18 sq mi (USDA-NRCS Memo 8/29/07). The resulting run-off from this land clearing caused severe streambank and streambed scour in the UT, resulting in streambank failure and loss of instream habitat on the Eason property. The property damage included large rocks and debris blocking a driveway culvert, sediment deposition, stream scour, and bank erosion. The property owners were concerned about increased runoff and flows in the UT, debris consisting of wood, rock and soil that had moved into the stream channel, and the safety of themselves and property as a result of the upstream land clearing. (FMN Stream Restoration Plan.)

Because of the extreme damage to the stream as a result of the headwater land clearing and flood, personnel with the North Carolina Department of the Environment and Natural Resources (NCDENR), Division of Water Quality, Winston-Salem Regional Office, requested benthic (aquatic insects) sampling of the UT. Benthic studies were conducted by the NCDENR, Biological Assessment Unit in August, 2007. Results indicated that there was a “devastating impact to the benthic macroinvertebrate community in the impacted UT Little Phoenix Creek...The complete rearrangement of the stream bed and the extreme streambank erosion indicate that scour by high flows had occurred recently. Recovery of the impacted UT will be slowed by the fact that the entire stream, including the headwaters, have been scoured” (DWQ Biological Assessment 27 August 2007) (FMN Stream Restoration Plan)

During two visits to the impacted UT by Foggy Mountain Nursery (FMN) personnel on August 6, 2007, and March 12, 2008, following the flood and extreme stream scour, no fish were observed in the stream. However, Mr. Eason indicated that trout were present in the stream prior to the flood (personal communication, March 12, 2008). It is expected that brook trout inhabited the UT and used it as a nursery stream since brook trout inhabit Little Phoenix Creek (personal communication, NC Wildlife Resources Commission). (FMN Stream Restoration Plan.)

As a result of the damage to the UT, the National Committee for the New River (NCNR) applied for and received a DWQ Section 319 Non-Point Source Pollution Grant, # 711 on December 15, 2007. The purpose of this grant was to repair approximately 315' linear feet (lf) of an UT to Little Phoenix Creek on the Eason property. (FMN Stream Restoration Plan)

The stream restoration at this location was based on natural channel design concepts (Rosgen 1996) that match the stream dimension, pattern, and profile based on the valley type and water surface slope. The UT's confluence with Little Phoenix Creek was considered in the design process. Restoration efforts were based on bankfull flows. The stream restoration was based on a B or Ba stream type (Rosgen 1996). To achieve a B

stream type, rock step-pool structures were installed in the impacted reach and streambanks reshaped to the proper profile for B streams. Once the stream work was completed, native riparian vegetation was planted along the streambanks to aid in bank stability and to lessen the impacts of thermal pollution on this small headwater stream. (FMN Stream Restoration Plan)

An existing culvert was removed since it acted as a dam, interfering with proper sediment transport. A bridge that spans the entire flood plane was built that allowed the stream profile (step-pool sequence) to be maintained through the reach. (FMN Stream Restoration Plan)

Purpose and goals

The purpose of this project was to repair 315 ft of a UT- Little Phoenix Creek on property belonging to Barbara and Percy Eason. This stream was severely damaged by excessive flooding as the result of upstream land clearing activities above their property. Project goals were to re-slope eroding streambanks, install instream structures (rock cross-vanes), replace the existing culvert with a bridge, and plant vegetation along the streambanks.

Deliverables—Proposed:

- Replace the existing culvert with a spanning structure (bridge) to allow for sediment transport.
- Restore benthic habitat (evaluated through DWQ monitoring)
- Restore proper dimension and profile to 315 linear feet of the UT that will allow the sediment load to be properly transported through the reach during high flow events.
- Stabilize creek banks to prevent further erosion.
- Ensure survival of a minimum of 80% of the stems (trees/shrubs) planted along the restored reach.

Deliverables—Actual:

- Constructed steel beam and concrete bridge to replace the culvert.
- Improvement in EPT taxa richness which increased from 6 to 17 and EPT taxa abundance increased from 12 to 65, indicating recovery is occurring. (DWQ Biological assessment August 27, 2008)
- Fourteen rock step-pool structures were installed in the impacted reach and banks were sloped and vegetated. (FMN Stream Restoration Plan) Within 6 weeks of construction there were two 2-inch rains and one 5.5-inch rain (conversation with owner August 2008). All structures held and there was no bank erosion.
- Stabilized creek banks. There are no signs of erosion.
- Ensured plant survival for 99% of stems planted as of September 2008.

Methodology/Execution

The first activity for this project was the removal of the existing culvert. The culvert was acting as a dam in high flow events. (See photo sheets.) A bridge was constructed to allow for the proper stream profile (step-pool sequence) to be maintained through the entire reach. (FMN Stream Restoration Plan)

The second activity was the restoration of 315 linear feet of the small UT to Little Phoenix Creek on the Eason property. Restoration was based on natural channel design concepts for a B stream type (Rosgen 1996). Proper stream dimension, pattern, and profile were restored through the impacted reach, based on bankfull flows and data gathered from a reference reach stream. Streambanks were reshaped to proper profile and dimensions. The stream pattern was not changed. Fourteen rock step-pool structures were installed, creating a cascading channel that will properly transport high sediment loads which occur during high-energy streamflow events.

The third activity was the planting of native vegetation. Native grasses were planted and covered with coconut fiber matting. Silky dogwood, ninebark, spice bush, rhododendron, mountain laurel, elderberry and other natives were planted on the banks. Fruit trees and other hardwoods were planted 10 feet from the top of the bank. The establishment of the riparian zone vegetation will help stabilize the streambanks, reduce thermal pollution, and provide nutrient input to aid macroinvertebrate recolonization.

NCNR will conduct survival monitoring of plants six months after planting and then yearly. A test plot of 100 live stakes has been set up to help evaluate survival. Photos are also used to document the reach before, during, and after construction. (See photo sheets.) Foggy Mountain Nursery will continue to monitor the stability of the project for several months.

NCDENR Department of Water Quality did biological studies on September 4, 2007 and again on August 27, 2008 in which the benthos sampling went from “near complete removal of the benthic stream community” (DWQ Biological Assessment 4 September 2007) to “some ubiquitous small stream fauna have returned in abundance.” (DWQ Biological Assessment 27 August 2008)

Outputs and Results

- The new bridge spanning UT-Little Phoenix has effectively allowed for unimpeded flow of water during heavy rain events.
- Fourteen rock step-pool structures were constructed along 315 linear feet of stream channel. These structures have effectively directed flow to the center of stream and are providing habitat for fish, macroinvertebrates and other aquatics as they migrate upstream from Little Phoenix Creek.
- Vegetated creek bank established including:

- Native grasses
- Native shrubs: silky dogwood, silky willow, ninebark, and elderberry
livestakes have successfully sprouted with almost 100% survival.
Rhododendron, mountain laurel, flame azalea and other native plants are
planted at and near the top of bank. Fruit trees and other hardwoods are
planted 10 feet from the top of bank.

Outcomes and conclusions

This 315-foot reach of UT Little Phoenix Creek at the Eason property could only be described in the worst of terms: “devastated”, “scoured,” and “dead.” With scoured banks twelve to fifteen feet wide from bank-full to bank-full, rocky debris both in the creek and all over the Eason’s yard, a 6 foot culvert full of rock and mud, and all vegetation washed away, it looked like a war zone.

But the story has a happy ending.

The goal of the project, to stabilize the lower reach of UT Little Phoenix Creek at the Eason property, was met. DENR officials worked with the landowner at the top of the mountain to stabilize the 85 acres that had been cleared. NCNR worked with the landowners (Barbara and Percy Eason) and Foggy Mountain Nursery to develop and implement a site plan. The result is a functional, stable stream that is also attractive. The Easons are very pleased with the results and no longer wake up at night to move their cars when they hear a few drops of rain.

Though there are still high flow events, the stabilization at the top of the mountain has decreased the quantity of water flowing downstream, and the step-pools slow water down as it cascades from the top of the mountain. The bridge span allows the water to flow unimpeded so there is no “back up” of water onto the Eason’s property. Stabilization has decreased the amount of sediment flowing into Little Phoenix Creek and the macroinvertebrates are recolonizing. Small fish have been spotted in the step-pools.

In the fall of 2006 the Eason’s problems began. NCDENR and the National Committee for the New River began working together in August 2007 to find a solution to the devastating impact that this land clearing had on their property. Within one year, thanks to NCNR, NCDENR, funding from the 319 grant, and quick work by Foggy Mountain Nursery on design and implementation, the situation has been totally resolved.

While this is a story of success, it is a travesty that this situation could have occurred at all. NCNR is willing to help in any way to change the “agriculture exemptions” that would allow an individual to clear 85 acres of land of all vegetation at one time. It is our hope that this exemption will be modified so that only a few acres at a time may be cleared before stabilization occurs for ANY land clearing activity in the mountains.

319(h) Contract Reimbursement Request

PROJECT TITLE: Little Phoenix Creek Stream Restoration
 CONTRACT#: NPS 319 Contract #711
 DATE SUBMITTED: 23-Sep-08
 FEDERAL ID#: 58-1949660

SPONSOR ORGANIZATION: National Committee for the New River
 REMITTANCE ADDRESS: PO Box 1480, West Jefferson, NC 28694
 PRINCIPAL INVESTIGATOR (PI): Lynn Caldwell

Request Payment For Period: June 1-August 31, 2008

<u>Description</u>	<u>Current Federal 319 Expenditures</u>	<u>Cumulative Federal 319 Expenditures</u>	<u>Current Match Expenditures</u>	<u>Cumulative Match Expenditures</u>
Personel/Salary: NCNR	\$1,300.00	\$2,240.00		
Personel/Salary: Foggy Mountain Nursery	\$900.00	\$10,150.00	\$1,250.00	\$1,250.00
Personel/Salary: NC DENR Division of Water Quality				\$5,640.00
Supplies	\$7,033.00	\$31,311.00	\$250.00	\$750.00
Equipment	\$2,400.00	\$8,930.00	\$455.00	\$455.00
Travel	\$18.72	\$327.46		
Contractual	\$9,465.00	\$9,465.00	\$400.00	\$400.00
Other (Design/permit fee	\$570.00	\$2,970.00		

Total Request For Reimbursement	\$21,686.72	\$65,393.46	\$2,355.00	\$8,495.00
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Make Payable to: National Committee for the New River
 Mail Check To: PO Box 1480, West Jefferson, NC 28694
 Contact Person: Lynn Caldwell
 Phone number: 336-982-6267 office or 336-977-6590 cell

Email:

lynn@ncnr.org

Transfer Funds to:	<u>Company#:</u>	-
DENR (agency use only)	<u>Account Code:</u>	-
	<u>Center/RCC:</u>	-

REFERENCES

Division of Water Quality Biological Assessment Unit 27 August 2008,
Trish MacPherson

Division of Water Quality Biological Assessment Unit, 4 September
2007, Trish MacPherson

Stream Restoration Plan for an Unnamed Tributary to Little Phoenix
Creek, Ashe County, North Carolina, Joe Mickey and Glen Sullivan

Natural Resources Conservation Service, Eason Trip Report, 27 August
2007—can be furnished upon request

NCDENR (North Carolina Department of Environment and Natural
Resources). 2004. Basinwide assessment report – New River
basin. Division of Water Quality. Raleigh.

Rosgen, D. L. 1996. Applied river morphology. Wildland Hydrology
Books, Pagosa Springs, Colorado.

USDA-NRCS Memo 8/29/07—can be furnished upon request

APPENDICES

Stream Restoration Plan

DWQ Biological Assessment 4 September 2007

DWQ Biological Assessment 27 August 2008

Photo sheets