



NCDA&CS - North Carolina Forest Service

Stream Restoration Post-Implementation Annual Monitoring Report

Year 2: 2013

Covering the Period of July 2012 to July 2013

For the N.C. Division of Water Quality (DWQ)

Project #10-0493:

“DuPont State Forest Lake Julia Outfall Stream Restoration”

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Project Background

Approximately 550 linear feet of stream reach flowing out of Lake Julia at DuPont State Forest in Transylvania County was repositioned and restored in May 2011. The outfall stream channel was originally established in its pre-restoration location at the time when Lake Julia was constructed in the mid-20th Century by a previous landowner. Over the ensuing decades, significant erosion and undercutting of an adjoining earthen embankment was contributing sediment loading into the nearby Little River, and resulting in the loss of large, mature trees atop the failing embankment. In addition, the erosion was accelerated during the first decade of the 2000's as a result of successive years of abnormal flood events from tropical-influenced rainfall systems which tracked over the southern Appalachian Mountains of the United States. The accelerated embankment erosion, if left unchecked, would have undermined the footers of a permanent vehicle access bridge located on the State Forest.

After scoping out the nature of the work that might be required, the N.C. Forest Service (NCFS) obtained funding and contracted with the Department of Biological & Agricultural Engineering at N.C. State University (NCSU) for planning, engineering, and construction management restoration services. The project's primary deliverable was to restore a segment of the outfall stream*, beginning at the bridge on the forest access road (known as the Conservation Road), and extending downstream to where the outfall channel joins the old, legacy stream channel, but prior to the stream's junction with the Little River.

Project Goals

- Establish a new stream channel that is positioned away from the collapsing embankment but within the stream's legacy floodplain.
- Improve the hydrological connectivity between the stream and floodplain.
- Improve the stream's substrate and channel configuration in a manner that enhances or improves aquatic habitat, including fishery habitat.
- Partially backfill the embankment to reduce further loss of trees due to soil erosion.
- Plant a diverse mix of appropriate tree species within the floodplain area to re-establish a protected forested riparian corridor.

Site Visits

Five site inspection visits were made during this recent reporting period: October 2012, November 2012, February 2013, April 2013, May 2013 and July 2013. It should be noted that the Forest Supervisor and other staff at DuPont State Forest pass by this restored stream reach daily as they travel along Conservation Road to/from the Forest Office. The Forest Supervisor frequently visits the project location to check on the status of the seedlings and the overall stream. If notable concerns are observed, the Forest Supervisor will contact the NCFS Forest Hydrologist in Raleigh. This arrangement allows for the Raleigh-based project managers to reduce the need for extensive travel and associated costs for routine site visits.

*In some of this project's documentation, communications, and on some maps, there are instances in which the outfall stream channel may be referred to as Reasonover Creek, since this Creek is a major contributing stream into Lake Julia and would have likely been the major water course through this landscape if the lake had not been constructed. For the sake of clarity, the segment of stream which was restored, and which begins its course at the spillway of Lake Julia, is colloquially referred to as the *Lake Julia Outfall* by the NCFS. The old, legacy stream channel does not have a given name assigned to it by the NCFS.

Precipitation

The NCFs operates a remote automated weather station at the “Guion Farm” area on DuPont State Forest. During the period from July 2012 through June 2013, the weather station recorded 66.76 inches of precipitation (Note: This weather station was inoperable for the month of August 2012, so the reported precipitation total is likely less than actual). This included multiple occurrences of significant rain events which resulted in the issuance of flood warnings by the National Weather Service.

Vegetation

We observed excellent growth of planted seedlings and transplanted (salvaged) woody shrubs across the restoration site, as well as widespread colonization of the riparian zone with native vegetation, including significant amount of *Juncus* species in wetter areas. At this time there are no concerns or observations of exotic, invasive plants in the restoration area. However, prior to the restoration work there were observations of *multiflora rose* within the area which was disturbed. Monitoring of the site will include routine observations for any nuisance invasive plants which may warrant control effort. There were observations of active tree stem damage from beavers. Action may be needed to control beaver populations so as to assure long term growth of the trees in the restored area, once the stems emerge from the protective plastic tubes. During a brief site visit in July 2013, some dead seedlings were observed, and when removed from the soil there were no lateral or fine roots on the seedling. These seedlings may have been damaged by voles. A seedling survival tally is scheduled for summer.



Photos above from October 2012 after one growing season.
Left, swamp chestnut oak. Center, river birch. Right, new sprouts on transplanted salvaged alder shrub.



Photo from October 2012, showing colonization of the upper restored area with native vegetation, emerging growth of planted seedlings, and re-sprouting of transplanted shrubs along the stream.

Outreach/Education/Training

This project once again is featured on the front of our NCFS annual *Year in Review* report, highlighting annual accomplishments of nonpoint source pollution management and water quality protection. This annual report, and prior year reports, can be viewed from the NCFS website at the following link:

http://ncforestservice.gov/water_quality/year_in_review.htm

A set of color, interpretive exhibit signs was designed and produced during this past year. One large exhibit sign was produced to overview the entire project. This sign will be installed along the roadway bridge which overlooks the project, allowing visitors to view the restoration site without encroaching into the riparian area. Additional smaller detailed signs were also produced which describe the various components that went into restoring the stream. These smaller signs will be installed at a future time, closer to the stream, once the site vegetation matures, the site fully stabilizes, and a walking trail can be established to allow visitors to navigate through the restoration site safely with minimal disturbance. Examples of these signs are included as an attachment to this report.

In May 2013, the NCFS hosted a visit from staff of the U.S. Army Corps of Engineers' Asheville Field Office and the Commanding Colonel of the Wilmington District, upon their request to observe restoration projects in which the USACE was involved through its regulatory permitting program.

Aquatic Biology and Fish Habitat

In October 2012, a team of biologists from the NCDWQ Biological Assessment Unit conducted a survey of benthic macroinvertebrates within the restored reach upon request from the NCFS. Overall the results of the assessment found a noteworthy improvement in the habitat quality and observations of intolerant insect species. The report from NCDWQ is attached in the Appendix.

In May 2013, a fisheries biologist from the NC Wildlife Resources Commission deployed several in-stream monitors to track diurnal temperature fluctuations within the upstream (un-restored) reach of the Lake Julia Outfall, and within the downstream (restored) reach. The Commission is investigating the effects of impoundments on downstream water temperatures, and the NC Forest Service is interested to determine the effectiveness of the restoration to support viable trout fishery habitat. In conjunction with this effort, the NCFS documented, via catch and release, the existence of two species of trout (brown and rainbow) within the restored reach. The presumption is the trout migrated upstream from the Little River, after that waterway had been stocked. But the fact that trout was observed and validated within the restored stream would lead us to conclude that the work to improve the overall habitat conditions, when compared with pre-restoration conditions, has proven successful thus far.

Stream Bank Repair

First documented in late 2012, about 50 feet of left bank had been scoured and washed away during high flow events. In April 2013, the restoration engineer and contractor both returned to the site and completed warranty repair work to restore the left bank and partially re-construct an arm of the boulder vane, while also reducing the slope angle of the embankment, thereby allowing high streamflow water to more easily connect with the adjoining riparian floodplain.



*Photo above left in November 2012 looking downstream, shows scouring of the left bank.
Photo above right in May 2013 looking upstream at the same location, after repair work was completed.*



Photo above in July 2013: The stream repair has stabilized and vegetation is re-colonizing the area. The stream flow seen here is near bankfull after steady, heavy rains in the region over a period of days in late June and early July.

Other than the warranty repair work, the stream's structure remained stable. In-stream biological and streambed structures remained intact, as illustrated by the photos below.



Photo Above, October 2012: Brush toe material on right bank that was installed during restoration is intact, providing habitat cover and bank stability.



Photo Right, July 2013: Brush toe material on left bank remains intact and functioning, seen here at bankfull, or near bankfull.



Photo Above Left, July 2013: Two vane structures functioning, with woody debris collected in the foreground.



Photo Above Right, July 2013: Overview of restoration from the forest road bridge.



Photo Above, February 2013: View looking upstream from near the end of the restoration project.



Photo Above, July 2013: Photo from same vantage point, with stream at or near bankfull stage.

Goals for Continuing Management

- Install the large interpretive sign that provides an overview of the restoration project.
- Monitor stream bank repair work and make adjustments as needed to assure stability.
- Maintain collaborative water temperature study with NCWRC.
- Conduct a survey of seedlings to assess overall survival and growth; and monitor for invasive species.
- Use the site for field study, educational workshops, and training as needed or requested.

Appendix

The following attachments are included with this report:

- Report from NCDWQ Biological Assessment Unit
- Project overview interpretive exhibit sign artwork, and one example of five different “Parts of a Stream” interpretive exhibit signs