1. Groff's Mill Park Streambank Restoration - Montgomery County, Pennsylvania

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Every time a restoration project is undertaken it can be counted on to generate at least one, or possibly many, stories. The story of how a project was conceived, assembled, implemented and then how it survived the onslaughts of nature out of balance and human overuse are often more telling than viewing the "before" and "after" photographs that are generated. The act of restoring nature is still being learned and much of the learning is better told in story format than scientific reporting. Unfortunately, the "failures " of a project are often kept quiet, partly because of the mindset that if one breakdown or unmet goal is admitted then the entire project will become known as a failure. Perhaps this is flawed thinking.

The story of the Groff's Mill Park stream bank stabilization project on the East Branch Perkiomen Creek offers a good example of a design entering into uncharted waters. The following story details only a few of the aspects of this project and does not attempt to completely describe what was done. However, it does provide a few learning experiences for those who would dig into them.

As an ecological restoration project designer and professional instructor in bioengineering, John Munro was distressed to find that there were no serious local (or even regional) examples of how plant-based techniques are used to correct serious erosion problems on moderately sized streams. However, John discovered that a local watershed organization and the Natural Resource Conservation Service (NRCS) were interested in doing such a project. He offered his professional services for design, permitting and project supervision on a pro-bono basis, as long as funding for materials would be donated and as long as the project involved the use of bioengineering (bio-structural) design and not "hard engineering" methods (riprap and concrete). Groff's Mill Park offered an opportunity, since the stream was quickly eroding a narrow portion of the park, and the park road and access to the upstream portion of the park was soon to be cut off if the erosion was not stopped.

The ecological restoration model for the site was to re-establish native floodplain forest cover as would have been the original (pre-colonial) condition. The use of swamp white oak, black willow, silver maple, sycamore, river birch and native shrubs was planned since those species can tolerate varying degrees of ice pounding and survive it. The Township parks board unfortunately could not be convinced to allow the planting of trees along the entire length of the restoration work since they did not want to obscure the view of the creek. All parties agreed to the project as planned and it was carried out.

The project area consisted of a 400-foot long, rapidly eroding stream bank that was four feet to six feet high. There were two very large known hazards looming over the design of the stream bank stabilization project. One was fast flow velocities during floods that could reach eight feet above normal water levels, and the second was the fact that large ice blocks and tree trunks were known to travel in some quantity with the flow during floods. When this was confronted during the design process, the need to provide some means of

protection for the tree and shrub plantings was obvious. The basic wedge-shaped design (*see photo below*) was adopted for the protection structure, along with a strong vertical support, a downstream buttress and bolted reinforcement timbers, not to mention concrete filled footer holes. They were designed to allow a 1-ton block of ice or a large log, floating at about 10 feet per second, to hit the deflector and slide to a stop or be pushed aside. The intent was to prevent the debris from shearing off the trees planted immediately downstream of the deflector and to allow them to grow to a size large enough for them to absorb direct damage, before the deflector would deteriorate. Trees planted without this protection could, with a high degree of certainty, be expected to be sheared off by ice.

The photo-diagram of an ice deflector taken during installation shows the orientation of the deflector to current direction and the location of protected tree plantings.

Well, the six deflectors took a beating. Within two years only one remained. That remaining one still protects a 15-foot swamp white oak, nine years after installation. What went wrong with the others? The deflector size, material and design were apparently sufficient to withstand the pounding, but:

- If the deflectors were not lined up exactly parallel to the high-water current direction they would be toppled sideways (and some were).
- The direction of current flow changed during high water, and was not predicted well in the area where the floodwaters left the channel and spread onto the floodplain.
- Turbulence, created in part by sticks, leaves and branches caught on the deflector, caused the deflector to vibrate, which gradually fluidized the soil around the footing and allowed the deflector to be pushed right out of its holes, concrete and all.
- Volunteers installing the deflectors paid less attention to the specified details than appropriate and could not be supervised sufficiently, which resulted in oversized excavation, insufficient concrete detailing and inadequate soil compaction. This produced inconsistent deflector installation.

A portion of the stream bank project was extended a short way onto the floodplain in an area where a wide "outlet swale" was excavated to allow floodwaters to exit the creek and flow onto the floodplain without scouring-off the top of the stream bank during floods, as it had done previously. A vegetation cover of tall native grasses and riparian shrubs was planned and planted. The grasses, both seeded and plug-planted, grew well and gained a height of about 36 inches by the end of the first full growing season. During initial planning, the use of "NO MOW" signs was proposed but rejected by the parks board as un-necessary because the Township did not use that kind of sign.

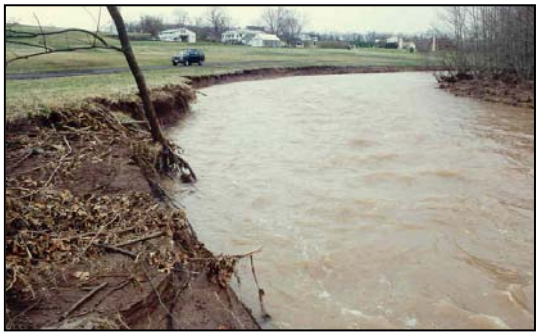
At the end of summer, the Township's annual mowing of meadows is typically done. The mower operator knew about the project and the new plantings but decided on his own that he should just mow the area as he always had. Within a week of this mowing, the new "tall grass" meadow and shrub patches had been

reduced to a height of two inches. Luckily this mistake became a golden opportunity for the project. The Township officials were embarrassed at what their own staff had done and readily agreed to pay for new plant stock. More importantly, "NO-MOW" signs were purchased and placed within the park. In addition, the mowing policy for tall-grass and wildflower meadow areas of several other parks was clarified, and mowing crews were sternly advised to stop mowing at the established lines.

The installation of no-mow signs followed an embarrassing mowing of original native grasses and shrubs. No mowing in the restored area has occurred since the signs were installed.

The success or failure of an ecological restoration project should not be assessed as either absolute success or absolute failure. Generally there is a measure of both, and that should be openly recognized. With all that can happen in nature, some successes can be entirely unpredictable. Therefore, the assessment of this project should be broken down as follows:

- The site is stable and well vegetated with native plant communities.
- Much was learned from observing the site since the initial installation.
- The park road is no longer threatened.
- The native riparian vegetation is thriving and is typical of model conditions.
- The demonstration project provided an excellent "first" in the region for high-energy site stream bank stabilization using bio-structural methods.
- As a "demonstration" project, the site is being used as an educational location for professional training classes and universities.
- Where failures occured, corrections were accomplished.
- Design elements worked well and have been used in many other projects.



Before (*left*) and after construction (*right*)