NCDA&CS - North Carolina Forest Service

Stream Restoration Post-Implementation Annual Monitoring Report

Year 1: 2012

For the N.C. Division of Water Quality (DWQ)
Project #10-0493:
"DuPont State Forest Lake Julia Outfall Stream Restoration"

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July 2012

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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

Four primary follow-up site inspection visits were made after completion of the restoration:
- June 2011 by the NCFS Forest Hydrologist
- October 2011 by the DuPont Forest Supervisor
- December 2011 by the NCSU Project Manager/PI
- March 2012 by the NCSU Project Manager, and the NCFS Forest Hydrologist

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.

*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.

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.

Both photos from June 2011: Above view looking upstream from the downstream end of the restoration work. A new riffle was installed in the foreground, and log vane in the background. Below view is a closer look at the log vane, while standing on the left bank.

Above: Photo from October 2011. View looking upstream at one rock vane structure and its pool.

Above: Photo from October 2011. View looking downstream from riffle section, of a pool and additional structures.

Photo October 2011. View looking upstream at location of former channel, against the backfilled embankment.

Precipitation

The NCFS operates a remote automated weather station at the "Guion Farm" area on DuPont State Forest. During the period from June 2011 through May 2012, the weather station recorded 65.03 inches of precipitation; this includes five months in which precipitation exceeded 6-inches, and one month of almost 10-inches. Data from this, and the other weather stations, are available through a link from the NCFS website: http://www.ncforestservice.gov/fire_control/fc_raws.htm

The overall structure and integrity of the restoration remains intact and functioning, in spite of several heavy precipitation storm events since the project's completion, including a cumulative rainfall total exceeding 12-inches during June and July 2011.

During the December 2011 site visit, some minor erosion along one of the stream banks on a riffle section was noted, but it was estimated that this situation could be remedied with additional live staking and hand-work.

Vegetation

In December 2011, a diversity of bare-rooted hardwood tree seedlings was planted along both sides of the restored stream, and across a large portion of the floodplain area on the left bank of the new channel. After planting, seedlings were shrouded by a protective, semi-transparent plastic tube to protect the seedlings from predation by deer, rodents, and other wildlife. Wildlife often will browse (eat) the leaf buds and succulent twigs of hardwood seedlings during the winter months. The plastic tubes will allow the seedlings to grow tall enough so that the uppermost tip of the tree's leading bud will be beyond the reach of the animals. The species of seedlings that were acquired from the NCFS Claridge State Forest Tree Nursery for planting included: black gum; butternut; persimmon; river birch; sycamore; yellow poplar; shagbark hickory; and white oak.

In addition, supplemental planting of live stake woody shrubs was completed in March 2012. The live staking was done to fill-in areas which did not have sufficient survival from the initial live-staking upon the project's close-out in May 2011; and to remedy minor bank erosion along small areas of the channel. A total of 50 silky dogwood and 50 elderberry live stakes were installed.

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.

Photo from March 2012. View looking downstream from the Conservation Road bridge.
Seedlings have been planted and shrouded by plastic tubes to protect them from wildlife browse.

Both photos from March 2012: Above, left bank: showing seedlings planted out into the floodplain area; and below, right bank.

Outreach/Education/Training

In June 2011, a joint field trip to the site was conducted by regional staff from the USEPA and US Forest Service, co-hosted by the NCFS and NCSU. The design and construction techniques used for this project were highlighted and attendees were given the chance to more closely examine the aquatic life of the restored reach, shown in the photo above.

This project was the cover-story for the NCFS Water Quality and Nonpoint Source *2011 Year in Review* annual report which highlights major program accomplishments. This publication is available from the NCFS website at the following link: http://www.ncforestservice.gov/publications/WQ0311.pdf

Graphic design artwork has been completed for a series of six self-interpretive exhibit signs which will be manufactured and installed along the restored stream. Five of the signs will each highlight a specific component of the stream channel, with one large sign to be installed along the Conservation Road, overlooking the entire project site. The NCFS is working with a vendor to begin production of the signs.

Goals for Continuing Management

- Have interpretive signs produced and installed
- Assess status of planted seedlings and live stakes during the 2012 summer growing season to determine if re-planting is needed
- Continue to use the site for field study, educational workshops, and training as needed or requested
- Inquire with NCDWQ Bioassessment Unit to determine the feasibility of conducting aquatic life sampling in the restored reach, to compare with pre-restoration sampling that was conducted.

Appendix

- Final Report from NCSU, includes as-built drawings.