NCDA&CS - North Carolina Forest Service

Stream Restoration Post-Implementation Annual Monitoring Report:

Year 4 - 2012

For the N.C. Clean Water Management Trust Fund (CWMTF)
Project #2004A-411:
"Rendezvous Mountain Purlear Creek Stream Restoration"

Prepared by: Tom Gerow, Jr.
Forestry Nonpoint Source Branch
1616 Mail Service Center, Raleigh NC, 27699-1616
(919) 857-4824 tom.a.gerow@ncagr.gov

With Assistance from: Stream Restoration Program
Department of Biological & Agricultural Engineering
North Carolina State University
Campus Box 7625, Raleigh NC, 27695
(919) 515-2694 www.bae.ncsu.edu

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www.ncforestservice.gov
www.ncagr.gov

Project Background

Approximately 2,600 linear feet of Purlear Creek were restored in two phases on Rendezvous Mountain Educational State Forest (ESF) in Wilkes County with funding provided by the N.C. CWMTF. The project was implemented in two phases:

Phase 1: 700 linear feet, UT-Purlear, perennial, Priority 1 restoration.
Phase 2: 1,900 linear feet, mainstem Purlear Creek, perennial, Priority 1 and Priority 2 restoration.

The site was a hay pasture prior to ownership by the N.C. Forest Service (NCFS). The growing and harvesting of fescue for hay production was taking place across the entire pasture and immediately alongside Purlear Creek. This intensive land use along the creek resulted in incised and undercut stream banks. There was no functioning riparian buffer along most of the length of stream within the pasture, except for an occasional large tree.

The outcomes of this restoration project include:

- Align the stream into the natural valley of the site;
- Connect the stream to a functional floodplain;
- Create in-stream structures suitable to manage bankflow events and enhance aquatic habitat;
- Establish a permanent forested riparian buffer.

The long-term goal is to create conditions within Purlear Creek that are suitable for the introduction of trout in partnership with the N.C. Wildlife Resources Commission. More detailed background information about the project's scope of work, the site characteristics and restoration implementation is available in the project's Final Report to the CWMTF dated October 31, 2008.

In addition, a "Phase 3" of this project was accomplished in 2009 with the realignment and restoration of approximately 1,500 feet of Purlear Creek beginning at the downstream ending point of "Phase 2", and extending to the bridge of Mozelles Road over Purlear Creek where the creek leaves State Forest property. This Phase 3 was funded via a grant from the N.C. Division of Water Resources. While this annual monitoring report focuses primarily on Phases 1 & 2 (as these were funded by the CWMTF), occasional discussions regarding Phase 3 may be included in these reports as a means to discuss and depict overall watershed conditions.

Annual Monitoring Narrative

Seven individual site visits were conducted by NCFS Nonpoint Source Branch personnel during 2012, which included multiple site visits in late winter/early spring 2012 related to the completion of the bridgemat demonstration stream crossing project. This bridgemat demonstration required substantial labor from local NCFS personnel, but is now a viable and low-impact stream crossing alternative for accessing State Forest property on the east side of Purlear Creek.

Site visits were made by biologists from N.C. State University and the U.S. Fish & Wildlife Service during the growing season. Based upon feedback from the biologists, and our own routine observations, the overall vegetation status on the restoration site is excellent. In addition, the successful re-hydration of the wetland area that was restored during Phase 1 was noteworthy. This wetland is situated north of the confluence of the un-named tributary and the Purlear Creek mainstem. Water remains perched, or immediately below, ground surface for much of the year across most of the wetland area. While the wetland area is thought to be suitable habitat for bog turtles, a survey done this year by the biologists did not reveal any turtles.

A successful prescribed burn was conducted in early 2012 across the early-successional upland habitat areas. Care was taken to exclude fire from the restored riparian zone. Future prescribed burning will be conducted across the wetland area, as well, to control woody vegetation migration into the wetland and as a tool to control invasive plants.

Total precipitation at the project site during 2012 is estimated to be approximately 46 inches*. Precipitation totals for the remote sensing station at the State Forest for previous years are included for comparison: 2011: 57.55 inches; 2010: 46.75 inches; 2009: 52.25 inches; 2008: 39 inches; 2007: 33 inches. In April 2012, a bankfull event was captured on video which can be viewed at the following link on the YouTube website: http://youtu.be/gQXXSOT4FOg.

Stream Morphology

Attached are cross-sections, profiles, and plan sheets from surveying of the site that was conducted by students and faculty from NCSU. In comparison with as-built surveys, the stream structure is largely intact and has not had any major changes, remaining stable. Incursion of old legacy sediments from upstream, beyond the restoration reach, continues to mobilize in the restored system. This sediment source remains unclear and will continue to be investigated.

Vegetation

Tree growth remains abundant and there continues to be a diversity of tree species within the riparian corridor. Growing-season shade from trees and woody shrubs appears to be increasing both in area and length along the stream corridor. This past year, the wild plum (*Prunus americana*) trees that were planted in 2008 produced an abundant crop of fruit (photo at left, June 2012); even to the extent that tree limbs broke off from the weight of the fruit.

Several dozen bushels of fruit were harvested by local NCFS personnel to collect the seed for propagation of additional wild plum seedlings at the NCFS Claridge State Tree Nursery. This project site should be an important seed source well into the future for providing wild plum seedlings for customers of the NCFS nursery program.

Photo at right taken August 23, 2012 shows a close up view of the stream channel within the un-named tributary and adjacent vegetation within the riparian corridor.

Long Term Vegetation Growth

Photos on the following two pages illustrate the maturation of vegetation on the overall project site.

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* This estimate is believed to be lower than actual for the year. The rain gage apparatus located on the State Forest which is typically referenced to obtain the precipitation data for this annual report was not fully operational throughout 2012. The total precipitation estimate of 46" reported here for 2012 was obtained by averaging the incomplete State Forest's precipitation data (42") with those from other nearby gages, including: from a NCFS remote weather station at Raven Knob in Surry County (50"); and from data provided by the USACE at its W.Kerr Scott Reservoir located in Wilkes County (47.48").

Un-Named Tributary, Phase 1:

Top photo was taken August 2006, soon after water was turned into the newly constructed channel.

Bottom photo was taken October 2012. While overall vegetation height growth is limited from the mature forest overstory canopy, the trees and shrubs have completely filled-in the lateral extent of the disturbed area. An abundance of native seedlings have supplemented the plantings that were installed after restoration.

Purlear Creek mainstem, Phase 2:

Top photo was taken September 2004, prior to any restoration work. A protected riparian corridor is functionally non-existent. The entire parcel was cultivated as a hay pasture prior to acquisition.

Bottom photo was taken October 2012. Privately-owned property seen in the foreground is still cultivated for hay. However the property line now extends out beyond the stream's centerline to ensure permanent protection on both sides of the riparian corridor as State Forest property. Note the growth of vegetation along the restored stream and early-successional vegetation upland habitat on the opposite side of the stream.

Invasive Plant (Kudzu) Control

In 2010 we identified an infestation of kudzu within portions of the riparian zone. In late August/early September of 2011, NCFS personnel conducted the first herbicide treatment application on the kudzu in an attempt to eradicate the plant from along Purlear Creek. No treatments were made in 2012 in order to allow time to determine the effects of the first treatment. Observations indicated that while the kudzu had not significantly re-grown, patches remain that require additional treatment, including some of which has extended upstream along portions of the un-named tributary. In spring 2013 a follow-up selective herbicide treatment will be conducted.

Aquatic Insects

An assessment of benthic macroinvertebrates was performed in the spring of 2012 by Dave Penrose, on behalf of the NCSU Department of Biological & Agricultural Engineering. The complete report of the findings is included in the Appendix to this Annual Report, including a full listing of identified species. Taxa richness at the upstream reference site remained relatively high; however all metrics at the restored tributary declined significantly between years. Up until this year, the Dominant-In-Common comparisons had been improving. The reason for this apparent change in trend in the data is, at this point, unknown. There was at least one substantial rainfall event in April, which may have contributed to the overall findings. Pending funding availability, effort will be made to conduct another round of sampling in 2013 to determine if this trend was an isolated incident or is indicative of other issues.

Bridgemat Stream Crossing

A bridged crossing of the mainstem of Purlear Creek was established in late 2011. Follow-up work was completed in 2012 to reinforce the engineered lumber/wood bridge panels, apply a water- and slip-resistant coating, and improve the road approachways leading down-slope to the crossing, in keeping with appropriate forestry best management practices (BMPs). An interpretive exhibit sign panel was created and fabricated to explain the process that went into establishing this crossing demonstration. The sign will be installed in 2013.

Photo above from April 2012 during a bankfull event at the bridge crossing. The crossing provides ample vertical and lateral clearance for accommodating normal bankfull flow while still allowing NCFS to fully access the State Forest.

Photo at left from October 2012 shows the completed bridge crossing. Road approachways received ample stone aggregate to dissipate surface runoff and prevent sedimentation.

Outreach/Education/Training

In early 2012, the NCFS created and launched a new "Stream Restoration" page on its agency's website (www.ncforestservice.gov) which explains the extent of work that has been completed thus far on State Forest properties. The Purlear Creek project is included, along with reports and other related documents.

In July, N.C. State University led an informal training field tour for 14 Cooperative Extension Service personnel to illustrate riparian tree and plant restoration within former agricultural fields and pastures.

In August, the Purlear Creek restoration site hosted a group of approximately 30 water resources and environmental regulatory professionals from across the eastern U.S. participating in the *RiverCourse RC-521* training workshop. This series of workshops is led by the Stream Restoration Program of N.C. State University.

Photo above shows RiverCourse participants alongside the un-named tributary (Phase 1).

Goals for Continuing Management

In addition to routine monitoring, other project goals for 2013 and beyond include:

- Continue herbicide treatment to control kudzu infestation
- Explore options for re-introducing trout, in coordination with the N.C. Wildlife Resources Commission
- Conduct a prescribed burn on the uplands areas and restored wetlands to foster growth of native warm season grasses, control invasive plants, and improve small game habitat
- Freshen the property line markings to discourage un-intended trespass into the riparian corridor

Appendix

- Benthic macroinvertebrate sampling report from April 2012.
- Plan sheets
- Cross Sections and Profiles