The Policy & Practice of Stream Restoration

John Clayton Chapter of the Virginia Native Plant Society

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Disclaimer: This PowerPoint presentation does not necessarily reflect the views of the City of Alexandria.

Upper Watts Branch Forest Preserve, City of Rockville, Maryland.
Photo by City of Rockville

“Wrong Approach for Stream Restoration” [Letter to Editor]

The biggest problem with the so-called natural channel design approach to stream "restoration" in the greater Washington, D.C. region is that it is planned and implemented in completely the wrong places: small order, interior forested, upper headwater streams and wetlands. Natural channel design (Rosgen method) is mainly applicable to large order streams and rivers, especially the kinds one finds in the American west. Applying it to small order, upper headwater stream channels of our area is a misuse of the methodology, a misunderstanding of eastern Fall Zone hydrology and stream geomorphology, a sure recipe for failure, a mismanagement of public funds by inappropriately targeting sediment-control projects in places with low levels of the very nutrients for which funding is based, and an unacceptable loss of irreplaceable native forest, wildlife, and landscape memory…

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Serious concerns with the stream restoration industry

'I helped lead the effort in developing the *Recommendations of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects* with Tom Schueler of the Chesapeake Stormwater Network… I can no longer hide from the turmoil that I helped to create in the stream restoration industry… This action unleashed an unprecedented flurry of stream restoration projects identified in Watershed Implementation Plans and MS4 implementation plans across the Bay watershed which are now being implemented by a thriving billion-dollar stream restoration industry comprised of engineers, hydro-geomorphologists and a few biologists. I forgot to mention big-time financiers. Also, take notice of what I said about "few biologists"…

A severe training need exists among local and state governments, NGOs and practitioners in understanding their application and the appropriate siting of projects. Also, the Expert Panel felt strongly that as a qualifying condition to receive credit, projects have to be part of a comprehensive watershed plan that also addresses the root causes of stream bank erosion: impervious cover. Further, stream restoration projects are supposed to demonstrate "functional lift" or improvement to the ecosystem. Generally, this is not happening at least not to the extent that it should. Few biologists or ecologists are asked to participate in the design of stream restoration projects. As a result, municipalities are spending enormous amounts of money on projects that generate the necessary water quality credit but have no real impact on stream function… I am not sure what it will take to make these projects part of an integrated watershed plan to provide functional lift beyond the sediment and nutrient credits. Perhaps this will come after we spend billions of dollars on these projects and the taxpayers ask "why can't I catch fish in this stream?" '

- Bill Stack, Professional Engineer and Center for Watershed Protection Deputy Director of Programs

The denuded, post-construction footprint of a natural channel design (NCD) stream construction project along the north braid of the west branch of Turkeycock Run at Mason District Park in Fairfax County, Virginia. NCD and similar construction projects are highly destructive to forest communities and wetlands because they require extensive clearing of canopy trees and forest along the stream banks as staging areas and to create artificial floodplains and stream channels.

Egregiously misapplied recent NCD project along a privately owned section of Donaldson Run at Zachary Taylor Park in Arlington County, Virginia that unnecessarily clearcut a swath of old-age forest (top left). Bottom left: The same naturally shallow, cobbly section of stream that was enhanced naturally through the installation by hand of logs and wood along the very shallow bank by the property owner. Bottom right: April 2022 photo of recently completed NCD project in the same section of the stream. Much of the forested canopy and understory were razed to the ground, soil and topography regraded, and non-native turfgrass planted to create the artificial landscape.

Globally and state rare Coastal Plain / Outer Piedmont Acidic Seepage Swamp (USNVC: CEGL006238) along the south bank of Taylor Run at Chinquapin Park in the City of Alexandria, Virginia. Despite some protection from encroachment, natural channel design will destroy this groundwater-controlled, *non-alluvial* wetland by creating an artificial floodplain where none naturally exists and using the non-alluvial wetland as an *alluvial* habitat to be washed out by overland flooding regimes. This violates the explicit terms and conditions of the Nationwide Permit 27 (NWP) because the "NWP does not authorize the conversion of a stream or natural wetlands to another aquatic habitat type."

Does aquatic wildlife matter? Amphibians, juvenile box turtles, crayfish and other aquatic macroinvertebrates, and fishes like the Eastern Blacknose Dace are particularly healthy and abundant in many upper headwater streams and wetlands. However, most such fauna are intolerant of wholesale disturbance to their habitats caused by stream construction, i.e., “root wad” and streamside forest above, and will perish. Many cannot repopulate sites because they no longer occur upstream or downstream.

Unintended consequences of the Clean Water Act

While the Clean Water Act has accomplished many great things and benefited society, of late it has driven some unintended negative consequences by inducing inappropriate stream restoration projects. The driving force behind most stream construction projects in the Chesapeake Bay Watershed in recent years is local jurisdictions seeking to find ways to meet Clean Water Act requirements focused on reducing nutrient and sediment loads - principally Chesapeake Bay and individual river/stream Total Maximum Daily Load (TMDL) requirements, but also Municipal Separate Storm Sewer Systems (MS4) permits.

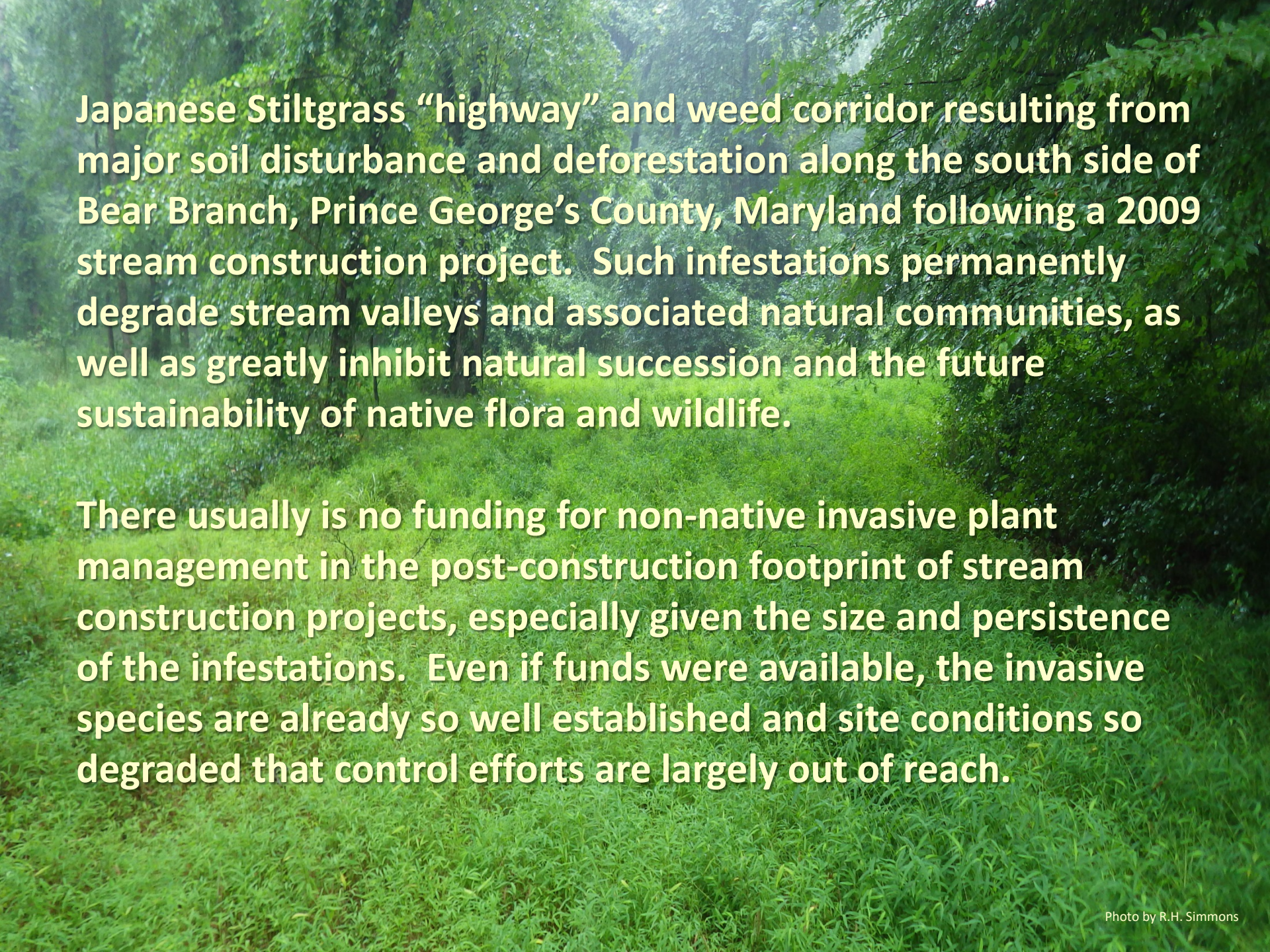
Managing excess phosphorus (P) delivery is probably the greatest concern. The most important measures to curb excess phosphorus sediments are by improved agricultural practices, sanitary sewer rehabilitation, and better urban stormwater runoff management. So-called stream restoration projects, however, do not actually target phosphorus-rich deposits, yet are often targets for stream construction work because erosion from unchecked stormwater runoff can occur there.[1]

Phosphorus is highly concentrated in human and animal waste and fertilizers, as opposed to phosphorus-poor stream bank soils of upper headwater streams and is probably the main nutrient of concern affecting water quality downstream. Bioavailable P is considered to be the fraction of total phosphorus (TP) with the potential to cause excessive algal growth and eutrophication in downstream waterways and the Chesapeake Bay, therefore it is a regulated nutrient/pollutant.[2]

[1]Simmons, R.H. 2020. A Review of Little Hunting Creek Watershed, Paul Spring Segments 1 & 2 (Brickelmaier Park and Goodman Park), Hollin Hills Stream Restoration 100% Plans.

[2]Simmons, R.H. 2021. Evaluation of the Mehlich-3 soil test for phosphorus with implications for calculating pollution reduction credits in the mid-Atlantic region. River Management Society Journal 34: 30-31.

Stream construction projects are major vectors for the growth and spread of non-native invasive plants that completely engulf sites following major soil disturbance.



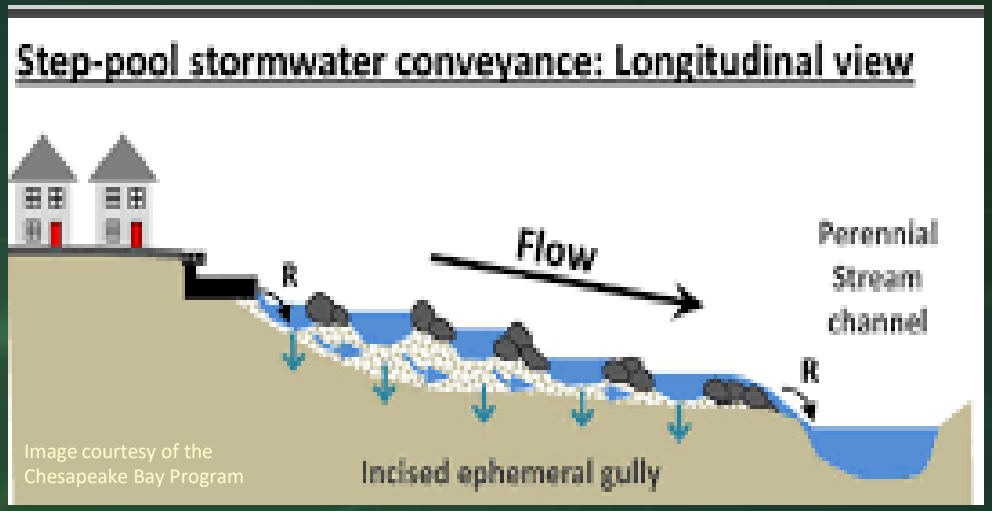
Japanese Stiltgrass “highway” and weed corridor resulting from major soil disturbance and deforestation along the south side of Bear Branch, Prince George’s County, Maryland following a 2009 stream construction project. Such infestations permanently degrade stream valleys and associated natural communities, as well as greatly inhibit natural succession and the future sustainability of native flora and wildlife.

There usually is no funding for non-native invasive plant management in the post-construction footprint of stream construction projects, especially given the size and persistence of the infestations. Even if funds were available, the invasive species are already so well established and site conditions so degraded that control efforts are largely out of reach.

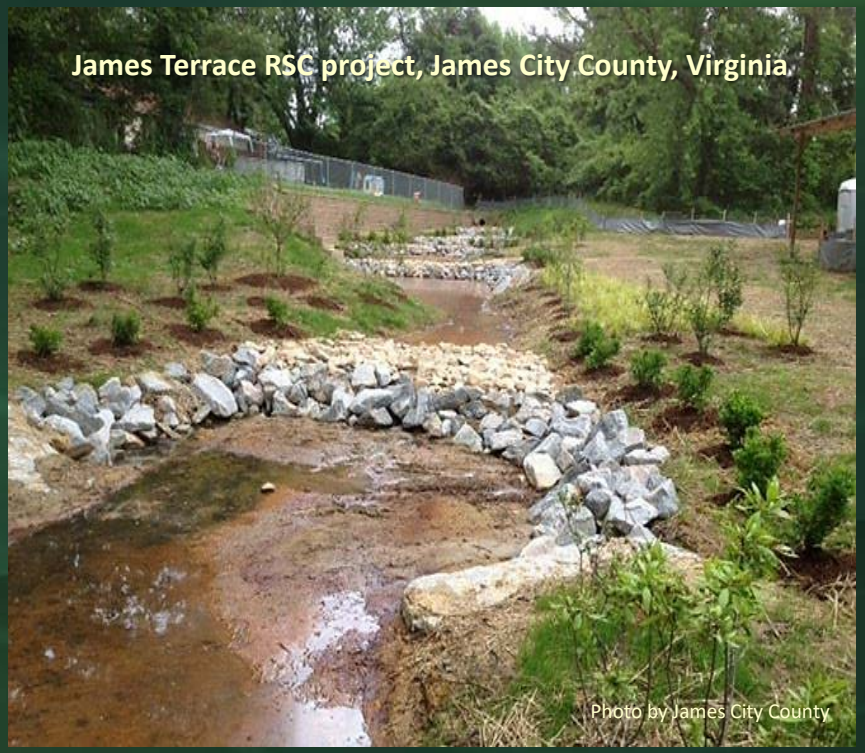
Photo by R.H. Simmons

Typically, post-construction stream project plantings are greatly overplanted and collectively bear no fidelity to a known natural community, let alone the habitats they are replacing. Introducing species and large numbers of such to a habitat where they do not naturally occur is not an ecological restoration best practice and should be strongly discouraged. One cannot plant a forest community because the living foundation of the habitat, the result of millennia of evolution and complex interactions of organisms and geologic conditions, cannot be replicated - and certainly not by a "forest-in-a-can" method.

Failed 2010 NCD project along the lower section of Strawberry Run at Fort Williams Park, City of Alexandria, Virginia. Top left: View downstream from the bridge on May 24, 2011, a few months after the project completion. Bottom left: Blown out J-hooks and cross vanes and stormwater-mined soil (imported fill) scoured from the hardened sandstone and interbedded cobbles of the stream banks. Bottom right: The stream naturally restoring itself with wood snags and log jams, which trap sediment and provide aquatic wildlife habitat. The selective boulder armoring in sections of this small order, upper headwater stream was minimal and largely successful (right background of photo).



Regenerative Stormwater Conveyance (step pools) projects are every bit as destructive as NCD projects because both require extensive clearing and grading for construction access; both raise incised channels by filling them in with tons of imported soil, sand, woody material, and rock; and neither method can effectively mitigate unchecked stormwater runoff.



Best practice recommendations to help ensure the preservation and future sustainability of forested stream valleys

Hold central the overarching concept of Do No Harm and for keeping sites natural and causing as little disturbance as possible.

It is critical that all irreplaceable natural resources affected by a stream construction project be thoroughly assessed and considered as necessary environmental review prior to construction. The environmental concerns need to be properly quantified and considered to enable effective resource protection.

All stream "restoration" projects in stream valley forests, where they are typically implemented, are not ecological restoration best practices. They are construction projects for the purpose of converting forested stream valleys and groundwater seepage wetlands into stormwater management facilities.

Adopt the policy that disallows the construction of highly destructive, misapplied stream construction and stormwater management projects in small order, interior forested, upper headwater stream valleys.

It is essential that impervious surface stormwater runoff be effectively controlled before reaching storm drains. Bioretention cells, bioswales, and dry basins are the most effective infrastructure for achieving this.

The careful and *selective* armoring of stream banks and channels with wood, log jams, and snags that mimic natural processes are proven best practice recommendations for stabilizing and helping to restore eroded stream channels. Often, the No Build Option is the best alternative.

Be vigilant in controlling non-native invasive plants along waterways. It is also critical to acquire some funding for large-scale projects to accomplish work out of reach of staff and volunteers.

Alexandria's First Consensus Building Group (CBG) meeting, facilitated by the University of Virginia's Institute for Engagement & Negotiation (IEN) team, to explore science-based, environmentally friendly alternatives to construction for Taylor Run and Strawberry Run was held on September 10, 2022.


Questions?
Thank you!
Photo by R.H. Simmons