

## Best Stream Restoration

Where a 20 foot deep eroding gully laid until 2014, a beautiful restored coastal plain stream with a highly connected floodplain now exists. The Poplar Point Stream Restoration Project provides a unique blend of aquatic and upland wildlife habitat, while providing effective stormwater storage and processing. In total, this project created, restored and enhanced approximately 1.9 acres of coastal stream and wetland complex within the expanded Critical Area buffer. While the project could have been larger for greater benefits, significant effort was made to protect existing high quality wetland habitats and to retain as many existing trees as possible in the upland floodplain that is now slowly converting to wetland.

The Poplar Point Stream Restoration is the “Best Stream Restoration BMP” because what was a significant source of bacterial and sediment pollution is now a beautiful, functional BMP that seasonally contributes cool, clean baseflow to the creek. As a result, the site meets and exceeds the criteria of the “Best Stream Restoration BMP.”

**Integrated Watershed-based Approach:** The 2008 South River Watershed Assessment identified the Church Creek drainage, which includes Poplar Point, as the single highest contributor of sediment and nutrient loads to the South River. As such, Anne Arundel County's Phase II WIP lists Church Creek in the highest priority category of subwatersheds for restoration. Several projects of significant scale – totaling over \$12 million – have been completed since 2011, or are moving towards implementation in this subwatershed in the next 16 months. Projects range from tiny rain gardens to expansive wetland and stream restoration.

**Exceeds Goals and Objectives:** The primary objectives of the project were 1) to create a sustainable and stable coastal plain stream system that slows the down-slope movement of runoff and sediment in a drainage area developed prior to current stormwater management regulations and 2) to create a model for collaboration that communities, watershed organizations, and Anne Arundel County can use to meet water quality goals while working within the developed landscape. Specific project goals include a 75% reduction in fine sediment transport and a 200% increase in amphibian richness and abundance. Pre-restoration monitoring included: bank stability, sediment study, vegetation monitoring, surface water quality monitoring (upslope and downstream), and amphibian monitoring. Secondary goals of this project were to decrease peak flows by 24% and decrease nitrogen export under regular flows by between 25-55%. The project is on track to meet all goals based on late 2014 post-construction monitoring.

This project successfully handled all major storm flows since construction, which included a 500 year, 75 year, two 10 year storms, and four flash floods. This is impressive given the drainage area is over 40% impervious.

**Innovative Techniques:** We completed our key objectives (delaying storm flows through the gully, reducing the transport of fine sediments, increasing amphibian use of the site) by setting a series of grade control riffles through the length of the site, re-hydrating the soils, and creating a step pool stream and wetland system that traps sediment before surface water leaves the site. By using a high carbon sand mix - naturally efficient at nutrient uptake and sediment sequestration - as fill for our stream bed, the site's substrate constantly works to improve the water quality of this stream segment, Church Creek and in turn, the South River. This method restored the lost functions of a well-connected floodplain and stream that likely existed prior to 1900, allowing the land to handle the water as it did before modern head cutting began.

**Maximizes Biological Uplift:** While a primary goal was reducing sediment loads, the Federation aimed to maximize habitat potential of this former ephemeral gully and potentially transform it into an intermittent stream. To maximize biological uplift, the project was designed to enhance and protect existing vernal pools that are critical habitat for amphibians. Coarse woody debris was strategically placed throughout the project to increase

the habitat range of the pools. Submerged woody debris gives small fish a place to hide while exposed woody debris can be used as a perch by various predators.

Upon completion, the site was planted heavily with a wide variety of native plants that would thrive in shaded, wet, and polluted soils. A variety of flowering shrubs and small trees were selected to appeal to the nine landowners, while also offering a variety of food for wildlife and pollinators year round. While it is important to use pollution tolerant plants, the Federation places great emphasis on using a diverse palate of plants to appeal to a range of native fauna. Like most Federation projects, a large number of the plants were installed by community volunteers. During construction, small but dense patches of invasive plants were removed. The Federation will continue invasive species management through 2019 or longer if necessary.

The new stream provides habitat for aquatic organisms and wetland-dependent wildlife. As the project was completed, frogs, toads, crayfish, and turtles quickly moved in and can now be seen throughout the site. Amphibian monitoring has demonstrated that at this site, frog and toad evenness and richness both increased once the project was finished and the floodplain reconnected to the stream.

**Minimized Intrusion/Damage:** The project was designed and constructed to minimize damage as much as possible. Construction was limited to a single access path and completed in the gully with de-watering and pump-around practices (working in the dry). The limit of disturbance was kept tight to protect surrounding forest from construction. Hand labor was used to place rocks in the most sensitive areas so additional trees did not need removed and no additional land disturbed. Construction matting was used whenever possible to avoid further impact to the stream corridor or neighboring vernal pools.

**Post-construction Monitoring:** This project drains into Church Creek where the SOUTH RIVERKEEPER® has been taking water quality measurements at a permanent station for over six years. Because of the long term nature of the program, we have pre and post construction data for all projects in Church Creek. The Federation will continue to monitor for numerous water quality parameters and analyze samples for nutrients. The Federation has monitored the site for *Anuran* richness and diversity for two years and plans to continue monitoring for at least five years post construction. Groundwater wells were placed in 2013, and will demonstrate whether raising the streambed successfully recharged shallow groundwater. Permit-driven monitoring, including bank stability and vegetation success, are also being undertaken.

**Education/Outreach:** From students to corporate volunteers, we engaged a variety of community members with different interests and levels of understanding of watershed restoration. Each event included a site tour and lesson on the importance of managing stormwater. The Federation worked with a team of various Anne Arundel County agencies to develop a new Memorandum of Understanding that would provide stormwater or TMDL credits to the County, while absolving the landowners from repair costs in the case of major storm damage. The Federation is proud of the efforts put into creating this MOU which is now standard for all new non-profit and community based restoration projects in the County.

The most unique and challenging aspect of this project was landowner coordination. While most projects take place on one property, this project stretched across nine, each with landowners who had different levels of commitment to restoration. The Federation engaged the community for four years leading up to the project including countless hours of meetings, phone calls, and home visits. This effort already paid dividends in 2012 when the Federation installed a lot-scale erosion control project funded by adjacent homeowners. The Federation consulted with another landowner on the installation of a living shoreline (2012) and continues to work with them to increase their habitat value. In 2015, the landowners next to the project will connect lawn to the project through a series of rain gardens and bioretention swales, providing important pre-treatment for this site.