

Best Stream Restoration in the Bay Bacon Ridge Stream Restoration

“Best Stream Restoration in the Bay” is a bold title, but one that the Bacon Ridge Branch, as the first stream restoration project in Maryland to use only wood harvested on site, lives up to. Less than 30 miles from Washington, DC and nestled between the large populations of Baltimore and Annapolis, Bacon Ridge Natural Area (BRNA) encompasses 630 acres of forest and wetlands, with Bacon Ridge Branch, a headwater to the South River, flowing at its center. While land protection efforts by Anne Arundel County, the Maryland Environmental Trust, and the Scenic Rivers Land Trust, have been strong in this watershed over the last 20 years, ecosystem damage was already well underway. With a history of poor land use from hog farming and logging, Bacon Ridge suffers from miles of degraded streams and over 180 active headcuts. Without restoration, these headcuts would have worsened, completely draining the surrounding wetlands.

Aligning with the BUBBA goals of enhanced stream function, stability, and ecosystem services, the objectives of the Bacon Ridge project included: modifying the hydraulics of the stream channel and valley to optimize floodplain reconnection of stormflows; improving geomorphic conditions of the stream channel to ensure long-term bed and bank stability; detaining and slowing stormwater flows throughout the full width of the valley bottom, improving physiochemical functions and water quality; creating and enhancing the ecological functions of existing and historic non-tidal wetlands and stream habitats.

With a traditional rock-based approach, only 750 feet of the stream could have been restored with available funding. Biohabitats' suggestion of this innovative, low-cost technique maximized funding and exceeded expectations allowing for the restoration of 4,350 linear feet of eroding stream, almost 6 times the original proposed length. The integrated watershed-based restoration approach consisted of a natural, low-impact design that featured interlocking log jams made from material harvested on site and placed at various points in the stream, acting as grade control structures in place of typical rock weirs. (See graphic at end of nomination) The use of wood as grade control is consistent within this coastal plain stream system and will contribute to its habitat complexity. The project reconnected the stream to its floodplain, enhanced and restored habitat, provided nutrient-reduction benefits, and improved stabilization.

The carefully placed log jams absorb energy and slow the flow of stormwater, allowing the water level to rise and spread out onto the floodplain, where sediments and nutrients can be deposited instead of carried down into the river. This restoration yields yearly load reductions of **633 lbs of nitrogen, 292 lbs of phosphorus, and 39,150 lbs of suspended solids** to the South River and Chesapeake Bay. The County will put these credits towards their MS4 goals, as well as provide long-term structural maintenance for the site. By not importing boulders and cobbles mined and trucked from other sites, the project's carbon footprint is much smaller than the footprint of a standard stream restoration project.

Designed to successfully withstand significant floods without failing, extensive effort went into researching this new approach and learning from projects completed in the western US. The design team recognized the importance of creating a strong tie between the structure and the stream bank to minimize piping and create a woody apron on the downstream side of the structure, minimizing bed scour associated with plunging flow. Incorporating a redundant system of structures, each structure reinforces those up and downstream, while the wood-based approach also allows for the natural recruitment of trees to grow along

banks and structures, increasing the site's resistance to erosion and ensuring the long-term sustainability of the project.

To address concerns over structural integrity, brush mattresses were weaved within the vertical posts and backfilled with excavated bank material to properly seal log jam structures. Further sealing of the structures will occur over time as leaves and fine woody debris accumulate on the upstream side of each structure. The project site is close to ideal for supporting long-term saturated wood conditions thus preventing decay. The floodplain is a forested wetland with soils saturated to the surface and free water flowing into all soil cores. Based on inferences drawn from published literature, wood that is completely buried in this material will remain saturated and persist for generations. Assessments completed in the project area also indicated that the tree species present are ideal for preservation in submerged and saturated conditions. The structures were also made mostly impermeable to flow, improving biological uplift and creating an environment that supports fish passage.

The project was not without its challenges. 2018 received record rainfall, resulting in numerous weather-related challenges. Thanks to an efficient construction crew who was willing to work weekends to make up for rain delays, the project was completed as designed and on budget. With such an innovative and new approach, there were concerns from partners that presented challenges early on in the process. However, through documented research, numerous field visits and in person meetings, as well as in-depth conversations with regulators, the project received the support needed to move forward. The project will continue to be monitored in compliance with permitting regulations, including habitat assessments, a wetland delineation, vegetation richness, and classification of flow. In conclusion, the Bacon Ridge Stream Restoration project exemplifies the BUBBA criteria in its innovative design and sustainability.

There is strong interest from funders and partners on this technique because of its low-cost and low-impact. As a result, the design is already being replicated throughout the South River Watershed, with the intent to build interest with this approach in other watersheds. In fact, Biohabitats is currently working with GreenVest, a restoration/mitigation banking firm, to restore over 16,000 linear feet in the Bacon Ridge sub watershed with plans to include additional areas as funding is secured. The Federation also looks forward to continuing to restore the surrounding property in anticipation of the County's efforts to open this area to the public.

