



Stream Restoration Discussion

"Beavers before bulldozers"

Taken from exchange of thoughts of Rod Simmons and Tony Fleming in April, 2016

Observations from a geomorphic perspective:

Most attempts to "restore" and "stabilize" streambanks in the fall zone are pointless...they might be thought of as "make work" projects...for the fundamental reason that streams are **naturally downcutting** their channels at an accelerated rate due to the delayed effect of Pleistocene base level lowering. Put simply, the much larger and more powerful Potomac River (base level for all area streams) has already cut a deep channel (between Great Falls and the Bay) in response to lower sea levels that occurred repeatedly during the Ice Age. Whereas the much smaller and less powerful tributaries are still "catching up" and in many cases (especially on the Virginia side) are left "hanging" high above the river. The most dramatic examples are visible along the Virginia palisades, where nearly every tributary plunges over some kind of falls or cascade as it debouches into the river, but fall zones are present in various reaches of every stream in the region. In any case, this process is responsible for the fall zones on every stream, each of which represents a wave of downcutting propagating upstream. Great Falls, Stubblefield Falls, and Little Falls are all examples of such knickpoints on the river, and similar knickpoints are observable on every tributary.

In other words, stream gradients are strongly out-of-equilibrium, and this represents a very large amount of potential energy available to streams. That potential energy is converted into kinetic energy in the form of enhanced rates of incision, reflected by the typical "V-shaped" stream channel profiles that dominate all of the regions streams.

This natural process is further accelerated by urbanization and the dramatic and unnatural imbalance it causes to stream hydrology: By some estimates, the amount of urban stormwater runoff has resulted in several-fold increases in average flood discharge, producing streams with highly "flashy" behavior. Most stream channel work occurs during the annual flood, ergo, increase the discharge and you increase the size of the "tools" (i.e., cobbles, boulders, etc.) the stream carries. This produces more downcutting and rearrangement of streambanks during a given flood than would occur absent urbanization.

Given this backdrop, attempts to "restore" streambanks to something we humans think they should look like are foolish...you can liken it to Atlas pushing the boulder up the mount. In only a few short years, the stream will return to its pre-restoration profile. And therein lies the conceptual problem with all these stream projects: few, if any, seem to understand the geomorphic setting and processes that are occurring in the Fall Zone, and fewer still recognize that you have to deal first with all that stormwater (in other words, infiltrate it) before attempting any channel modifications. And even then, it often makes little sense to try to artificially change the channel profile, because if you significantly reduce the discharge by controlling stormwater, the stream will modify its channel accordingly, naturally, at no cost and with no ecological degradation.

- Tony Fleming, Licensed Professional Geologist

"Civilization exists by geological consent, subject to change without notice" - Will Durant

I generally discourage stream restoration projects, including banking mitigation projects, in forested natural lands and parks of our area – and certainly large-scale, whole stream corridor ones – because they are highly artificial elements that constitute a loss of natural lands and are greatly destructive to native stream valley forests, geologic resources and landforms, flora, and wildlife. Moreover, I’ve never seen what I would regard as a true stream “restoration” project anywhere in forested areas of the northern Virginia, D.C., and Maryland region in 25 years of experience with them, except the occasional repair job along small segments of a stream where folks worked extra hard with a variety of experts to achieve somewhat “natural” and unobtrusive results. In my opinion, it’s not something we know how to do well in this region (as opposed to Florida, for instance, i.e., Kissimmee River restoration), and the characteristic V-shaped and small stream valleys where most of these projects take place in our area are not at all conducive to these type of practices.

In the end, large chunks of forests are clear-cut; soils and landforms are removed; wildlife killed off (salamanders, box turtles, etc., cannot outrun earth-moving equipment); and a massive spread of non-native invasive plants where they didn’t previously occur follows all these projects (rarely are these artificial corridors managed for invasive exotic plants once the project is completed; in some ways, they remain in such an artificial, degraded condition that their value is greatly demoted and stewardship priorities for them are now low). What remains is a lasting footprint of artificial “hardscape” – any of or a mixture of rip-rap boulders (including “designer” ones), gabion, and concrete. That’s pretty much it. Some serious, *permanent* degradation and loss of natural features that is in most cases unnecessary in relation to the downcut, eroded - but still functioning ecologically - streams and corridors that are surprisingly stable.

Also, unnecessarily plugging stream restoration projects into our precious few remaining forested natural areas as a mitigation for poorly planned surrounding development and storm water management (or pursuing “low hanging fruit” and banking mitigation funds) is decidedly NOT a Best Management Practice (BMP) – no matter how many ways the numerous design-build ecological services and engineering companies lobby and spin them. In short, a *significant* part of our irreplaceable natural heritage that has survived for millennia in these forested stream valleys is lost forever. This material can never be “restored” or replanted.

Typically the “restoration solution” one gets when they hire a design-build engineering company in the greater D.C. region to do geohydrology and slope studies and waterway restoration work is lots of rip-rap or studded boulders of fresh-quarried bluestone; complete removal of all trees and other vegetation; destruction of existing landform features; a huge staging area; and a greatly overblown, costly project where nothing of the sort was ever needed.

Degraded streams requiring restoration that are situated in already developed areas would appropriately and ideally be given the highest priority ranking in terms of restoration funding, urgency for restoration, etc. It is these already highly developed and degraded – mostly open - sites that are in need of restoration, i.e., **concrete flumes, artificially channelized streams, past rip-rapped banks with rip-rap to be removed, etc.**, and not forested sites with streams exhibiting varying degrees of downcutting. (Again, this does not include small-scale repair work that is occasionally necessary in past-engineered forested stream segments.) Restoration projects in *open, developed areas* where natural features are substantially absent can be an improvement if done correctly. Careful restoration of open bogs and wetlands that have been degraded in the past is also warranted in some cases, though only if restoration work strictly adheres to ecological restoration principles.

- Rod Simmons, Natural Resource Specialist, City of Alexandria



This Small coastal stream and forested valley does NOT need to be grubbed out and replaced with an artificial floodplain of studded boulders and denuded vegetation. It's largely stabile and functioning, despite the "false alarm" of exposed roots and slightly downcut banks. "Restoration" work here is completely unwarranted. The mud and silt in the stream is from earthmoving equipment upstream. Photo by R.H. Simmons



This is the same densely forested stream valley as in the above photo after most of the existing vegetation was removed and the stream was re-contoured and reconfigured with artificial boulders, liners, and vegetation. This project would be considered "high end" by today's industry standards. Photo by R.H. Simmons

Supporting slide presentation – [“The Limits of Restoration”](#)