Environmental Restoration in the Paxtang Parkway – A Preliminary Action Plan

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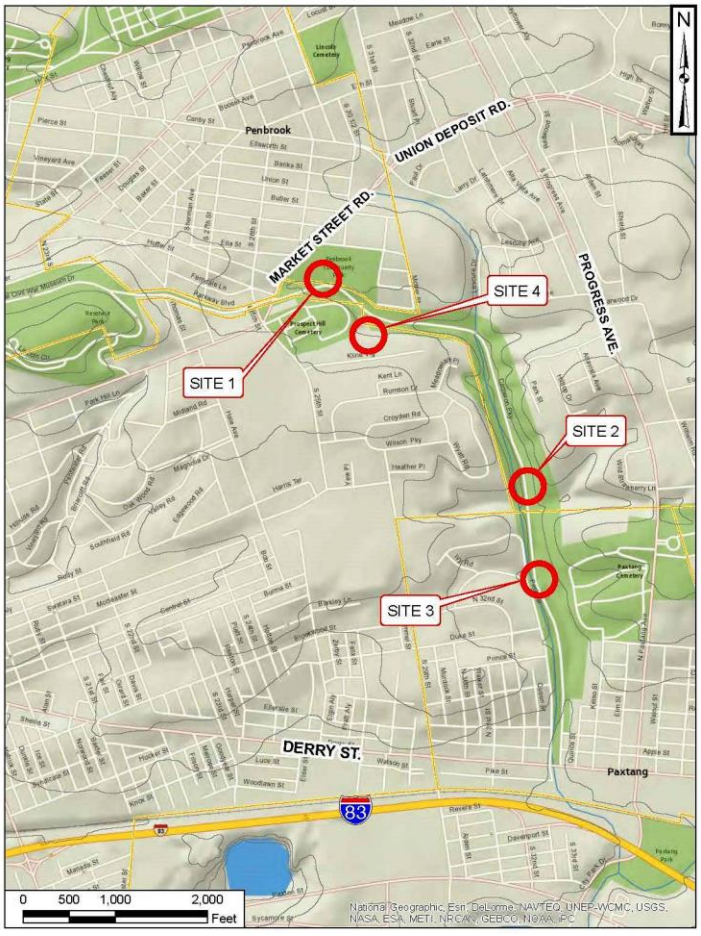
Background

One of the oldest parts of what is now the Capital Area Greenbelt in the Harrisburg metropolitan area, the 1.3-mile long Paxtang Parkway consists of a small stream and parallel road (now closed to traffic) running through a small, forested valley extending between Market Street Road and Derry Street (see the map). The stream (known as the Paxtang Tributary of Spring Creek West) originates at a spring near the pipe which outlets at Market Street Road. Older residential and commercial areas completely surround the Parkway, which cuts across two municipalities (Paxtang Borough and Susquehanna Township). The Parkway property itself is owned by the City of Harrisburg.



The Parkway's origin lies in Harrisburg's City Beautiful Movement, begun in 1900. This urban renewal project was designed by the influential Boston landscape architect Warren H. Manning. Manning, who advocated the naturalistic "wild garden" approach to public open spaces, originally proposed a 'necklace' of planned parkways (linear parks with carriage trails) connecting the larger city parks of Harrisburg. The Paxtang Parkway connected Paxtang Park (then larger than today) with Reservoir Park. Although this grand plan was never completed, two of the connecting parkways were constructed, including the Cameron Parkway (in 1905) and the Paxtang Parkway (in 1906).

The Paxtang Parkway carried motor vehicle traffic for some time, but this road was closed to traffic after Hurricane Agnes ravaged the area in 1972. In 1989, while performing a tree inventory for Paxtang Borough, state foresters Norm Lacasse and Ellen Rhone "re-discovered" the Parkway. They subsequently formed the Capital Area Greenbelt Association (CAGA) in 1990 with the aim of restoring the City's parkway system and completing Manning's great vision. The asphalt roadway within the wooded stream corridor of the Parkway remains closed to traffic and is now a multi-use trail used by pedestrians and bicyclists.

While the Parkway today provides an important escape from the hustle and bustle of the surrounding urban area, it exhibits numerous problems which detract from its beauty and value as an urban natural area. These problems, along with a (provisional) phased plan to tackle them, are briefly described below.

Existing Environmental Issues

Serious stream erosion is currently occurring throughout the entire Parkway but the eroding channel has now closely encroached on the old roadway (henceforth referred to as the 'trail') in three separate locations. Erosion at these locations is not only unsightly and unsafe, but ultimately threatens the sanitary sewer line embedded within the old road embankment. Accelerated erosion of the high, steep streambanks typical of nearly the entire length of the stream within the Parkway is also releasing large quantities of sediment to the main channel of Spring Creek (which still supports a wild trout population) and, ultimately, to the Chesapeake Bay. Stabilizing the stream within the Paxtang Parkway will therefore make yet another contribution to the multi-state effort to reduce sediment supply to this largest and most ecologically and commercially important estuary in the United States

Another major problem is a large, undermined stormwater outfall which carries runoff from the Kline Plaza Shopping Center located on the south side of the upper part of the Parkway. The roughly 14 acres of impervious surface (roofs and parking area) associated with this commercial complex rapidly sends a huge volume of stormwater runoff to the stream during major rainstorms. The outfall is coupled to the stream by several large gullies which are eroding at a high rate and are beginning to undermine trees in this immediate area.

Additional problems within the Parkway include the presence of branch sanitary sewer lines which cross Paxtang Tributary at right angles. These are being undermined by storm flows, threatening eventual failure of the sewage pipe and contamination of the stream. There are also three culverts at old road (trail) crossings along the stream that are undersized and are likewise promoting erosion in their vicinity. The most pervasive problem in the Parkway is the widespread invasion of aggressive weeds. These non-native plants are smothering the indigenous vegetation so beneficial to native wildlife (including threatened pollinator species, such as butterflies and wild bees) which would otherwise be able to thrive in this open space.

Because of all of these effects, the Paxtang Parkway is a microcosm of the problems plaguing older urban greenspaces in many communities in the Northeast. Such areas have deteriorated to the point that they are now subject to major water quality impacts and infrastructure failures. At the same time, however, there has been widespread recognition of the immense quality-of-life benefits such places can have – once restored and revitalized – for an increasingly urban population with limited access to natural areas. The benefit of such places to human health and happiness is well documented. The need for both environmentally-focused landscape stabilization and enhanced recreational open space therefore form the impetus for the environmental and cultural restoration of the Paxtang Parkway.

The Legacy of Landscape Change

Although the little valley traversed by Paxtang Tributary was substantially altered by the first European colonists through logging and farming, it was urbanization of the watershed (flow contributing area) draining to the creek, along with routing the road through this narrow valley, that delivered the most decisive impacts to the area. Because of watershed development, a huge volume of runoff is now quickly discharged to the stream via pipes and gutters during major rainstorms. This causes serious erosion all along the way, resulting in a deep, slot-like channel that prevents high flows from dissipating their energy on the floodplain (see the photo on page 2). In its natural state, the floodplain is nature's way of reducing erosional stress in this kind of stream system. The filling of much of the former floodplain to accommodate the road further confined the stream channel, aggravating the erosion of its bed and banks.

In stark contrast to this modern situation, a so-called functional floodplain traversed by a stable (non-entrenched) channel is able to actively dissipate storm flow energy and prevent accelerated erosion of the stream channel. This kind of "two-stage" channel has relatively low banks which are largely covered by vegetation and knitted together by plant roots. It is this kind of natural channel configuration that will serve as the basic model for stream corridor restoration within the Paxtang Parkway.

Proposed Restoration Phasing

We have, at least preliminarily, partitioned the long-term restoration of the Parkway into five separate phases. Several decades of work are envisioned since all phases will require significant levels of funding and time to complete. Phase 1 represents the beginning of this long-term process.

Phase 1

The Phase 1 project has recently received funding from the Pennsylvania Department of Environmental Protection and several other sources. This consists of two different work components which are now getting underway. The first component consists of the design and permitting tasks associated with the stabilization of what were originally prioritized as the four most egregious erosion sites within the Parkway (these sites are indicated by the numbers on the location map on page 1). The four separate restoration sites include the three areas where channel erosion is eating into the trail, as described earlier (Sites 1,2 and 3), and the gully erosion site below the Kline Plaza stormwater outfall (Site 4). In addition to preventing further erosion and revegetating these areas with native plants, all of these restorations will provide energy dissipation during storm runoff (to reduce downstream flood heights) as well as an enhanced opportunity for flow to be re-absorbed by the ground before discharge downstream.

The second component of the funded Phase 1 effort involves developing an "Invasive Plant Management Plan" for the Parkway. This investigation will determine the type and extent of invasive plants present in the greenspace and provide best practice guidelines for managing these weedy species in an environmentally appropriate way. Recommendations for volunteer outreach and education relevant to invasive species management within the greenspace will also be provided since community volunteers will have to do most of this maintenance work in the Parkway over the long haul.

Restoring native vegetation is vital to preserving as much native wildlife species diversity as possible in urban natural areas and invasive alien plants are the biggest threat to this effort. The plant management guidelines developed as part of Phase 1 will therefore be critical to the successful implementation of both the Phase 1 designs and all future restoration and landscape management efforts planned for the Parkway.

Phase 2

There are at least three sites along the valley floor where sanitary sewer crossings are at risk of failure due to erosion. In the case of the crossing illustrated on the right, the concrete-encased pipe may have always been a dam (as evidenced by the culverts) but this has now become seriously compromised by continuing stream erosion. The existing 'leaky' dam is actively being undermined and this, along with pipe weathering, will inevitably result in the failure of pipe in the relatively near future.

Another exposed and eroding sanitary sewer crossing of mainstem Paxtang Tributary (pictured on the left) was also fully exposed when constructed but is now being flanked by erosion along its margins and is also being undermined. There is a third exposed sanitary sewer pipe bridging a smaller tributary stream between these two mainstem sites which is also at risk. All three sites need to be repaired soon to ensure that no spills occur and that the vital sanitary connections are not disrupted during a large flood.

Phase 3

This Phase 3 project would address erosion and flood capacity issues at the three road crossing locations where the mainstem is pinched down and routed through a culvert. One crossing may be removed as part of the Phase 1 design since it is on a stub road that has been abandoned and can be removed. The other two culverts must remain as crossings since they carry creek flow under the main trail. These should be replaced with either much larger capacity open-arch culverts or with bridges. (Undersized culverts are always prone to debris plugging during floods in forested areas, with this often resulting in massive erosion during really large storms.)

The other likely work component at this Phase 3 stage includes trail resurfacing where needed, especially in connection with the culvert replacements. Associated with this may well be a strategy to reduce the width of the paved trail since,

without vehicular traffic, such a wide paved roadway is no longer needed in the valley. A narrower trail would still allow maintenance access but would expand the area of water receptive trailside capable of infiltrating trail runoff. All or some of these border zones could be planted as attractive pollinator gardens.

Phase 4

This phase of work would focus on identifying and implementing Green Stormwater Infrastructure (GSI) storm runoff management measures throughout the Paxtang Parkway. GSI refers to the entire suite of distributed, often relatively small scale infiltration-enhancing measures designed to reduce storm runoff to streams in urbanized areas. These best management practices are intended to mimic processes within more natural, well-wooded watersheds, where most rainfall quickly goes subsurface before discharge to the stream. This natural hydrological situation both reduces the incidence of flooding and helps to maintain higher stream flows during prolonged dry periods.

Good examples of undeveloped sites with great GSI potential are located between the trail and Park Terrace, a residential street along the southern part of the Parkway. The wide trailside depressions here receive surface runoff and piped drainage from the adjacent residential area (see photo on the left). Although these depressions are currently loaded with sediment derived from these runoff sources, they can potentially be deepened and converted into rain gardens, which are GSI facilities which both biologically treat urban contaminants in runoff and temporarily store stormwater, allowing all or most of this to infiltrate before direct release to the stream.

A likely additional GSI site includes the stream's 'headwaters' at the top of the Parkway, adjacent to Market Street Road. Receiving storm runoff via the outfall from the piped storm 'sewershed' above this point, this area can potentially be re-designed to function as both a sediment forebay (where sediment from street runoff could be collected for eventual disposal) and a landscaped flood storage area. Both effects would benefit the entire open channel of Paxtang Tributary downstream of this point.

Ideally, this phase of work would proceed to design and construction after all suitable sites have been identified. These on-the-ground GSI improvements can also be implemented independently of efforts by the surrounding municipalities to address recent Federal- and state-mandated water pollution control requirements, which will rely in part on GSI. These improvements within the Parkway may thereby directly benefit these communities in their efforts to meet these water quality mandates.

Phase 5

Well into the future at this point, this 'last' restoration work effort would consist of stabilizing and re-naturalizing the remaining segments of Paxtang Tributary within the Parkway. While not currently directly threatening the trail or buried infrastructure, these sections of the stream remain eroded, unstable and biologically simplified. As currently envisioned, the restoration of these locations would not proceed until the first four phases of work have been completed.