2. TACONY CREEK PARK MASTER PLAN

Fairmount Park System

Natural Lands Restoration

Master Plan

Stream bank stabilization in progress.

Tacony Creek Park

2.A. TASKS ASSOCIATED WITH RESTORATION ACTIVITIES

2.A.1. Introduction

Input from park staff and the community was sought throughout the process. At the start of the project in October 1997, through January 1998, site visits were conducted in each of the park segments with the Fairmount Park Commission (FPC) District Manager, other park staff, community members, Natural Lands Restoration and Environmental Education Program (NLREEP) and Academy of Natural Sciences of Philadelphia (ANSP) staff. Informal lunchtime meetings at the park's district offices were held to solicit information and opinions. ANSP participated in the NLREEP Technical Advisory Committee (TAC) meetings in March and October 1998. These meetings were used to solicit ideas and develop contacts with other environmental scientists and land managers. A meeting was also held with ANSP, NLREEP and FPC engineering staff to discuss completed and planned projects in or affecting natural lands in Tacony Creek Park. A variety of informal contacts, such as speaking at meetings of Friends groups and other clubs and discussions during field visits provided additional input. In parallel with the NLREEP planning process, ANSP has been investigating means of improving management of the natural lands of the broader park system. As part of this process, ANSP conducted a meeting with a number of park staff (district and operations staff) to discuss park problems. Information derived from FPC staff was used to set priorities for programs such as the management of Japanese knotweed and Norway maple. This information was also useful in the NLREEP planning process.

ANSP, NLREEP and the Philadelphia Water Department (PWD) set up a program of quarterly meetings to discuss various issues of joint interest. These meetings were valuable in obtaining information useful in planning restoration and in developing concepts for cooperative programs. As a result of these meetings, PWD staff reviewed the list of priority stream restoration sites proposed for Tacony Creek Park.

2.A.2. Community Meetings

As part of the planning process, NLREEP held three community meetings and conducted a community mapping initiative to solicit citizen attitudes and information on park use and conditions. ANSP participated in these activities and used information from them in planning restoration activities.

The first community meeting in Tacony Creek Park, held on December 3, 1998, introduced the public to NLREEP and the project. The goals of NLREEP were identified, then the ANSP was introduced as the consulting team hired to assess the natural areas of the park and recommend areas to be restored. At this initial meeting, the existing conditions of the park were summarized, based on ANSP's year-long study of natural conditions. Slides of the fauna and flora were shown, natural areas of good quality were identified and current environmental problems in the park identified and explained. The community was given a general assessment of their park to date. Many residents were surprised to learn of the plants and animals which inhabit the park. After the ANSP presentation, ANSP team members met with residents in breakout sessions in order to gain personal information about how the park was used.

The second meeting for Tacony Creek Park was held on February 9, 1999 to present initial restoration sites and options. ANSP summarized the team process for nominating a site for restoration and presented a draft summary of recommended sites. The sites were categorized into habitat types and their function in the environment was explained to the public. Again, a breakout session followed, during which residents could view maps with the sites outlined. Comments from the participants were noted and used in the final nomination process.

The prioritized list of restoration sites was discussed with NLREEP, FPC, and other city staff at a meeting held on March 17, 1999. The purpose of this meeting was to provide an overview of the priority restoration options and seek additional information on the proposed work.

The final meeting with the community in Tacony Creek Park, held on May 11, 1999, focused on the high priority restoration sites. The sites proposed for restoration were summarized according to location with pictures depicting areas to receive restoration. The ANSP also commented on what the sites might look like after the restoration work was completed. Slides of comparable restorations were shown. ANSP took the final comments from the public and made necessary adjustments to the restoration site nomination list. At this point the list was finalized and delivered to NLREEP.

2.A.3. Community Mapping

2.A.3.1. Overview

In an effort to further involve community members in the restoration planning process and to augment the technical information about the park system's natural environments prepared by the ANSP, NLREEP undertook a series of "community mapping" initiatives in Tacony Creek Park. The idea behind community mapping is to actively engage residents of the neighborhoods adjacent to Tacony Creek Park in helping FPC staff and the ANSP team members better understand how the park is used, both currently and historically. The purposes of the community mapping initiatives were to:

- Increase the effectiveness of restoration activities within the park.
- Increase the FPC staff awareness of the community's use of the park.
- Increase the community's understanding of the park's natural areas.
- Better inform decision-making about which restoration activities should occur and where.

The community mapping initiatives occurred over the winter of 1998-99 and involved interested neighbors, led by FPC staff, in hikes through the trails and woods of Tacony Creek Park. Participants noted human impacts on the park by mapping 15 key indicators of use: trails, safety issues, dump sites, fire, trash, sewer smells, all terrain vehicle (ATV) use, abandoned cars, erosion, invasive plants, party sites, graffiti and other uses. During the mapping initiatives community members also noted other positive and negative uses of Tacony Creek Park. Specific results of the community mapping initiatives were provided to the ANSP to aid in the selection of potential restoration sites and activities. A general overview of the way the park is used, as determined by the mapping exercises, was shared with community members at the second public meeting about natural lands restoration activities in Tacony Creek Park.

2.B. TACONY CREEK ASSESSMENT AND RESTORATION PLANNING

2.B.1. Executive Summary

Tacony Creek was settled in the middle of the 17th century by Swedes and Finns who traveled up the Delaware River and settled along the mouths of Tacony and Pennypack creeks. The new arrivals cleared land for farming and later early industrialists dammed the creeks for milling. By the middle of the 19th century Tacony Creek supported several large mills while the stream valley was actively farmed (Silcox 1994).

The lands composing the current Tacony Creek Park have been much altered over time by farming and milling. The creek channel in particular has been greatly impacted by dams and associated mill ponds and millraces.

Park land first purchased in 1915 and later added to in 1939 today totals 302 acres. The land which constitutes the present-day park and adjacent land was originally farmland. Much of the immediate area of the park was open land even through the 1930s. Development around the park increased after World War II and continued until all available open space was consumed. Thus, most of the trees in and around Tacony Creek Park are relatively young with the exception of the mature growth in the area above Adams Avenue.

In the 1998 survey undertaken by the ANSP, factors that pose a threat to native biodiversity in Tacony Creek Park were identified. The threats include an increase in the presence of exotic species, disturbed hydrology and human misuse of natural areas. Use of all-terrain vehicles (ATVs), cars and motorcycles on park roads, abandonment of cars, and trash dumping are major disturbances in the park, especially below Roosevelt Boulevard. The restriction of natural lands to narrow strips along slopes and along the creek makes them vulnerable to trail misuse, stormwater flows, slope erosion and invasive/exotic plants. These threats have decreased the number of native species in the park. The vegetative communities and levels of disturbance are shown in Vegetation Classification Map, Volume II, Section 2.

The faunal inventories found a diversity of species, although most of these are widespread and typical of disturbed sites. The aquatic fauna was impaired, although there were relatively large numbers of several species of fish, including eel, minnows, suckers, and sunfishes. Some woodland bird species were present, but the small size of most park woods, the abundance of exotics, and understory disturbance preclude the most sensitive species. The northern part of the park, above Adams Avenue, has the most intact woods as well as a small stream with spring flow. The combination of woods and meadows in the section of the park near Fisher's Lane has the potential for being good wildlife habitat, especially since the area is adjacent to undeveloped sites. The area around the Juniata Golf Course and the Ferko Recreation Center also has good potential habitat. Currently, disturbance limits the quality of these areas. Deer densities appear low within the park. While deer are present in the park, significant damage to vegetation, such as browse line, frequent browsing of shrubs and saplings and grazing on spring ephemerals, was not noted. Anecdotal observations by FPC staff and park users suggest an increase in the frequency of deer and deer sign over the last few years. At this time, it cannot be determined whether deer populations in the park are lagging behind those in other parks (e.g., Wissahickon) and will in time reach similar levels, creating similar levels of damage, or whether conditions in and around the park are less suitable for deer. Monitoring of deer populations (see Section 2.C.3.7) is important in future management of the park.

Using the information derived from the inventory, other data, and input from the community and FPC staff, potential restoration activities at different sites were considered. Restoration options were evaluated with respect to expected ecological benefits, other benefits, likelihood of success, constraining factors and costs. The rankings were used to prioritize activities and develop groups of restoration sites. Three public meetings were held at different stages of the project to inform the community of assessment results, discuss potential restoration activities and sites, and to present the recommended restoration activities. Ideas and feedback were sought during each meeting.

Tacony Creek is one of the largest streams in Philadelphia. It drains an area of almost 35 square miles and flows through Montgomery and Philadelphia counties to the Delaware River. There are 4 miles of stream in Tacony Creek Park. Most of this length is the mainstem, though there are a few small tributaries in the northern end of the park. These small streams are fed by groundwater seeps and are in good condition. The Tacony Creek watershed covers more than one-eighth of the City of Philadelphia. However, Tacony Creek Park only occupies approximately 1.5% of the watershed. In fact, the majority of the watershed (about 80%) is developed land and only 15% of the watershed is forested. With the urbanization of the Tacony Creek watershed, many of the tributaries

of the creek were buried and placed in pipes and sewer lines. Historic streams, including the Wingohocking Creek, Rock Run and the Little Tacony Creek, have disappeared underground completely and only the stormwater outlets along the banks of Tacony Creek remain.

A stream is only as healthy as the watershed from which it flows. Tacony Creek shows the impacts of an urbanized watershed. Many hydrologic changes have occurred on the creek due to the conversion of a native forested watershed to a highly urbanized and impervious watershed. The flows in Tacony Creek are variable with fast rise during storms, and rapid drop to low base flow levels. The vast area of impervious surfaces in the watershed restricts rainwater from following its normal path of infiltration in ground water which replenishes surface waters. Groundwater is depleted, causing low base flows (perennial, dry-season flows) in Tacony Creek, while storms generate much runoff which leads to significantly increased stream flows. These changes to stream flow have altered the stream channel to the point where Tacony Creek cannot provide adequate aquatic habitat. Habitat Quality Map, Volume II, Section 2, gives details on the habitat quality and the urbanization impacts on Tacony Creek and its tributaries, as determined by the screening-level assessment.

In addition to the physical, water quantity-related problems, Tacony Creek has severely degraded water quality. Although water quality was not specifically addressed by this restoration plan, it did arise as an issue for this creek. A known source of pollution comes from combined sewer overflows (CSOs), which contribute untreated wastewater to the creek during storm events (Marengo 1992). Undoubtedly, other impairments to Tacony Creek's water quality include typical urban pollutants such as vehicle fluids (oils, anti-freeze) and household and lawn chemicals (detergents, fertilizers, pesticides). Still other impacts to Tacony Creek come from the Juniata Golf Course. Since Tacony Creek runs directly through the golf course, it is at a high risk of having water quality and water quantity related problems. Pesticides and fertilizers used on the course may be running off into the stream further degrading water quality. Furthermore, there is poor riparian buffer along the creek, and in some parts the maintained grass is mowed to the edge of the bank. This practice does not allow beneficial stream-side vegetation to take root and consequently streambanks can be very unstable.

The 30 sites recommended as high priority for restoration include approximately 70 acres, composing 45% of the natural lands of Tacony Creek Park and 23% of the total park acreage. High priority sites are located throughout the park, with groupings of sites clustered in several parts of the park. The locations of all high priority restoration sites are shown on Restoration Site Map, Volume II, Section 2. Restoration activities are recommended north of Adams Avenue to stabilize streambanks, control exotics, and replant native plants. These activities will enhance one of the areas of highest quality in the park. Control of exotic plants, replanting of native plants, and control of slope erosion are recommended for the park between Adams Avenue and Tabor Road. Creation of a wetland on a site south of Tabor Road and north of Roosevelt Boulevard is recommended. Several activities to control runoff from mowed park areas onto the slopes are recommended for the area of the park between Roosevelt Boulevard and Whitaker Avenue. The area between Whitaker and Wyoming avenues contains a mix of meadow and woods habitats. Repair of meadows, repair of gullies on the slopes, and replanting of native plants is recommended. Coordination with adjacent landowners to manage this area is recommended as well. Restoration of slopes, repair of gullies, control of exotic plants (including a patch of kudzu) and replanting of native plants is recommended in the area between Wyoming and Cayuga avenues. In addition to these projects, control of invasive vegetation, especially Japanese knotweed, is recommended along the banks of Tacony Creek along much of the park. Vehicle use, including all-terrain vehicles (ATVs), motorcycles and cars, and associated dumping of trash, are major problems in much of the park. Control of access is vital to the restoration of the park. This is particularly true in the area from Roosevelt Boulevard to Wyoming

Avenue. Trail erosion is a problem in many areas of the park and this should be addressed in the trail master plan. In addition to the activities at specific sites, general recommendations are made which will reduce impacts of management of the designed landscape on natural lands. These recommendations would help control runoff on slopes and in tributaries, improve the border between the designed and natural lands, and reduce the potential for invasion by exotic plants. The following contains more detailed descriptions of the park assessment, tasks associated with different restoration activities, and the recommended restoration sites and activities.

2.B.2. **Introduction**

Tacony Creek Park is part of District 5 of the Fairmount Park system, which is also responsible for Pennypack Park, Poquessing Park, and street trees in the northeastern part of the city. The park contains 302 acres, 152 of which were classified as natural lands. The park is mainly a narrow strip of land along the creek corridor. The section around Juniata Park is relatively large; the Juniata Golf Course and Ferko Recreation Center occupy much of this part. The upper end of the park (above Adams Avenue) is wooded and connects with the Tookany Park corridor in Cheltenham Township, Montgomery County. Between Adams and Whitaker avenues, the park consists mainly of landscaped and recreation areas on the plateau above the creek, narrow wooded slopes, and a narrow flood plain. The flood plain vegetation varies from a mix of trees and mowed lawns (e.g., west side above and below Rising Sun Avenue) to scrubby woods and old fields, to a narrow band of riparian forest. Below Whitaker Avenue, most of the streamside land is outside the park. Here the park consists of the slopes and upper plateau on the west side of the stream, and contains grassy meadows and woods. The area on the south side of Tacony Creek east of Ramona Street and north of the recreation center contains open woods. This area was probably landscaped at one time.

Below what is now Juniata Park, the Tacony joins with now buried tributaries to form Frankford Creek. The hydrology of the Tacony/Frankford system is highly modified. Originally, Frankford Creek bent northeast and entered the Delaware River at the northern end of the Bridesburg section of Philadelphia. This bend was bypassed, and the creek now flows southeast into the Delaware River just south of the Betsy Ross Bridge. Most of the tributary system of Tacony Creek in the park has been converted into storm sewers. The storm sewer outlet in Juniata Park now drains about one-eighth of the city's area (Philadelphia Water Department, pers. comm.). The park has four dams, two in Juniata Park, one below Rising Sun Avenue, and the Crescentville dam above Adams Avenue. The Rising Sun dam has a low drop, while the others are several feet high.

Tacony Creek Park, a portion of the Tacony watershed, was purchased by the City of Philadelphia by ordinance in 1915 and represents only a part of what was once a stream valley with many tributaries. The Tacony/Frankford Creek stream valley was very attractive to early Europeans who settled in this area. Frankford Creek flows into the Delaware River and, combined with cleared open lands, the valley was attractive for farming using tide water for transportation. Soon however, the creek's waters were harnessed for power and dams sprang up along the creek. The mills of the Tacony made gun powder and textiles, fueling several industrial complexes, beginning in the Colonial period and ending in the latter part of the 19th century. The close proximity of the area to the city made for ready markets and easy access. However, with the exception of the mills, the area remained primarily agricultural well into the first decade of the 20th century (Bromley 1891).

The Swedes, who began to settle on the tributaries of the Tacony and Pennypack creeks near the mouths of these two streams in the 17th century, were the first to clear the forests. Bridesburg, a developed area at the mouth of the Tacony, was settled first, and development ran north to Orthodox Street (Bromley 1895). Wheat Sheaf Lane and Powder Mill Road are just two of the street names which reflect the area's early milling and agricultural activities. Travel was linked to the creek and river which carried people and produce into the city. Small villages at the mouths of the creeks and

along the tributaries formed a network of agricultural lands which in turn were linked to the city. This network first developed and grew due, in part, to the influx of British immigrants who flooded Pennsylvania in the 18th century. The small individual farmsteads and farming families cleared the lands, and a new network of roads connected the countryside with the city and the ready markets for agricultural and industrial products (Stilgoe 1982). Milling developed hand in hand with agriculture and, in its earliest 18th century form, often supplemented an agricultural farmstead. The people who purchased lands along the rivers were in an ideal position to pursue industrial activities and had the markets close at hand in the city. Three important milling operations thrived in what is now Tacony Creek Park well into the later part of the 19th century (Baist 1895).

The early industry provided the much-need equipment and materials for both the development of the city and for supply of the local agricultural economy, making it possible for the area to grow into a large industrial city (Stilgoe 1982). By 1854, the city was looking to expand, and the six large townships which lay to the north were consolidated into present-day Philadelphia County.

Between what is now Whitaker and Wyoming avenues, across the creek from Friends Asylum (now Friends Hospital), was the Spade and Shovel Works (Hexamer 1954). The 1889 Bromley Atlas shows an industrial complex with a large mill race at the bend in the creek. The complex ran upstream from the Fisher's Lane Bridge. Urban development stopped at Kensington and Clinton. The area north of Spade and Shovel Works was dotted with farmsteads on both sides of the creek. The Bromley Atlas shows little other development in the upper portion of the watershed with the exception of Cedar Grove Mills and Crescentville Woolen Mills. However, the atlas identified hundreds of paper streets forecasting the dense development ahead.

Cedar Grove Mills was listed as an active mill in 1895. The complex ran south from Olney Avenue or Tabor Road. The complex consisted of six large buildings, numerous outbuildings, barns and millers' houses all between the creek and Garland Avenue, which appears on the map as a paper street (FP Archives Tacony file). The area surrounding the mill appears to have been agricultural. The 1983 base maps label the dam below Rising Sun Avenue as Cedar Grove Dam. However, maps of the mill show that the mill and dam were further downstream.

The mills at Crescentville bounded the upper reaches of the new park. The dam is still in place and appears to correspond to the one identified in the Bromley Atlas. Here a large race was cut out of the lands on the left bank and the lands adjacent to the mill were farmed. In the first years of the then 20th century, development began to replace the open agricultural lands with buildings.

The continual expansion of the city from the 1890s until the stock market crash in 1929 gave Philadelphia a sense of vitality and dynamism. From 1890 until 1920, the city's population grew at a rapid pace. Housing developers purchased more farms and estates, and the urban fringe advanced outward. Even so, the park was rural. Morris (1915) describes the park valley as a mix of open meadows, marshy meadows, wet thickets, and woods surrounding the old mill buildings. Development was temporarily stopped by the stock market crash and the Great Depression. During the Depression, federally-funded housing was built at Rising Sun and Adams avenues, just east of the park (Still Phila. 1983). A 1937 aerial photograph shows the creek valley between Rising Sun and Adams avenues as largely open land, with scattered open trees, and a few patches of denser forest around the railroad tracks (especially on the north side). Development began again after WWII as densely packed residences were built. Except for manufacturing districts and company housing, the new neighborhoods were different from those closer to the city. They were more uniform in design, usually a two and one half story house made of brick. Today these neighborhoods encircle the present-day park, so what began in the 17th century as a small settlement on a stream corridor has grown into a section of a large industrial city with a park forming a central linear spine of green open space.

2.B.3. Existing Conditions Inventory and Assessment

2.B.3.1. Introduction

Existing information and new information collected as part of the 1998 inventory are discussed in Section 4 of Volume I. The comparison of information among parks provides strong evidence for pervasive disturbance throughout the Fairmount Park system, as well as individual differences among parks. In this section, more site-specific information on conditions in Tacony Creek Park are presented. These focus on condition of and disturbance in the vegetation of the park, faunal occurrence, and condition of stream channels as determined by the 1998 streamwalk. This information formed the basis for selecting sites and specifying restoration activities to be done at the sites.

2.B.3.2. Vegetation and Flora

This section focuses mainly on problems and issues associated with the severe alteration of the natural vegetative communities of Tacony Creek Park since settlement. The Vegetation Classification maps (Volume II, Section 2.F.) illustrate the vegetation classification and level of disturbance for Tacony Creek Park. However, it should also be noted that the park system supports a myriad of plant and animal species that would otherwise be absent from the Philadelphia area.

Description of Vegetation. Tacony Creek Park consists primarily of lightly forested areas along the slopes leading down to the creek. The steep slopes have a canopy of black locust (*Robinia pseudoacacia*), ash (*Fraxinus* spp.), and black cherry (*Prunus serotina*). The effects of ATV use, trash dumping and overall misuse of this park are obvious in every area of the Tacony Creek. Impacts of ATVs and discarded automobiles are especially severe in the lower reaches of the park. However, the lack of deer has allowed for understory to develop in areas not overgrown with knotweed or other exotics. The least disturbed forest in the park is the area north of Adams Avenue. These woodlands can be found at the northern-most section of the park adjacent to the railroad tracks. In comparison to the surrounding disturbed forests, this area could be considered one of the most mature healthy stands of woods in all of the parks combined. The canopy in this section of the park consists of red oak (*Quercus rubra*), white oak (*Quercus alba*), and hickories (*Carya* spp.). The understory consists of maple-leaf viburnum (*Viburnum acerifolium*), hazelnut (*Corylus americana*), witch hazel and ironwood. The riparian zone and streambank community composition is characterized throughout the park by an overgrowth of *Polygonum cuspidatum* (Japanese knotweed). Wetlands can be found in several areas of the park. There are several small wetlands in Tacony Creek Park. One of these, which can be found south of Adams Avenue, includes three different species of sedges (*Carex stipata, Carex vulpinoidea, Scirpus hattorianus*) and several species of native wildflowers. A larger wet area between Tabor Road and Rising Sun Avenue includes several native herbaceous species, but is dominated by *Alliaria petiolata* (Garlic-mustard). A small area of open meadow habitat is located North of Wyoming Avenue. This meadow is on a plateau adjacent to a highly eroded hillside. Several species of grasses and forbs including andropogon and goldenrod, can be found on this meadow. The top of the hill is one of the sites for car dumping in Tacony Creek Park. This meadow may exist because of the fires set by vandals in this area.

Exotics/Invasives. Since deer populations are low in Tacony Creek, it appears as if the main disturbance to native herbaceous and woody plant species are human activities and the high density of exotic invasive plants. There are several small wetlands in the park, south of Adams Avenue and in the Juniata Golf Course, and they contain an abundance of the common reed (*Phragmites australis*). The most abundant exotic species found in Tacony Creek Park is Japanese knotweed (*Polygonum cuspidatum*), which occurs along the creek in almost every section of the park. Management techniques, including herbiciding, cutting and covering the treated area with black plastic, are presently being applied by FPC staff and volunteer groups in an effort to control this

species. Other exotic species which are commonly found in flood plains and riparian zones include lesser celandine, garlic-mustard, goutweed and Japanese stiltgrass. Tree-of-heaven, sycamore maple (*Acer pseudoplatanus*), paper mulberry and white mulberry are several exotic species which are found in the canopy layer and in the understory of forested areas. Porcelain-berry (*Ampelopsis brevipedunculata*) and Japanese honeysuckle are common exotic vines in Tacony Creek Park. Kudzu vine (*Pueraria lobata*) covers approximately 0.55 acres of open field at the intersection of Ramona and 'I' streets and is reported near the park south of Roosevelt Boulevard. If this species is not controlled it may invade the adjacent wooded areas.

Human Impact. The areas surrounding Tacony Creek Park are very highly developed, which has directly and indirectly impacted the park's ecosystem integrity. Direct effects of such development are loss and fragmentation of habitat. The indirect effects include stormwater runoff and overuse of streams, which alter nutrient levels in streams and leads to contamination. Misuse of park land leads to an overall decrease in native vegetation and an increase in exotic plant species.

Tacony Creek Park is used heavily for swimming and picnicking by local residents. The soils have been compacted and native vegetation is commonly absent in these heavily disturbed areas. These open soil areas create niches for exotic species. Abandoned vehicles and trash dumping sites are common throughout the park. Many of the slopes are badly eroded and gullies have been created by ATVs and dirt bikes. Picnic tables and signs have been vandalized throughout the park and graffiti can be found on trees and large rocks.

2.B.3.3. **Community Mapping Results**

The community mapping initiatives in Tacony Creek Park resulted in the mapping of over 300 items throughout the park. The Community Mapping Results maps in Volume II, Section 2.F., show the results of this intensive effort by community members and FPC staff. The following is a brief synopsis of the some of the results of the community mapping initiatives.

Trail/Barriers. An extensive network of trails throughout Tacony Creek Park was mapped. It was often difficult to determine formal, marked trails from 'rogue,' or unofficial trails. One main trail runs the length of the park from north to south. North of the Roosevelt Boulevard the trail is paved, south of the Boulevard it is unpaved. There are many rogue trails along the railroad line north of Rising Sun Avenue. The many trails throughout the park can cause fragmentation of habitats, erosion and eco-system damage. Barriers to access exist in only a few spots throughout the park. Some are man-made (i.e., poles, fences, concrete 'Jersey' barriers) and some are natural (i.e., fallen trees, steep slopes). Some of the rogue trails were established to get around barriers or guard rails.

Trash/Dump Sites/Sewer Smells. Smaller volumes of trash were found throughout the park. Generally, trash blows into the park from the outside or is the result of an activity such as a picnic. Trash generally was concentrated along roads and the stream. Larger-scale dumping of items such as household appliances and construction debris occurs at several locations. Dumping was generally concentrated along the railroad line, adjacent to bridges and in secluded areas. A sewer line runs the length of Tacony Creek Park. A broken sewer line and smell was reported near Tabor Road. There was no visible evidence of pollution in the stream.

Graffiti. Graffiti was found throughout the park on bridges, manhole covers and trees. A large 'paintball' area exists in the meadow north of Wyoming Avenue.

Cars/Fire Sites. These two items were grouped together because abandoned cars often become the targets of fire. Abandoned cars were found throughout the park; however, they are typically grouped in a few select locations, such as immediately north of the Roosevelt Boulevard and north and south of Whitaker Avenue. FPC staff periodically removes all abandoned cars from the park and is constantly trying methods to keep abandoned cars from entering the park. There was

also evidence of fire along the stream between Adams and Cheltenham avenues. Fire can damage the soil, plants and animals of Tacony Creek Park.

Invasive Plants. Non-native invasive plants were found throughout Tacony Creek Park. A large stand of the invasive plant Kudzu is located at 'I' and Ramona streets. Japanese knotweed is found along the length of the stream in the park. FPC staff and volunteers have been working to eliminate the knotweed along the west bank of the stream, north of Rising Sun Avenue.

All-terrain Vehicles (ATVs). The use of ATVs on city streets and public property is illegal in the City of Philadelphia. However, evidence of ATV use was found throughout Tacony Creek Park. Residents have reported trucks unloading ATVs in the park. ATVs disrupt the quality of life and threaten personal safety of park users, as well as cause environmental problems by fragmenting habitats, stripping vegetation and causing severe erosion. Areas of evidence of particularly heavy ATV use include Adams Avenue and the area north and south of the Whitaker Avenue bridge. The southern end of Tacony Creek Park is particularly heavily impacted by ATV use.

Illegal/Unsafe Use. This category includes party sites, hangouts, reported areas of drug activity, physical hazards and other safety concerns. Party sites, combined with ATVs and abandoned cars, were reported in the section of park between Whitaker and Wyoming avenues. Drug activity was reported around the Whitaker Avenue bridge and in the vicinity of Loudon Street. Little evidence of drug activity was found at the mapped party sites. Participants reported hearing gunshots or automatic weapon fire while undertaking the community mapping. A dangerous rope swing hanging over the stream was located near the Ferko Recreation Center on Cayuga Street.

Positive Features. During the community mapping initiatives, participants noted many positive features throughout Tacony Creek Park. Forts and tree houses where children play were noted and the park contains two popular sledding hills. The park is used extensively for picnicking, running, walking, hiking, horseback riding, dog walking and fishing. There were requests to consider restoring fishing areas at the northern and southern ends of the park.

In summary, the community mapping initiatives undertaken in Tacony Creek Park provided valuable information about park uses that aided in the selection of natural lands restoration sites.

2.B.3.4. **Fauna**

The following sections provide specific information on the fauna of Tacony Creek Park, as indicated by the ANSP 1998 inventory and other sources of information. The Habitat Classification maps (Volume II, Section 2.F.) illustrate the locations of fauna surveyed. This information is important in determining links between disturbance, vegetation, and fauna, which are used to select restoration sites and activities. The information also indicates significant sites which need to be protected because of faunal occurrence.

Birds. Tacony Creek Park is located in Northeast Philadelphia, between the city's boundary with Cheltenham Township, Montgomery County and the park's southern boundary at the Juniata Golf Course near Cayuga Street. The park is characterized by its extremely narrow shape, and overall lack of healthy bird habitats. Consisting of lightly forested areas along the slopes leading down to the creek, riparian zones overgrown with Japanese knotweed, and managed parklands for recreation, wildlands in even moderate condition for breeding birds are extremely limited in the park. Impacts from motorized ATVs and discarded automobiles are especially severe in the southern reaches of the park. However, a lack of deer has allowed understory vegetation to develop in areas not overgrown with knotweed or other exotics. The largest tract of forest is opposite a woodlot owned by Friends Hospital. There is also an area upslope from this forest of several small, old fields separated by treelines.

Very little was known about the bird life of Tacony Creek Park prior to the 1998 census. Few amateur bird-watchers in the Philadelphia area regularly visited the park, and only one published record (Morris 1915) covers the valley. The following, is a sample from that publication.

> *For well nigh fifty years I have lived on the edge of the valley through which winds the Tacony Creek, a stream flowing into the Delaware in the northern section of the county of Philadelphia. Each year the city creeps closer to us. That red-brick wave has almost reached to the opposite edge of our valley, yet still the quiet stream comes down as of old between its wooded hillsides, its marshy meadows, its over-hanging willows and its alder thickets. For the study of bird-life this valley is almost ideal.*
>
> George Spencer Morris, 1915

Much has changed since the time that was written. Without recent benchmarks there is little against which to measure current conditions. The park is a remnant of a once wild and beautiful river valley. The park is now completely without marshy meadows, nearly devoid of willows and alder, and harbors little of the bird life that once flourished there.

The census of Tacony Creek Park provides an excellent comparison with the relatively larger Pennypack and Wissahickon parks. The narrowness of the park appears to be a primary reason for its impoverished bird-life. In fact, only 39 species (36 probable breeders) were recorded in Tacony Creek Park, of which there were only several individuals for many of the 20 significant species recorded (including Red-eyed Vireos, Wood Thrushes, Carolina Wrens, Great-crested Flycatchers and Warbling Vireos). This illustrates the direct relationship between an area's size and its diversity of bird life, and lends strong support to the argument for acquisition or protection of adjacent lands. The relatively young age of most of the forest and the occurrence of exotic species probably further affects the abundance and diversity of breeding forest species.

Mollusks. Very little historical information exists on mollusks in Tacony Creek Park. The 1998 inventory found mollusks at six sites, yielding two native Holarctic species, one native North American species (with another just outside the park) and two introduced species. The introduced species were found in the middle and southern part of the park, below Rising Sun Avenue and near Fisher's Lane. The Holarctic species were found throughout the park, and the native North American species were found just north of the park and in the woods near Fisher's Lane. These results are consistent with the parkwide findings for mollusks, with Holarctic species in a range of habitats, introduced species widely distributed, especially in disturbed areas, and native species in larger forest remnants (see Volume I, Section 4).

Herpetofauna. Very few records were found on the herpetofauna of Tacony Creek Park. Only three reptile species were observed during the study period. Disarticulated skeletal remains of a wood turtle were found on a mowed section of the park a few feet from the edge of the west bank of Tacony Creek just upstream from Tabor Road. The turtle was apparently killed by lawn mowing operations in fall 1997. The turtle may have been a liberated specimen collected some place in the state and released along the creek, since the section of the park in which it was found does not seem to provide adequate habitat for the species. However, records of the wood turtle in the 1980's in developed areas of upper Poquessing Creek and Cobbs Creek suggest that the species may occur in low densities within the park system. The riparian lands of Tacony Creek remain in a somewhat natural state upstream of the city, with the creek flowing though residential areas and a golf course. Although good habitat does remain for the species to survive, it is limited to just the park boundaries within Philadelphia. Several northern brown snakes were found under cardboard on the edge of a small overgrown field at the end of Fisher's Lane near the Wyoming Avenue Bridge. No turtles were captured or seen during the surveys, although a baited hoop style turtle trap was set on the upstream

side of the Rising Sun mill dam (north of Tabor Road). Bullfrogs and green frogs are common along the creek. Two-lined salamanders and a northern red salamander were located by a small spring seep near the city limit.

A longer-term study would probably reveal additional reptile and amphibian species. However, the lack of tributary streams, ponds, swamps, backwaters and uplands has limited the diversity of reptiles and amphibian in the park.

Fish. The main channel of Tacony Creek is the only fish habitat within the park. The tributary system within the park has been enclosed in storm sewers. There are a few short sections of stream at the mouths of the tributaries, but these do not appear to support fish. Much of the stream within the park consists of long runs with areas of moderate current and depth, riffles of shallow, rocky habitats with fast currents, and a few deeper pools, such as at the base of the Crescentville Dam and under the railroad tracks below Adams Avenue. Angling at these sites was observed on several occasions. Anglers caught numerous small fish, such as minnows, mummichog (*Fundulus heteroclitus*) and sunfish, but no large sport species were seen in the anglers' catches. The Crescentville Dam and the dam in Juniata Park have small impoundments above them. The impoundment above the Juniata Park dam lies just below the large storm sewer outlet at Ramona Street. During summer, the pool had extensive algae, presumably from the impoundment of high nutrient water. The Rising Sun Dam creates a small drop and has only a small pool above it. There are a few small wetlands in the flood plain, but these are not accessible to fish.

One site, above Rising Sun Avenue, was sampled. In addition, observations were made of fish at several other places. Based on these observations, the creek has relatively few species, although several of these occur in high abundance. The species present are typical of small streams in the region. Mummichogs were observed in the lower creek around Fisher's Lane. The mummichog is an abundant estuarine species in both freshwater and brackish tidal marshes and channels. Adults eat algae, decaying plant material and aquatic invertebrates. Its common occurrence in the nontidal part of the creek could reflect its tolerance of dissolved salts and low dissolved oxygen, its ability to adapt to rapidly changing flow conditions, and/or its ability to feed on algae as opposed to requiring macroinvertebrate prey. In any case, its occurrence is probably linked to the impaired hydrology or water quality of the creek. Eels (*Anguilla rostrata*), which are born in the ocean and ascend streams as small juveniles (elvers), were collected at the Rising Sun Avenue site. This is upstream of the Juniata Park dam, showing that eels are able to ascend the dams.

Other studies found two additional species, the creek chub (*Semotilus atromaculatus*) and pumpkinseed (*Lepomis gibbosus*) in the creek. The creek chub is a common inhabitant of small streams in the area, and its distribution in Tacony may be limited by the loss of tributary habitat. The pumpkinseed is a common species in ponds, rivers and pools in streams.

Reintroduction of native fish can enhance the biodiversity of a stream, if conditions can sustain the species. Although the biodiversity of fish in Tacony Creek in the park is relatively low, the creek does contain most of the widespread species in the area, and there are no obvious candidates for reintroduction under existing conditions. The satinfin shiner (*Cyprinella analostana*) was not collected, although it is found in other streams. It is very similar to the spotfin shiner (*Cyprinella spiloptera*) and may be limited by competition with that species in some types of streams. Since the spotfin shiner is common in Tacony Creek, introduction of the satinfin shiner is not recommended. In addition, sampling intensity in the park was low and some species, such as brown bullhead (*Amieurus nebulosus*), may have been missed.

Benthic Macroinvertebrates.

Historic Benthic Macroinvertebrate Surveys: Existing benthic macroinvertebrate data from streams in Philadelphia was searched to determine the amount of information available and to further understanding of the condition of urban streams in the area. Several data base services (Biological Abstracts, BIOSIS, AGRICOLA, Aquatic Sciences and Fisheries Abstracts, Water Resources Abstracts, Dissertation Abstracts and others) were used. Additional data were sought from the Pennsylvania Department of Environmental Protection (PA DEP) and Philadelphia Suburban Water Company. By far, the most useful information was PA DEP surveys of the area and these data were provided by Steve T. Schubert and Alan Everitt of the DEP's Southeast Regional Office.

All the historic data acquired through literature search concerning Tacony Creek Park were from Tacony Creek and Baeder Creek (a tributary in Abington Township, Montgomery County) and were amassed by PA DEP investigators. All sites are in Montgomery County, upstream of the Tacony Creek Park. Most samples were collected as parts of investigations of spills or other pollution incidents. Therefore, these tend to highlight poor conditions within the basin, but they also demonstrate the stress on the stream in its headwaters above Tacony Creek Park. The first benthic macroinvertebrate survey of the park, in October 1973, examined two locations on Baeder Creek as well as an upstream and downstream location on Tacony Creek. The Baeder Creek sites summarized the macroinvertebrate communities upstream and downstream of the Standard Pressed Steel plant's holding lagoon. Investigators found six taxa above the lagoon and seven taxa downstream. They found four taxa in Tacony Creek, both above and below its confluence with Baeders Creek. Both Baeder Creek sites had two EPT taxa and the Tacony sites both had one EPT taxon.

In January 1974, the PA DEP collected samples from Tacony Creek in Cheltemham Township (Montgomery County), near Waverly Road, near Rices Mill Road, and near Highland Bridge. They found eight, five and seven taxa with two, one and two EPT taxa, respectively.

In July 1981, the PA DEP sampled Tacony Creek in Cheltenham Township, near Rices Mill Road, Wyncote Station, and the Tookony Creek Parkway. They collected 11, 3, and 7 taxa and 3, 0 and 2 EPT taxa, respectively.

In 1998, the PA DEP conducted a more detailed assessment with mollusks, worms, and midges identified to genus. The number of taxa collected increased markedly because of the increased taxonomic resolution. They collected upstream from the Tookony Creek Parkway and downstream of the Gottschalk Fire Academy (near Elkins Park, Montgomery County) in March 1998. They also sampled near Rices Mill Road and upstream of the SEPTA drain at North Avene (in Wyncote, Montgomery County) about a month later. They collected 15, 13, 15 and 15 taxa from each of the four stations (respectively), and 2, 2, 3 and 4 EPT taxa, respectively.

Current Benthic Macroinvertebrate Surveys: In the 1998 inventory, the benthic macroinvertebrate communities were examined by ANSP at various sites within the Fairmount Park system. This section details the results from a location sampled in Tacony Creek Park. Ecological Community Metrics, Community Stress Metrics, and Functional Feeding Group analysis were used (see Volume I, Section IV for descriptions of these metrics) to describe the condition of benthic macroinvertebrate communities in Tacony Creek Park. In interpreting of the results for individual streams, it is important to note that streams are heterogeneous and patchy by nature. Only one sample was analyzed for this study, although replicate samples were collected and remain on hand for subsequent analysis. Meanwhile, the results for individual streams should be considered with caution.

Most of the small streams in Tacony Creek Park have been contained in culverts and thus do not function as normal streams. Therefore, one site, Tacony Creek about midway between Tabor Road and Rising Sun Avenue, was selected with characteristics representative of the environmental conditions of the whole park. The specific riffle sampled was on the left side of the mid-channel bar located below Rising Sun Avenue. At this point, the stream appeared to be influenced by sewage, as evidenced by grey water in pools.

Total abundance of macroinvertebrates at the Tacony Creek site was moderate for the streams of Philadelphia (711organisms/m^2) and taxa richness (eight taxa) was about average for the streams in 1998. This value is below the desired number of taxa for a stream this size, which should have a richer species assemblage. Diversity and evenness were low, indicating a high degree of dominance of few taxa. Only two EPT taxa were represented in the samples and Chironomid midges made up about 63% of the community. Non-insects composed an additional 25%, so that 88% of the community was made up of these opportunistic groups.

The Hilsenhoff Biotic index was affected by the dominance of midges and worms, which are highly tolerant to organic pollution.

Functional Groups were dominated by collector-gatherers (90%) and collector-filterers (9%) so that 99% was composed of collectors. Thus, virtually all macroinvertebrates were feeding on fine, organic particles, rather than using a complex of whole leaves, twigs, shredded leaves, etc. The remaining 1% was represented by predatory invertebrates, which are also generalists. The ecological community lacks the shredders, specialists that typically define small streams. Additionally, this stream should support populations of scrapers, which scrape mixtures of algae, bacteria, fungi and organic materials from rocks and submerged branches. Without organic pollution and other stress, the environmental conditions typically found in small streams like Tacony Creek, such as high allochthonous detritus inputs and sufficiently open canopy to allow primary production, would support large and diverse invertebrate faunas.

Direct comparison of the 1998 inventory data with the PA DEP data from upstream is somewhat difficult, since sampling effort, technique and taxonomic resolution varied among different investigations. However, the general results are consistent, suggesting neither clear improvement nor further degradation between the city boundary and the sampling site. The Tacony Creek Park site was typical of the Fairmount Park streams sampled during the 1998 inventory.

Although, the stream exhibits impaired biota and degraded habitat, it is unlikely that habitat restoration will significantly improve the diversity or integrity of benthic communities in this stream until water quality issues are addressed.

2.B.3.4. **Streams/Stormwater**

Outfall structure, Tacony Creek Park

Tacony Creek is one of the largest streams in Philadelphia. It drains an area of almost 35 square miles and flows through Montgomery and Philadelphia counties to the Delaware River. There are 4 miles of stream in Tacony Creek Park. Most of this length is the mainstem, though there are a few small tributaries in the northern end of the park. These small streams are fed by groundwater seeps and are in good condition. The Tacony Creek watershed covers more than one-eighth of the City of Philadelphia. However, Tacony Creek Park only occupies approximately 1.5% of the watershed. In fact, the majority of the watershed (about 80%) is developed land and only 15% of the watershed is forested. With the urbanization of the Tacony Creek watershed, many of the tributaries of the creek were buried and forced into pipes and sewer lines. Historic streams,

including the Wingohocking Creek, Rock Run and the Little Tacony Creek, have disappeared underground completely, and only the stormwater culverts along the banks of Tacony Creek remain.

A stream is only as healthy as the watershed from which it flows. Tacony Creek shows the impacts on an urbanized watershed. The creek has experienced many hydrologic changes that can be attributed to the conversion of a native forested watershed to a highly urbanized and impervious watershed. The flows in Tacony Creek are flashy. The vast amount of impervious surfaces in the watershed restricts rainwater from following its normal path of infiltration to ground water to surface water. Groundwater is depleted, causing low base flows (perennial, dry-season flows) in Tacony Creek, while storms generate much runoff which leads to significantly increased stream flows. These changes to stream flow have altered the stream channel to the point where Tacony Creek cannot provide adequate aquatic habitat. Habitat Quality Map, Volume II, Section 2, gives details on the habitat quality and the urbanization impacts of Tacony Creek and its tributaries, as determined by the screening-level assessment.

In addition to the physical, water quantity-related problems, Tacony Creek has severely degraded water quality. Although water quality was not specifically addressed by this restoration plan, it did arise as an issue for this creek. A known source of pollution comes from combined sewer overflows (CSOs), which contribute untreated wastewater to the creek during storm events (Marengo 1992). Undoubtedly, other impairments to Tacony's water quality include typical "urban" pollutants such as vehicle fluids (oils, anti-freeze) and household and lawn chemicals (detergents, fertilizers, pesticides). Still other impacts to Tacony Creek are the effects of the Juniata Golf Course. Since Tacony Creek runs straight through the golf course, it is at a high risk of having water quality and water quantity related problems. Pesticides and fertilizers used on the course may be running off into the streams further degrading water quality. Furthermore, there is poor riparian buffer along the creek, and in some parts the maintained grass is mowed to the edge of the bank. This practice does not allow any stream-side vegetation to take root, and consequently streambanks can be very unstable.

A Stream Quality Index (SQI) was developed to reflect the condition of distinct stream reaches throughout the Fairmount Park system. The SQI is based on three important characteristics: 1) stream geomorphology; 2) aquatic habitat; and 3) riparian or stream-side condition. A detailed methodology is provided in Section 5.C.4.1 of Volume I.

The resulting index allows for a comparison of the condition of any stream in the Fairmount Park system. Stream geomorphology, aquatic habitat, and riparian condition were weighted evenly and the final scores ranged from 0 to 300 representing bad to good, respectively. The resulting scores were divided into equal categories representing stream quality (Table 2.B.1). In addition, the resulting SQIs for Tacony Creek Park stream reaches are presented visually in Steam Quality maps in Volume II, Section 2.F.

Since Tacony Creek has a limited number of tributaries, both the tributaries and the mainstem were assessed using the SQI. Overall, the Tacony Creek Park tributaries are moderately impaired to severely impaired. None of the stream reaches was of slightly or non-impaired quality. Of only 11 stream reaches classified as severely impaired in all of the Fairmount Park system, 3 are in Tacony Creek Park.

South of Wyoming Avenue, Tacony Creek is primarily classified as severely impaired. The stream has a minimal forested riparian buffer due to the adjacent Juniata Golf Course. The geomorphology and in-stream habitat are greatly impacted by the two large dams in this section and the large combined sewer overflow (CSO) outfalls.

Table 2.B.1. Stream Quality Index categories and results.

Stream Quality	Stream Quality Index Range	Number and % of Reaches - Fairmount Park System	Number and % of Reaches - Tacony Creek Park
Severely Impaired	0 to 75	11 (3%)	3 (18%)
Impaired	76 to 150	164 (38%)	6 (35%)
Moderately Impaired	150 to 225	248 (58%)	8 (47%)
Slightly or Non-impaired	226 to 300	3 (1%)	0 (0%)
Totals	0 to 300	426 (100%)	17 (100%)

Note: This index and the number of stream reaches does not include FDR Park.

Upstream from Juniata Park, Tacony Creek varies in its classification from impaired to moderately impaired. Generally, the condition of the creek improves in the upstream reaches. The upper reaches of the creek do not have as many storm sewer and CSO outfalls and exhibit better geomorphic and habitat quality. The riparian buffer of Tacony Creek is generally disturbed, with Japanese knotweed and other invasives flourishing. ANSP has recommended a restoration of the Tacony Creek's riparian zone on the east stream bank in a section north of Adams Avenue where the Japanese knotweed is particularly dense and the stream bank is unstable. The restoration plan involves the eradication of Japanese knotweed, regrading and stabilizing the stream bank with bioengineering techniques and native plantings.

Many of the natural tributaries to Tacony Creek have long been buried and placed in underground culverts during the original urban development of the watershed. The tributaries that do remain are often not functioning as streams, but as drainage ditches for CSOs or storm sewer outfalls. Tributaries 1, 2 and 6 are examples of these underground streams that were ranked as severely impaired or impaired. These streams have little to no base flow, support little to no stream life, and show signs of deterioration of their geomorphology due to significant stormwater runoff. Tributaries 3, 4 and 5 are different in that they do not originate from a large storm sewer or CSO culvert. These streams are primarily groundwater-fed and only moderately impaired. These headwater streams are too small to be classified as non-impaired, since they are too small to support fish life or exhibit the fluvial characteristics of a larger stream, however they do provide excellent wetland habitat and base flow for Tacony Creek. Tributary 4 is recommended as a site for protection and enhancement.

2.C. APPLICATION OF RESTORATION GOALS

2.C.1. Overview

The concepts surrounding environmental restoration and habitat replacement are currently on the forefront in the scientific community. As described previously, the effects of human impact are apparent in every area of the Fairmount Park system. Based on the review of historical records, it can be stated that overall biodiversity of native species has decreased due to fragmentation and loss of critical habitat. The objective of this study is to identify recent trends and patterns of change in the levels of biodiversity found in each habitat type in the Fairmount Park system. Once these

changes have been assessed, critical habitat types which are missing or occur in low numbers can be identified and restored. Another objective of this project is to maintain native park lands. This includes promoting native species through replanting and removing exotic or invasive species through one of the accepted management techniques. Proposed restoration activities are described below. Some activities, such as controlling exotic plants and removing trash, are applicable to all habitats and techniques do not vary greatly among habitats. Other techniques are more specific to habitat types and are discussed separately.

2.C.2. General Restoration Activities

2.C.2.1. Exotic Control

Knotweed in Tacony Creek Park.

A habitat type that is becoming increasingly common in the Fairmount Park system is the exotic-dominated forest, shrubland and riparian zone. Exotic species are defined as those species which have been intentionally or accidentally introduced into an area outside its natural range. These species are most frequently found in open areas—forest edges, canopy gaps, along streambanks and riparian zones—but also occur in the herb and shrub layers in forests with native canopy species and on disturbed slopes. Exotic species that were found invading natural lands of Tacony Creek Park during the 1998 survey are included in Appendix A-1.1 in Volume III and are indicated by status code 'I'. Exotic species of concern outcompete native plants for resources and can become very

aggressive. The control of these species applies to all areas of the park system since exotic species are well established in each of the parks surveyed. The control of exotic species can be labor-intensive, and volunteer help can be effective. However, volunteer control may not be effective in some sites (e.g., sites with poor access, steep slopes) or for some techniques (e.g., herbicide application). The method of control is dependent upon the species involved and can include cutting, herbiciding and/or covering the area with plastic. Replanting of native species is highly recommended in areas where exotic removal has taken place, in order to increase shade and decrease reestablishment of exotics. However, exotic control is valuable even where planting is not feasible immediately, to prevent further spread into adjacent areas. This is particularly important around areas with restoration plantings.

Sites where exotic control has been initiated must be monitored following control. New shoots of exotic growth should be pulled to prevent further invasion. Due to the aggressive nature of most exotic species, it is essential that monitoring activities be well-planned and followed. Repeated application of control measures may be necessary for some plants.

2.C.2.2. **Planting**

Planting of native trees, shrubs or herbs is a primary restoration technique for different habitats throughout the park. While natural regeneration can provide new growth in many situations, planting can provide more rapid development of shade to reduce growth of exotics, more rapid cover to reduce erosion, and provide species which are unable to colonize the site. Typically, planting is done in sites that have been cleared of exotics. In the classification of restoration activities, it is assumed that control of exotics will be necessary prior to planting in most cases. Planting is also recommended to restore vegetation as part of erosion control on slopes (see Section 1.C.3.3), to counteract browsing damage by deer, and following control of other disturbances.

Selection of plants should be based on the habitat conditions of the site. A list of native species which are suitable for this area and the habitat requirements and resource demands for each are given in Appendix C-1 in Volume III. Selection of what type of stock is used (e.g., seeds, plugs, size of tree, bare root or balled root) will depend on the species to be planted, site conditions (e.g., risk of deer damage), site access and other logistical issues (Sauer 1998). Fencing, tubes or planting large stock may be necessary in areas where deer browsing is a problem. Soil preparation, e.g., tilling and mulching, may be desirable to improve planting success and reduce weeds. Follow-up maintenance, such as watering and weeding, can also increase planting success.

In the categorization of restoration activities, planting is designated where it is the primary restoration activity. Planting is also routinely part of other restoration activities, such as gully repair and wetland creation. *Forest planting* involves planting a mix of trees, shrubs and herbs and is appropriate on newly cleared areas. *Tree planting* is recommended to increase representation of specific tree species in existing forests or canopy gaps in forests, to establish riparian woods on unforested flood plains, to provide shade and cover to control exotics and reduce erosion. *Shrub planting* may be done to improve understory conditions and introduce specific species of shrubs. *Herb planting* is recommended for establishment of meadows and to improve understory diversity in areas where herb diversity has been reduced.

2.C.2.3. **Trash**

In the Fairmount Park system, trash includes a wide and varied array of items. It can range from litter in the form of garbage to dumping of used automobiles and large appliances. There are established dump sites within the natural lands of the park. If an area appears to be a dump, it will seem an acceptable place to dispose of unwanted household appliances, yard waste and vehicles and the boundaries of these sites will eventually expand into natural lands. In Tacony Creek Park, the

area north of Wyoming Avenue contains the largest tracts of open meadow habitat in the park, but also serves as a dump site for stolen automobiles. The degraded appearance of this area has promoted overall littering and a lack of concern for these meadows. The first recommendation at this site is to block access. After access to the site is blocked, the trash and exotic species should be removed and the disturbed area should be stabilized and replanted with appropriate native vegetation. Piling of waste is not only unsightly, but it also compromises ecosystem integrity. Soils will become covered and/or compacted in the area, which will prevent growth of vegetation. Canopy gaps are also created which opens the area to sunlight, prohibiting the growth of trees which are unable to grow in full sun conditions such as oaks and hickories. These sites are a perfect breeding ground for exotic plant species which thrive in disturbed soils and full sun. Yard waste, containing seeds and root fragments of invasive plants, also adds to the presence of exotic species. The first step in this activity is to block access to the site, such as by controlling access with permanent structures at points of entry. Clean-up can be an opportunity for volunteer groups, if the clean-up does not require heavy machinery or dangerous equipment. Removal of all debris from the site and proper disposal off site is required. Since the area will most likely be inundated with exotic species, replanting of natives should not begin until the exotics are removed and disposed of off site. Tilling the soil should not be done since an exotic seed bank will be present and this could cause regrowth of exotic species. The soil should not be left exposed or unplanted as this provides aggressive species with the opportunity to invade the area. The site should be replanted with native species that are appropriate for the habitat type which would have naturally occurred in the area. This type of restoration, as with other heavily disturbed areas, needs to be monitored consistently. Any exotics that may grow back, must be killed in order to insure the success of the native plantings.

2.C.3. Habitat-Specific Restoration Activities

2.C.3.1. Forested Uplands

Forested uplands have been fragmented in recent years by adjacent construction activities, overall development and park landscaping. Not only does the forested upland habitat type support a myriad of plant and animal species, it also acts as a buffer for stormwater runoff and prevents slope erosion. There are unique patches of woods generated by land use history, soil composition, moisture requirements and the effects of herbivory on vegetation at different sites. In Tacony Creek Park, these woods are found on a plateau above highly disturbed slopes. Both natural and anthropogenic influences on forested uplands have affected the stability of these woods. In areas where trash dumping and encroachment of recreational activities are issues, the wooded areas become fragmented, creating open habitat for exotic, aggressive tree species. Although the canopy in these areas may persist, there will not be any regrowth of the understory and herbaceous layer once exotic species become established. Norway maple (*Acer platanoides*), tree-of-heaven (*Ailanthus altissima*), paper mulberry *(Broussonetia papyrifera)* and sycamore maple (*Acer pseudoplatanus*) are a few of the non-native tree species that can be found in the upland forests of the Tacony Creek Park, replacing oaks, hickories and beeches.

Restoration in forested uplands is recommended to increase biodiversity of forested flora and fauna. In addition to exotic control, replanting and trash removal, the following activities can be included as restoration actions in the forested upland habitat: protection of high quality areas, repairing gullies and increasing forest area by decreasing the area that is currently mowed or managed, and replanting.

Protection and enhancement are activities that should be performed at sites which are presently considered high quality woods. Protect/enhance includes monitoring the site for any evidence of exotic species, clearing trash and exotics from surrounding areas and installing deer fencing where browsing poses a problem. Blocking vehicle access to sites is also recommended. The goal of the

protect/enhance recommendation is to recognize the area as a high quality site and to protect it from development.

Repairing gullies, which are usually caused by stormwater runoff and vehicle damage, helps to protect the forest from further erosion and allows native plants to regenerate. The repair would include filling the hole or gully with clean soil and replanting with native tree saplings. This soil should not be obtained from another site within the park because it may contain root fragments and seeds of non-native species. Stabilizing slopes by regrading or placing berms at the top to control stormwater runoff is usually necessary.

Releasing mowed areas can be done simply by mowing the area less frequently. This creates a tall grass buffer adjacent to forested areas, which aids in erosion control. Over time, if exotics are controlled, succession will occur and a forested area will be present in an area that was formerly turf grass. An example of where this type of restoration should be performed is in the forested areas adjacent to golf courses, where encroachment into the forest has occurred fragmenting the forest and making it more susceptible to invasion by exotic species and erosion.

The benefits of restoration in forested areas include creating habitat and increasing biodiversity, since small patches of woods do not provide suitable habitat for many animal species. Replanting or removal of exotics in any area requires monitoring of the site. Restoration areas should be protected from vandalism by barriers and community members should be made aware of the restoration and the expected outcomes so they can participate in the monitoring efforts.

2.C.3.2. **Non-forested Uplands/Meadows**

Bluestem meadow.

Tacony Creek Park

Non-forested uplands are open meadow habitats and those areas adjacent to forests, where there is a buffer of native grasses and shrubs. Non-forested uplands can also include lands which are classified as landscaped areas that are no longer actively used. Recommended restoration activities in non-forested uplands include, but are not limited to, the removal of exotic species, replanting of native herbaceous and shrub species, meadow management and gully repair. Removal of exotic species and replanting of native herbs, shrubs and trees has been described above.

Meadows do occur in the parks and are often found where agricultural fields have been abandoned and along the edge of forested areas which were previously mowed or burned as part of a management program. The meadows of the Fairmount Park system are composed of a mixture of exotic and native grasses and forbs. The vegetative community composition is dependent upon the level of disturbance and the length of time that the area has lacked a management program. In some sections of the park system, meadows have become waste disposal grounds for vehicles and large appliances. These areas are often located on the edge of the park, making these sites accessible to vandals. An example of one such site in Tacony Creek Park is described above in the section outlining trash and another can be found at the intersection of Ramona and 'I' streets where Kudzu can be found invading an open field habitat. Non-native forbs such as goutweed (*Aegopodium pedagraria*), garlic-mustard (*Alliaria petiolata*), Canada thistle (*Cirsium arvense)*, purple loosestrife (*Lythrum salicaria*) and lesser celandine (*Ranunculus ficaria*), as well as non-native grasses such as Japanese stiltgrass (*Microstegium vimineum*) and Kentucky bluegrass (*Poa pratensis*) take advantage of these open habitats and will outcompete grasses, rushes, sedges, and forbs such as milkweeds, asters and goldenrods. Meadow management encompasses the following removal of exotics and the

replanting of natives, prescribed burning, and periodic managed mowing. Managing the area as a meadow includes maintenance to prevent the area from succeeding into woods. These activities can be done to enhance existing meadows or they can serve as a way to create native meadows from lands that are currently maintained as turf grass to act as buffers for high quality woods. These meadows will provide habitat for native fauna and will protect adjacent slopes and forests from the negative impacts of stormwater runoff. A management plan for maintaining an area as a meadow must be drafted and followed throughout the year or the area will once again become inundated with exotic species and trash. Barriers and signs should be placed around the restored area to make community members and users of the park aware of the many benefits of open meadow habitats.

2.C.3.3. **Slopes**

Eroding slope, Tacony Creek Park.

Many of the slopes in the park have been severely eroded due to overuse by mountain bikes, motorized vehicles, trash dumping and stormwater runoff from adjacent streets. Activities which disturb the soil aid in eroding the slopes, which will make them unstable and unable to support vegetation. Once the slopes lack cover, the erosion continues. Stormwater runoff exacerbates the problem and creates gullies along the slopes, which serve as obstacle courses for ATVs.

The impacts to slopes are visible in Tacony Creek Park at the site north of the Adams Avenue Bridge. The slopes here are steep and ATVs use this area as an obstacle course. As part of the restoration recommendations for slopes, activities include regrading some of the highly impacted slopes, replanting with native species, repairing gullies, controlling erosion, and removing trash and exotics. Planting a native meadow at the top of the slope to help control water runoff during storm events, as was described previously, is also recommended. Placing berms at the top of the slope will also aid in decreasing the velocity of the stormwater which flows down the slopes toward the stream. This will not only prevent further erosion of the slopes but will decrease the amount of silt that reaches the creek and tributaries.

2.C.3.4. **Riparian Zones**

Bank erosion.

Riparian zones are areas adjacent to a body of water which are influenced at least periodically by flooding (Mitsch 1993). They serve as ecotones between aquatic and terrestrial communities and are important areas for animal refuge and migration. Plant communities of riparian zones are usually diverse due to the gradients in moisture. Riparian areas are valuable to people because they can slow the flow of water during a storm event and prevent flooding. Riparian forests have been shown to be very important to stream ecosystems as regulators of hydrologic and nutrient fluxes, light and temperature regimes, physical habitat and food/energy base.

In the Fairmount Park system, the areas adjacent to the creeks have been used by the public as picnic areas, bike trails, and fishing points. The natural vegetation of these riparian zones has been altered in such a way

that they are no longer able function as they should. Due to this disturbance, an exotic plant species, Japanese knotweed (*Polygonum cuspidatum*) has invaded the banks of the creek. In Tacony Creek Park, volunteer efforts are presently underway to eradicate this species from riparian zones, but it is still propagating along the mainstem of Tacony Creek and is particularly dense along banks near Adams Avenue and the area north of Rising Sun Avenue on the east bank. This plant reproduces vegetatively through rhizomes and is able to outcompete native riparian vegetation. It has a shallow root mass and therefore is not able to stabilize the banks as effectively as native tree species could. This makes the banks more vulnerable to erosion during a storm event. The more soil that becomes exposed, the more area this plant has to invade. Management techniques to rid the banks of this plant include cutting and removing the root to spraying with herbicide such as Rodeo, which is approved for use near water. The restoration activities for riparian zones in this project include removing Japanese knotweed, regrading the banks and replanting with native forest corridors at lease 35 feet in width to serve as a functional riparian zone.

2.C.3.5. **Wetlands**

Wetlands off Adams Avenue, Tacony Creek Park.

Wetlands are commonly referred to as "kidneys of the landscape" because they serve as filters for natural and anthropogenic pollutants. They function not only as pollutant filters, but also as sponges for water during storm events, therefore preventing floods. These are the functions that connote important values to humans. However, these areas are also biologically rich. They provide habitat for a wide variety of flora and fauna that participate in the food chain. Humans have impacted wetlands worldwide through development, farming and overpopulation. Wetland communities of native vegetation are scarce in the Fairmount Park system. Freshwater wetlands are the most common type of wetland to occur in the park. However, tidal wetlands are found at the mouth of the Pennypack Creek on the Delaware River. The majority of the wetlands present in the park are dominated by skunk cabbage (*Symplocarpus foetidus*), while some are dominated by common reed (*Phragmites australis*). Because the natural vegetation in the park has been disturbed by surrounding development and golf courses, many of these areas have been fragmented. The hydrology condition is essential for maintaining the wetland plant communities and has been altered by housing developments and stormwater runoff.

Wetlands can either be created, which involves constructing a wetland where no wetland has existed before on that site, or they can be restored by rehabilitating an existing degraded wetland. Restoration of a wetland often involves reestablishing the vegetation. The vegetation to be planted depends on the type of wetland desired, the region, and the climate. Hydrology is the most important variable. If the proper hydrologic conditions are developed, the chemical and biological aspects will respond accordingly.

Creating a wetland where none had existed previously requires a systematic approach. The design should incorporate an interaction of plants, animals, microbes, soils and water flows that require minimal maintenance. It should be assumed that the wetland will encounter floods, storms and droughts. An optimal wetland will be able to thrive despite these occurrences. Where possible, the system should utilize natural energies such as existing streams. The wetland should be able to fulfill multiple goals such as: stormwater control, habitat for endangered species and removal of toxic materials.

2.C.3.6. **Channel**

Main stem of Tacony Creek.

Proposed restorations were classified as "channel" type if the activity is intended to restore a stream within its channel or along its banks. The types of "channel" restoration actions include: protect/enhance, trash removal, bank stabilization/regrade/riparian, modify channel, infiltration/berms, detention basin, daylighting, dam modification, dam removal, structural improvements (trails and stormwater), and fish reintroduction. A given restoration site may involve one or more of these actions, depending on site-specific conditions (see Section 2.E). The overriding objective for channel restoration is to improve in-stream habitat to a more natural state. As discussed in the Restoration Goals, reference streams in rural southeast Pennsylvania served as models of how Fairmount Park system streams should "naturally" function.

Protect/Enhance. A site designated as protect/enhance is either a stream in very good condition or a stream feature of exceptional value (e.g., waterfall). These streams and features should be protected from future destruction or stresses, such as an increased stormwater flow. Highlighting these areas as restoration sites, is meant to enhance their recognition as important, sensitive areas. These sites should be maintained and enhanced with garbage clean-up and graffiti removal when necessary. Signs should be posted to inform the public of the site's significance. Maintenance and signs should increase the public's appreciation and understanding of the area. This is consistent with the goal of increasing public awareness of the scenic, inspirational, and spiritual values of streams.

Trash Removal. The dumping of trash is a problem throughout the park system. Not only is it unsightly and disheartening for park users, trash accumulation in stream channels can be especially problematic. Piles of debris can create dams, altering a stream's normal flow path and causing an unstable channel. Major dumping can cause streams to become almost entirely buried and unable to support aquatic life. Sites identified as needing trash removal are generally those with severe dumping. At these sites, removing the debris and preventing future accumulation of debris is recommended. Barriers should be installed at all existing or potential access points on the park edges to prevent further dumping.

Bank Stabilization/Regrade/Riparian. Stream sites selected for this action are those with unstable streambanks, streambanks choked with invasive vegetation, or streambanks without adequate riparian vegetation. Although many of the banks of Tacony Creek fit these criteria, sites were selected where restoration efforts can make a difference. For example, many of the problems on the main channel of Tacony Creek are caused by watershed-level or upstream impacts that require watershed-level solutions which are beyond the scope of this project.

The purpose of this type of action is to locally stabilize the streambank, thus decreasing erosion and the sediment flux downstream. The riparian buffer established by this sort of project will provide better stream-side and in-stream habitat, such as lower temperatures, more organic material. A bank stabilization project typically includes regrading the streambank to a lower slope, securing bioengineering (natural) materials to the bare bank, and planting native vegetation (i.e., herbs, shrubs, trees) to establish a forested stream-side or riparian buffer.

Modify Channel. This is an umbrella term which includes any type of in-stream modification of channel grade or shape. This activity has been recommended in streams that are severely unstable or in highly-erodible gullies. When it is evident that erosion is occurring in the bottom of a channel, further incision can be prevented by making changes within the channel. Options include installing check dams or natural rock falls to prevent the headcutting of the bottom of the channel. This type of channel modification aims to prevent destructive erosion by providing some stability, but not to be so stable as to inhibit the dynamic nature of the stream channel.

Infiltration/Berms. This action promotes infiltration of rainwater into the ground, thereby reducing stormwater runoff and improving groundwater recharge. These projects might include the installation of an infiltration trench (also called retention ponds) or the building of berms (dike-like vegetated mounds) perpendicular to the path of stormwater runoff. An infiltration trench is installed by digging out a deep trench, replacing the soil with a more pervious substrate, and replanting the surface. These measures would be used in areas where there is excessive stormwater runoff, usually from a paved or mowed surface, causing gullies and increased erosion. The trenches or berms placed in the path of runoff promotes increased infiltration/decreased runoff and decreased flow velocities, resulting in reduced erosion further downslope.

Detention Basin. This action includes the installation of wet or dry ponds to detain stormwater runoff. These basins can help reduce peak flows during storm events, but do not alter the overall volume of runoff. Elevated peak flows can be very destructive to a stream channel, causing incision, eroding banks, and the loss of stream habitat. Where feasible, a detention basin would be placed at the source of excessive runoff (i.e., paved parking lot) or near the stream, but should not be placed within the stream's channel. Stormwater runoff would be directed into the detention basin where it is slowly released into the stream system. Besides the reduction in peak flows, detention basins can be designed to provide wetland and pond habitat, if constructed to hold a permanent pool. A detention basin is not an easy restoration option. It is expensive and it requires a large amount of space, as well as future maintenance.

Daylighting. Numerous streams have been placed underground to allow for the development of Philadelphia. Many of these underground streams extend into the park. Daylighting refers to the excavation and restoration of a stream that has been buried in an underground culvert, covering, or pipe. When a stream is underground, it does not function as a stream. By daylighting a stream, it is reborn and can then support stream life. Most of these underground streams still flow due to groundwater sources and drain into larger streams, such as the Schuylkill River and Tacony, Pennypack, Poquessing, and Cobbs creeks. The flows from these underground streams may provide important contributions to the flows in these larger streams during low-flow or drought periods. Unfortunately, many of these underground streams also receive raw sewage due to combined sewer overflows during storm events and due to incorrectly connected sewage pipes from homes. Therefore, before daylighting a stream, sewage contributions must be considered and eliminated.

Dam Modification/Dam Removal. These actions are intended to improve stream conditions that are impaired by dams. As detailed in the restoration goals, dams have damaging effects on streams. Dams block the passage of fish and other aquatic organisms and cause backwaters that are warm and can become depleted of oxygen. A dam on a stream is analogous to a clogged artery. Many Fairmount Park system dams are falling apart and are a safety hazard as well. Based on ecological benefits, it is recommended that all dams be removed, but this is not feasible for all dam sites. When dam removal is not possible, a dam modification is recommended, which involves creating one or more V-shaped notches in the top of the dam to allow for better movement of water, sediment, and organisms. Dam removal involves the use of large machinery to remove the man-made elements. Some dams may have underlying bedrock or rock falls, which would remain as a natural waterfall. Mud flats adjacent to the banks would be planted with native vegetation and some bank

stabilization measures may be required after demolition. Removing these abandoned dams will serve as a long-term benefit to the stream and will require little to no future maintenance.

Structural Improvement. These actions seek to address problems caused by malfunctioning or obstructive structures in or near streams. A main problem with any structure in a stream is that streams are dynamic, while the structure was most certainly constructed to remain static. As a stream moves, transports sediment and acts in its dynamic nature, these structures get in the way and cause problems such as scouring, drastic erosion, and sediment trapping. Stormwater structures such as culverts, pipes, and manholes were found to have become obstructions in streams. These structures also block the flow of debris and garbage in the stream, causing piles of debris that are unsightly and may cause local erosion problems. Any plan to improve a Philadelphia Water Department (PWD) structure will have to be a joint effort between FPC and PWD. Stream crossings on trails can sometimes have a negative impact on the stream. Many times bridges and culverts under trails can cause local erosion problems. In addition, many clogged or failed culverts create unstable stream channels, streambank erosion or damage due to constant trampling. Any trail improvement related to stream crossings will have to be coordinated with the trails consultants. Improvements might include constructing bridges or better culvert systems and diverting or changing trail routes.

2.C.3.7. **Faunal Monitoring**

Most of the restoration activities are expected to affect park fauna by improving habitat for terrestrial and aquatic animals. Some activities directly involve fauna. These include some types of monitoring and introductions.

Deer Monitoring. Deer monitoring is a critical need for future restoration planning and park management. Direct effects of deer were noted in Wissahickon and Pennypack parks. The effects of deer on vegetation in Wissahickon Park were estimated over the 1994-1996 period, with population estimates done in 1995 (Natural Resource Consultants 1996). The FPC reviewed the information on deer, and held public hearings. Reduction of the deer population in Wissahickon Park was started in late winter of 1999. Deer densities are generally considered to be much smaller in Cobbs, Tacony, Fairmount (East/West) and Poquessing parks, and deer damage was not noted as significant impacts in the other parks. Anecdotal reports of park staff and nearby residents suggest that deer populations are increasing in some of the parks (e.g., Cobbs and Fairmount (West) Park), although densities were still reported to be low. It is not known whether these parks will follow the same pattern of increases observed recently in Wissahickon and Pennypack parks, or whether there are differences which would maintain lower populations. For example, much of the land surrounding the other parks is developed with industry or small residential lots, which probably don't provide as much food and cover for deer as areas adjacent to Wissahickon or Pennypack parks. This may reduce the attractiveness of these parks; however, it may also limit the amount of private land on which hunting is done. It is important to know if deer damage increases in the other parks to the point where it affects restoration and maintenance. For example, at high deer densities, restoration planting needs to include fencing, larger stock or other strategies to reduce browsing losses.

The nature of the deer monitoring to be implemented depends on the goals of the monitoring. For example, estimation of population density may be valuable in planning direct deer management, while estimation of damage may be more relevant to restoration planning. In order to aid restoration planning, ANSP reviewed information on possible approaches to monitoring, developed a protocol for monitoring deer damage, and tested this protocol in Wissahickon Park.

This information is summarized in Appendix C-2 in Volume III. The results and conclusions of the study may be summarized as follows:

- Monitoring of browse/grazing damage was considered to be the most relevant approach for the objectives of natural lands restoration. It was concluded that census methods were too expensive to implement for routine monitoring, and counts based on indicators such as pellet counts and tracks, were difficult to relate to deer density or deer damage.
- The protocol was based on monitoring browse damage to shrubs and trees with twigs accessible to deer. This allowed monitoring in winter when herbs were not evident. The addition of herbaceous monitoring (e.g., of preferred spring ephemerals like may apple) would be valuable for spring monitoring.
- The protocol was practical and could be implemented. There was some subjectivity in distinguishing browsed twigs from other sources of twig damage, but this was not thought to invalidate the protocol. However, false identification of browse could be more of a problem in areas with low frequencies of deer browse. In the future, testing in areas with little or no damage (e.g., within enclosures) would be useful to determine frequencies of other types of twig damage.
- Twig damage may reflect browsing over a relatively long period of time because old cut twigs may still be evident. This is a disadvantage in assessing short-term rates of damage. However, it would be an advantage for monitoring areas with low deer densities, where deer damage may be sporadic.
- The rates of browsing on any given plant species probably varies with deer density. Nonpreferred species may suffer little damage at low densities, but be browsed at high densities. Deer browsing is likely to affect recruitment of shrubs and saplings, so that species occurrence is not independent of deer density. For example, preferred species may be eliminated in areas of moderate deer density, leaving nonpreferred species with relatively low browse rates. In areas with lower deer densities, preferred species may be present, but browsed. Thus, interpretation of browse results needs to consider the frequency of damage by species and the frequency of occurrence of different plant species.
- Deer monitoring and management is ongoing by a variety of groups in the region. Contacts with these groups would be valuable in setting up monitoring programs. Personnel with the U.S. Forest Service in Warren, PA (e.g., David DeCalesta and Susan Stout), and with the U.S. National Park Service in Gettysburg, PA (e.g., Herbert Frost) have been identified as sources of information on deer and deer monitoring (Community Resources, pers. comm.).

Other Monitoring. While the faunal inventory for this study and other monitoring programs provided a great deal of information on faunal occurrence and abundance, sampling was limited in time and space. Additional monitoring can be valuable in determining occurrence of uncommon species, determining trends in species, and determining response to restoration. The assessment for this study demonstrated decreases in the native fauna in many groups and increases in exotic species in some groups. Sampling of other taxonomic groups would provide additional information on the park fauna. Monitoring programs can be linked to environmental center activities, to park special events and to more thorough scientific collection.

Faunal monitoring would be particularly valuable as part of some restoration activities. Where feasible, baseline and post-restoration monitoring should be defined as part of restoration planning, although in some cases, funding constraints may preclude monitoring. Monitoring of virtually any taxonomic group would be valuable, but certain groups would be particularly informative for different types of restoration, such as butterflies for meadow and edge management, aquatic macroinvertebrates for wetland creation and restoration, stream channel restoration, reptiles and

amphibians for wetland creation and restoration, fishes for dam removal, restoration in larger wetlands and streams, birds for woodland restorations, meadow restoration, exotic control, and terrestrial invertebrates such as land snails and slugs, ants and earthworms for woodland restoration.

Faunal Introductions. Re-introduction of animal species can restore the natural biodiversity of an area. However, there are some ecological risks to re-introductions which need to be considered. These risks are outlined in the project goals (Volume I, Section 3). Where major restoration of vegetation is done, faunal re-introductions should typically be undertaken after successful establishment of the vegetation. In many cases, natural recolonization is likely to occur. There are, however, situations where faunal reintroductions are recommended. Existing patches of suitable habitat occur which have not been colonized by some species. As part of the inventory, re-introductions of fish was identified as a potential restoration activity. Reintroduction of other groups, such as butterflies or skippers, may also be appropriate in some other parks. At this time, no introduction is recommended in Tacony Creek Park, since appropriate species have not been identified. Reintroduction of other groups, such as butterflies or skippers, may also be appropriate in some other parks.

While the Tacony Creek studies showed lower species richness than some of the other park streams, candidate species for introduction were not identified, and no introduction was recommended as part of Tacony Creek Park restoration.

Wetland creation is recommended for one site in Tacony Creek Park. Larger restorations (e.g., about one or more acres) with permanent water of a foot or more in depth would be able to support fish. These would provide an opportunity for introduction of fishes which were historically found in regional wetlands and are still present in some sites. The Eastern mudminnow and bluespotted sunfish would be good candidates for such programs. Stocking protocols would be similar to those defined for the stream fish, except that smaller numbers of specimens would probably be introduced, because of the more closed nature of the wetlands and to decrease impacts on source populations. Such introductions would be best done after establishment of aquatic vegetation within the wetlands. Stocking of smaller wetlands is not recommended, since these would support fewer fish individuals, would have a smaller likelihood of long-term success, and would be more valuable as breeding sites for amphibians which can be adversely affected by fish predation in breeding ponds.

2.C.3.8. Golf Courses

Juniata Golf Course.

The Juniata Golf Course presents a special opportunity for protection, restoration and management of natural lands. The course includes the main channel of Tacony Creek. The course also contains a small wetland and woods. These natural areas are used for walking in addition to the primary use for golf. General recommendations for golf course management and recommendations specific to the individual golf courses were developed and presented to the managers of the course. These recommendations are presented in Appendix C-3 in Volume III.

2.D. RECOMMENDED RESTORATION ACTIVITIES

2.D.1. Restoration Site Overview

Proposed restoration activities at different sites in Tacony Creek Park were evaluated, and groups of options are recommended as high, medium or low priority for restoration under NLREEP.

In this section, a general overview of the recommended restoration sites is presented. The full list is presented in Table 2.D.1. More complete descriptions of the high priority sites are presented in Section 2.E. The process for nomination and evaluation are described in Volume I, Section 6 of this plan. This process is based on the application of restoration goals (Volume I, Section 3) to the park (Volume II, Section 1), and on the park inventory (Volume I, Sections 4 and 5, and Volume II, Section 2.C).

A total of 30 sites covering about 70 acres are recommended as high priority for restoration. This constitutes about 43% of the natural lands of Tacony Creek Park and about 10% of the total area of the park. The recommended high priority restoration sites are located throughout the park, but are clustered in a few areas. The clustering builds on core areas of good quality, with associated restoration activities enhancing both the core and adjacent areas. The likelihood of success is increased by concentrating on these areas, where each restoration helps those around it. For convenience, sites will be described moving from north (Cheltenham) to south (Juniata Park).

The northern part of the park (north of Adams Avenue) contains some of the highest quality woods in the park and a springfed creek, which is unusual in Tacony Creek Park. The significance of these sites should be recognized, hence the protect/enhance recommendation. Restoration around these woods would enhance overall quality. Recommended enhancement activities include control of invasive/exotic plants and replanting and stabilization of stream banks. There is a small wetland south of Adams Avenue which contains native wetland plant species, which could be enhanced by removing the picnic tables.

The area between Adams Avenue and Tabor Road contains woods along the slopes, but the flood plain is dominated by Japanese knotweed, and the slopes and woods are affected by runoff from the plateau above. Control of exotics and replanting along the flood plain, and slope repair and small runoff control devices are recommended for the plateau and slopes in this area. Control of Japanese knotweed has been started in this area and should be continued. The low dam below Rising Sun Avenue (marked Cedar Grove Dam on the 1983 Park base map, but probably not the Whitaker Cedar Grove Dam) impedes flow and creates bank erosion. A wet area next to the dam, which was presumably part of an old millrace, would be enhanced by control of exotics and planting of wetland species.

Creation of a wetland in the depression along the west bank south of Tabor Road and north of Roosevelt Boulevard is recommended. This area was formerly a ballfield, but that use was apparently abandoned because of periodic flooding.

The section of the stream between Roosevelt Boulevard and Whitaker Avenue has a narrow band of flood plain woods and meadows with many exotic plants, and a narrow band of woods along the slope. The plateau above the slopes is mowed. The slopes and flood plain are heavily impacted by vehicle use. Reduction of runoff impacts on the slopes. Installing small berms and a narrow buffer zone at the top of the slopes is recommended. More extensive restoration of native vegetation along the slopes and flood plain could be done, but this is of lower priority than that in other areas, because of the narrowness of the area and ongoing disturbance. Control of vehicle access to this area is imperative to maintenance of natural vegetation.

A variety of restoration activities are recommended for the area between Whitaker and Wyoming avenues. This area contains both woods and bluestem meadows, an unusual habitat in the Fairmount Park system, which can support unusual plants and animals. Much of the stream bank and lower flood plain in this area is outside the park boundary. Like the area to the north, this area is heavily impacted by vehicle use and abandonment of cars. Control of access is important to maintenance of this area. Other recommendations include management of the meadows to preserve

Table 2.D.1. List of sites in Tacony Creek Park recommended by ANSP for restoration by NLREEP. Priority codes are: H=high; M=medium; L=low; HC=high, requires coordination; HD=high, after deer; HP=high protection; HPD=high, protection and restoration after deer are controlled; HT=high trail; HVD=high, volunteer action, other actions after deer are controlled; HV=high volunteer; MC=medium, requires coordination.

Site ID	Restoration Type	Site Name	Location	Priority	Acreage
S1	Channel	CU-07	J St. and Juniata Park	L	0.15
		Action	**Priority**		
		Bank Stabilization/Regrade	L		
		Structural Improvement (SW)	L		
S2	Channel	Friends holding (man hole in stream)	North of Andropogon meadows in creek	L	0.27
		Action	**Priority**		
		Structural Improvement (SW)	L		
S3	Channel	Ruscomb St. Outfall	CU-05 in creek at end of Ruscomb Street	L	0.20
		Action	**Priority**		
		Structural Improvement (SW)	L		
S4	Channel	Cedar Grove Dam	Adjacent to Bingham and Garland Sts.	INFEAS	0.65
		Action	**Priority**		
		Dam Modification	INFEAS		
		Dam Removal	INFEAS		
S5	Channel	Culvert and pipe fix	Upstream from Cedar Grove Dam	L	0.01
		Action	**Priority**		
		Structural Improvement (SW)	L		
S6	Channel	CU-06	160 feet south of Rising Sun bridge	L	1.88
		Action	**Priority**		
		Daylighting	L		
S8	Channel	CU-02	450 feet north of Reading RR bridge	L	0.74
		Action	**Priority**		
		Detention Basin	L		
		Structural Improvement (SW)	L		
		Infiltration/Berms	L		
S9	Channel	CU-01	450 feet north of Adams Ave. in creek, west bank	L	1.03
		Action	**Priority**		
		Daylighting	L		
		Structural Improvement (SW)	L		
S10	Channel	Tookany, Cheltenham west creek banks	Tookany, Cheltenham west creek banks	H	1.85
		Action	**Priority**		
		Bank Stabilization/Regrade	H		

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Site ID	Restoration Type	Site Name	Location	Priority	Acreage
S11	Channel	Tributary 4	Upper section of park near Tookany Pkwy.	HP	1.19
		Action	**Priority**		
		Protect/Monitor	HP		
S12	Channel	Crescentville Dam	Just upstream of Adams Ave.	INFEAS	0.22
		Action	**Priority**		
		Dam Removal	INFEAS		
S13	Channel	Juniata Golf Course Dam		INFEAS	1.00
		Action	**Priority**		
		Dam Removal	INFEAS		
S14	Channel	Castor Ave. Dam	Juniata Golf Course	INFEAS	1.00
		Action	**Priority**		
		Dam Removal	INFEAS		
V29	Wetland	Cedar Grove Dam Wetland	Right bank Tacony Creek next to Cedar Grove Dam	HV	0.59
		Action	**Priority**		
		Invasive-Exotic Control	HV		
		Replant Native Herbs	L		
		Structure Building (Boardwalk)	L		
V29A	Forested Upland	Cedar Grove Upland Forest	Top of Slope off Olney Ave.	H	2.64
		Action	**Priority**		
		Meadow Management	H		
V30	Riparian Zone	Cedar Grove Depression	Right bank of Tacony next to dam-depressed area	H	0.37
		Action	**Priority**		
		Replant Native Herbs	H		
V30A	Riparian Zone	Cedar Grove Flood Plain	Between Cedar Grove Dam and Tabor Road Right Bank	H	1.19
		Action	**Priority**		
		Replant Native Forest Species	H		
V30B	Riparian Zone	Cedar Grove Flood Plain	below dam west bank	H	2.87
		Action	**Priority**		
		Replant Native Forest Species	H		
V31	Forested Upland	Olney Avenue Forest	Between Rising Sun and Tabor off meadow on Olney	H	4.81
		Action	**Priority**		
		Replant Native Forest Species	H		
		Trail Improvement	H		

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Site ID	Restoration Type	Site Name	Location	Priority	Acreage
V31A	Slope	Cedar Grove Cliff	West of Cedar Grove Dam	H	2.82
		Action	**Priority**		
		Replant Native Shrubs	H		
		Gully Repair	M		
V32	Slope	West bank slopes	Slopes west of creek, near Reading RR	H	5.19
		Action	**Priority**		
		Erosion Control	H		
		Replant Native Trees	M		
		Replant Native Shrubs	L		
V32A	Riparian Zone	Rising Sun Flood Plain	Between Rising Sun and Reading Railroad	HV	0.85
		Action	**Priority**		
		Invasive-Exotic Control	HV		
		Replant Native Forest Species	L		
V33	Wetland	Adams Ave. Wetlands	Area adjacent to Adams Ave and Reading Railroad	H	0.67
		Action	**Priority**		
		Trash Removal	H		
		Protect/Monitor	HP		
V34	Wetland	Bingham Street Old Ball Field	Between Roosevelt and Tabor	H	2.06
		Action	**Priority**		
		Wetland Creation	H		
V35	Riparian Zone	Juniata Golf Course	East of Green #3 on Frankford Creek	H	0.88
		Action	**Priority**		
		Regrade	H		
		Replant Native Forest Species	H		
V35A	Wetland	Golf Course Wetland	North of Green#7 on Juniata Golf Course	HP	0.35
		Action	**Priority**		
		Protect/Monitor	HP		
V36	Forested Upland	Woods Adjacent to Juniata Golf Course	Juniata Park	H	1.50
		Action	**Priority**		
		Trail Improvement	H		
		Gully Repair	H		
		Slope Stabilization	H		

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Site ID	Restoration Type	Site Name	Location	Priority	Acreage
V36B	Non-Forested Upland	Open field/Kudzu site	Intersection of Ramona and "I" Sts.	H	0.55
		Action	**Priority**		
		Meadow Management	H		
V37	Slope	Cayuga and Ramona Streets Forest	Behind Rec. Center	H	7.07
		Action	**Priority**		
		Replant Native Shrubs	H		
		Erosion Control	H		
		Replant Native Trees	H		
V38	Non-Forested Upland	Andropogon Meadow Hill	Wyoming Ave. West of Ramona Ave.	H	2.13
		Action	**Priority**		
		Meadow Management	H		
		Trash Removal	H		
V39	Non-Forested Upland	Andropogon Meadows	Off Wyoming North of Ramona	H	5.50
		Action	**Priority**		
		Trash Removal	H		
		Meadow Management	H		
		Gully Repair	H		
V40	Slope	Slope Forests adjacent to Andropogon Meadows	Between Andropogon meadows and Friends inholding	H	6.06
		Action	**Priority**		
		Gully Repair	H		
		Invasive-Exotic Control	HV		
		Replant Native Trees	M1		
		Trash Removal	M2		
V42	Riparian Zone	Friends Hospital Flood Plain	North of Fischer's Lane on Tacony Creek	L	4.41
		Action	**Priority**		
		Replant Native Forest Species	L		
V43	Slope	Bingham Street Forest	South of Roosevelt Blvd adjacent to meadow	HV	4.07
		Action	**Priority**		
		Trash Removal	HV		
		Invasive-Exotic Control	HV		
		Replant Native Trees	M		

Table 2.D.1. List of sites in Tacony Creek Park recommended by ANSP for restoration by NLREEP. Priority codes are: H=high; M=medium; L=low; HC=high, requires coordination; HD=high, after deer; HP=high protection; HPD=high, protection and restoration after deer are controlled; HT=high trail; HVD=high, volunteer action, other actions after deer are controlled; HV=high volunteer; MC=medium, requires coordination.

Site ID	Restoration Type	Site Name	Location	Priority	Acreage
V44	Slope	Bingham Street Fields	Open mowed lawns on Bingham Street	H	2.77
		Action	**Priority**		
		Release/Widen	H		
		Replant Native Trees	M1		
		Replant Native Herbs	M2		
V45	Riparian Zone	Bingham and Roosevelt Blvd Flood Plain	Tacony Creek between Roosevelt Blvd. And Whitaker	M	2.79
		Action	**Priority**		
		Replant Native Forest Species	M		
		Invasive-Exotic Control	L		
V46	Riparian Zone	Trim path flood plain forest	Left bank of creek	H	1.62
		Action	**Priority**		
		Replant Native Forest Species	H		
		Trash Removal	HV		
V47	Slope	Swimming hole Forest	Left bank of Tacony Creek	H	5.57
		Action	**Priority**		
		Gully Repair	H		
		Trail Improvement	H		
V47A	Riparian Zone	Trim path riparian zone	Along trim path north of Adams	H	0.55
		Action	**Priority**		
		Replant Native Forest Species	H		
		Invasive-Exotic Control	HV		
		Regrade	L		
V48	Slope	Tookany Creek Pkwy. Cliffs	North of Adams west of creek	H	2.50
		Action	**Priority**		
		Gully Repair	H		
		Trash Removal	HV		
V49	Slope	Cayuga Street Forest	Behind Rec. Center. On Frankford Creek	H	0.15
		Action	**Priority**		
		Gully Repair	H		
V50	Forested Upland	Housing Authority Site?	Approximately 400 feet north of Cedar Grove dam	M	0.03
		Action	**Priority**		
		Replant Native Trees	M		
V51	Park Wide	Tacony Creek Park	Entire Park	Hwhole	1.00
		Action	**Priority**		
		Deer Monitoring	H		

Table 2.D.1. List of sites in Tacony Creek Park recommended by ANSP for restoration by NLREEP. Priority codes are: H=high; M=medium; L=low; HC=high, requires coordination; HD=high, after deer; HP=high protection; HPD=high, protection and restoration after deer are controlled; HT=high trail; HVD=high, volunteer action, other actions after deer are controlled; HV=high volunteer; MC=medium, requires coordination.

Site ID	Restoration Type	Site Name	Location	Priority	Acreage
V52	Slope	ATV Hill	North of Fisher's Ln.	L	
		Action		**Priority**	
		Gully Repair		L	
V53	Park Wide	Control Access	Several	H	
		Action		**Priority**	
		Control ATV/Dirt Bike Access		H	
		Gully Repair		L	

them and increase biodiversity, and repair of gullying and erosion on the slopes. Coordinated management of this area with the adjacent nonpark lands could greatly enhance this area.

The section south of Wyoming Avenue contains the Juniata Golf Course and the Ferko Recreation Center, but also has great potential for natural land restoration. Recommended restoration activities focus mainly on repair of eroded slopes, gully repair and replanting on the south side of the creek. Other activities include control of kudzu in a patch at Ramona and 'I' streets and replanting with native vegetation. The golf course contains a small wetland which should be preserved.

For ecological reasons, removal of the dams in the Tacony Creek Park (Crescentville Dam, "Cedar Grove Dam" and two dams at Castor Avenue) would be beneficial. However, sewer lines run under the first two dams and the second two protect the road bridge from storm flows. Hence, removal and modification are not recommended.

Currently, deer populations are low in Tacony Creek Park and are not causing obvious damage, though deer may be increasing. Monitoring is recommended to determine whether deer become a management concern in the future.

2.D.2. General Recommendations for Future Activities

The prior section described specific activities that are recommended for implementation in Tacony Creek Park. In addition to these, a number of other related activities are also recommended. These relate to overall operations in the park, particularly those involving management of the borders between the designed and natural lands. Some of these are outside the direct purview of NLREEP and should be implemented in cooperation with other groups.

- Damage done to the natural lands by unauthorized vehicles (cars, all-terrain vehicles and motorcycles) and trash dumping are major problems. Exercising control, through methods such as passive blocking of access points as well as patrolling and/or enforcement of regulations is necessary to minimize or eliminate the damage.
- Issues related to trails within Tacony Creek Park are to be addressed in a separate study. However, trail problems have major affects on vegetation, erosion and stream channels, and improvement of the trail system should be integrated with restoration initiatives. In particular, gullying, compaction and erosion on trails along slopes, widening and trampling of flood plain vegetation, and damage to streamside vegetation, are pervasive problems evident in much of the park. Inadequate trail siting or design is exacerbated by motorized vehicle use.
- Much of the flat areas at the tops of slopes are mown, for landscaped open areas and ballfields. These are often mowed up to the slope, leading to slope erosion and gullying. A narrow band of taller vegetation and/or small berms could decrease this problem. Berms could also be useful where sidewalks or roads close to the edge of slopes.
- Non-native plantings in landscaped areas are often a source of invasion by these plants. An increased use of native plants in landscape settings and avoidance of particularly invasive species, such as Norway maple, is recommended in order to avoid this infiltration of non-native landscapes.
- Decreasing the frequency of mowing can result in taller grass and other vegetation which increases water retention and provides better habitat. Implementation of a decreased mowing schedule in places where this does not interfere with other uses is recommended. However, monitoring of the areas of less frequent mowing should be done to ensure that they are not colonized by invasive plants.

- Exotic species occur in both landscaped areas and natural lands. However, exotic species are often patchy in occurrence and may be controlled if addressed early. Occurrence of the species should be monitored throughout the parks.
- Dumping of large quantities of logs, leaves and other horticultural waste is damaging and should be controlled. However, logs can be used in woods to increase soil fungus, decrease surface runoff, provide animal habitat and restrict access. Mulch can be used in restoration plantings to improve soil and decrease unwanted plants. Methods of making these materials available for restoration can improve the success of restoration initiative, while reducing the storage needs for these materials.
- The need for parking areas within the designed and natural lands should be addressed. Lack of available parking in some areas encourages parking on lawns, which compacts soil and destroys grass and other vegetation.

2.D.3. Suggested Implementation Schedule

Costs per acre for implementation of the various restoration activities were estimated and used to estimate restoration costs for the recommended activities at the recommended sites. These estimates indicate that most or all of the high priority options would be achievable under NLREEP funding and other grants which were submitted for restoration work. As a result, no attempt was made to further develop an implementation schedule, i.e., to prioritize sites among the high priority sites. Scheduling would depend on optimal times for performing various restoration activities and logistics involved in scheduling volunteers, contracting for commercial work, and making links with other agencies. Some particular considerations for implementation are:

- Some types of restoration, particularly control of invasives, will often require several treatments. Scheduling should allow for multiple treatments at optimal times.
- Scheduling should be done to optimize effectiveness. For example, control of exotics which spread by seed (e.g., garlic-mustard, mile-a-minute, and possibly Japanese knotweed) should be done before seed set. Planting of most species is best done in spring or fall to minimize stress on newly planted material. Some species will have particular requirements, necessitating a more specific planting season.
- Scheduling should be done to minimize impacts of implementation. For example, stream bank stabilization in the spring may increase chances of washout by storms and affect spawning fishes.
- The recommended stream restoration projects include wetland creation and dam removal, which are relatively expensive and need a longer lead time for planning and review. These should be started early to allow implementation and modification of other schedules if changes in these projects significantly change costs.
- Since many restoration projects are clustered, scheduling is important to avoid impacts on already completed projects and to increase efficiency of implementation.
- A maintenance schedule should be developed for different types of restorations. For replanting activities, several maintenance visits should be made during the first planting season to water new stock, control any invading unwanted plants, and, if necessary, plant additional material. For projects done early in the NLREEP funding period, additional visits will be possible in one or more seasons after planting, when control of invasives and other corrective activities can be done. These maintenance activities are expected to be inexpensive relative to the initial investment in restoration and can greatly increase probability of success and provide information to improve subsequent restoration work.

- Scheduling should allow for implementation of baseline and post-restoration monitoring programs. If such monitoring is not done by NLREEP, scheduling and notification should be done to give outside groups an opportunity to develop monitoring programs.

2.E. RESTORATION SITE ASSESSMENTS

The individual restoration site assessments for Tacony Creek Park are presented on pages II-155 through II-184. The high priority sites are also shown on the Restoration Sites maps in Volume II, Section 2.F. The key to codes used in the restoration site assessments is given below.

Option priorities:

HP High priority to protect/enhance

HV High priority, can be immediately implemented by volunteers

H High priority, single action for site or multiple, equivalent actions for site

M Moderate priority

L Low priority

Site Use constraints:

P Near playground, main paths, etc., where safety a potential issue

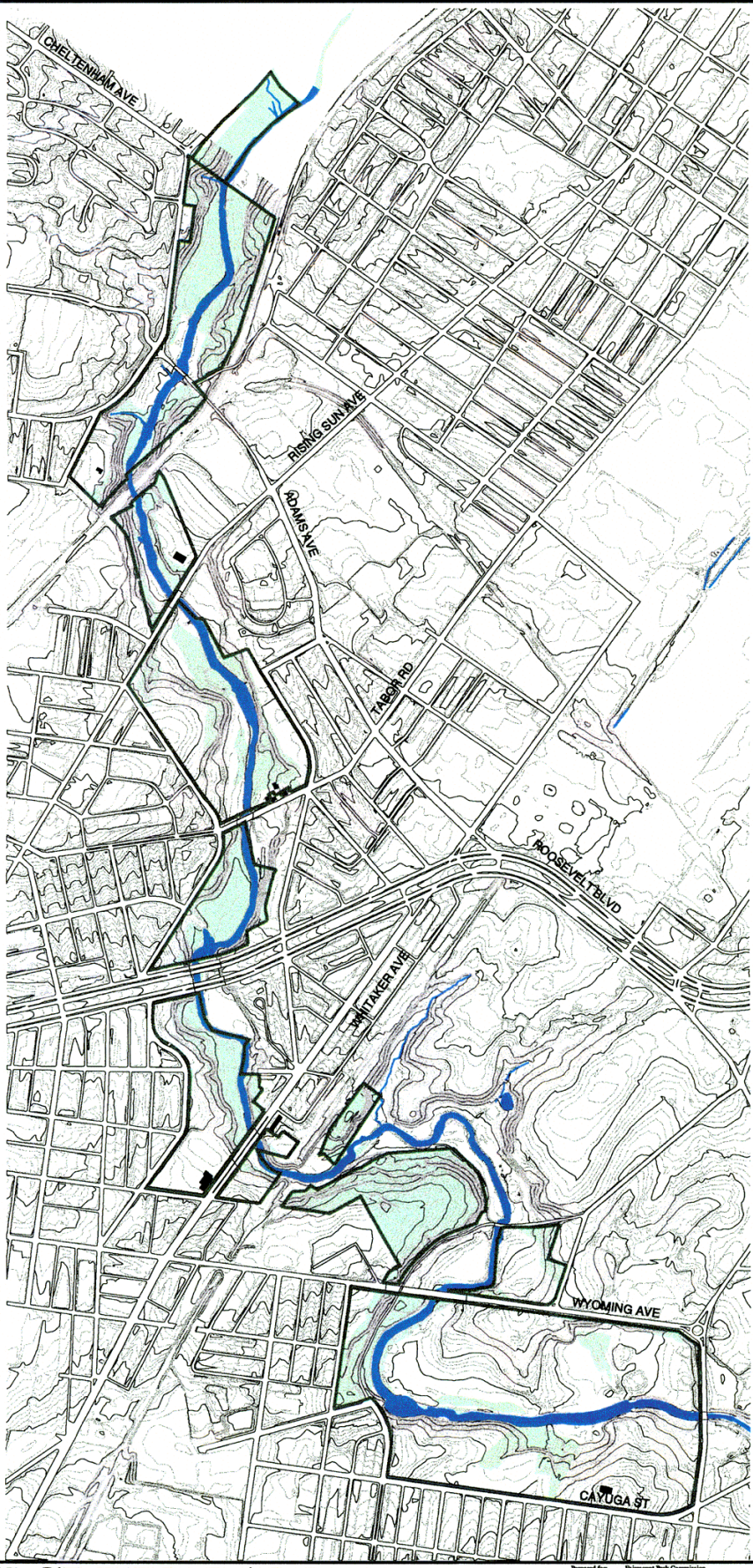
OM Ongoing mowing

D Likely ongoing disturbance

Restoration options include typical tasks associated with site preparation and restoration. For example, “replant” options assume that initial control of invasive plants will be necessary prior to planting, contrasting with “control invasive” options, which denotes invasive control with no replanting. Similarly, streambank stabilization and gully repair assume replanting of stabilized slopes. See text for more detailed descriptions of restoration options.

2.F. **MASTER PLAN MAPS**

The Master Plan Maps for Tacony Creek Park follow.



Legend

- Park Boundary
- Park Buildings
- Streams
- Natural Areas
- 2 Foot Contour Lines

FAIRMOUNT PARK COMMISSION

TACONY CREEK PARK
Natural Lands Restoration Master Plan
PARK BASE MAP

N

500 0 500 Feet

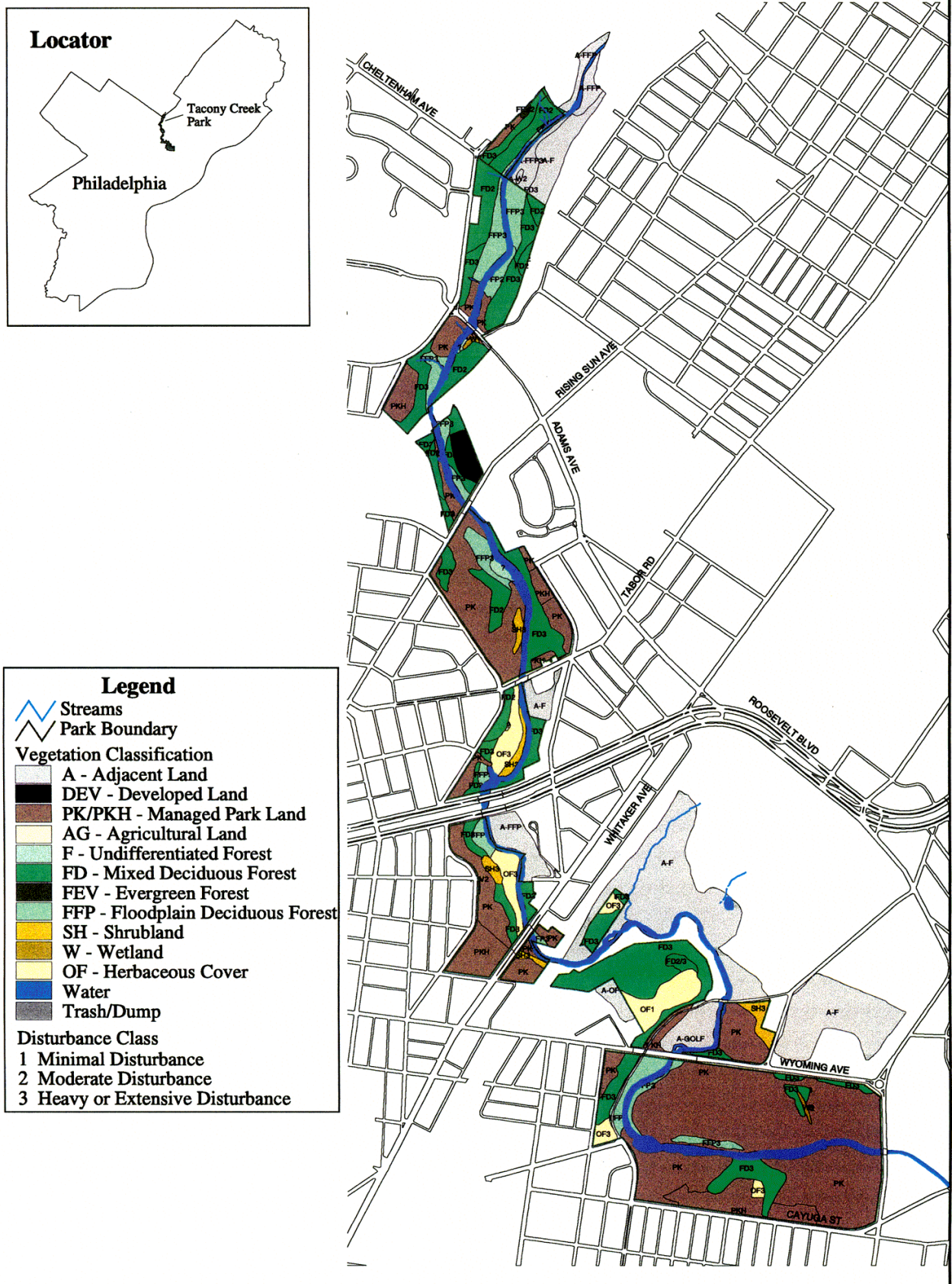
1 inch = 1100 feet

Prepared for: Fairmount Park Commission Natural Lands Restoration and Environmental Education Program

Prepared by: The Academy of Natural Sciences, Patrick Center for Environmental Research

Date: August 1999

Base Map Data: Roads from Phila. Water Department Digital Data Set
Park Boundaries from the Phila. Planning Commission with updates by PCER
Hydrology from the Phila. Water Department Digital Data Set with updates from PCER.



TACONY CREEK PARK
Natural Lands Restoration Master Plan
VEGETATION CLASSIFICATION

FAIRMOUNT PARK COMMISSION

N

500 0 500 Feet

1 inch = 1100 feet

Prepared for: Fairmount Park Commission
Natural Lands Restoration and Environmental Education Program

Prepared by: THE ACADEMY OF NATURAL SCIENCES
Patrick Center for Environmental Research

Date: August 1999

Base Map Data: Roads from Phila. Water Department Digital Data Set
Park Boundaries from the Phila. Planning Commission with updates by PCRR
Hydrology from the Phila. Water Department Digital Data Set with updates from PCRR.

Legend

- Uncommon Amphibian
- Widespread Amphibian
- Introduced Amphibian
- Uncommon Reptile
- Widespread Reptile
- Introduced Reptile
- Native, North American Terrestrial Mollusk
- Holarctic Terrestrial Mollusk
- Introduced Terrestrial Mollusk
- Native, North American Aquatic Mollusk
- Holarctic Aquatic Mollusk
- Introduced Aquatic Mollusk
- Uncommon Bird
- Widespread Significant Bird
- Native Generalist Bird
- Introduced Bird
- No Native Fish
- Low Richness Native Fish
- Moderate Richness Native Fish
- High Richness Native Fish
- Uncommon Cranefly
- Widespread Cranefly
- Uncommon Lepidoptera
- Widespread Lepidoptera
- Introduced Lepidoptera

Ephemoroptera-Plecoptera-Trichoptera Index

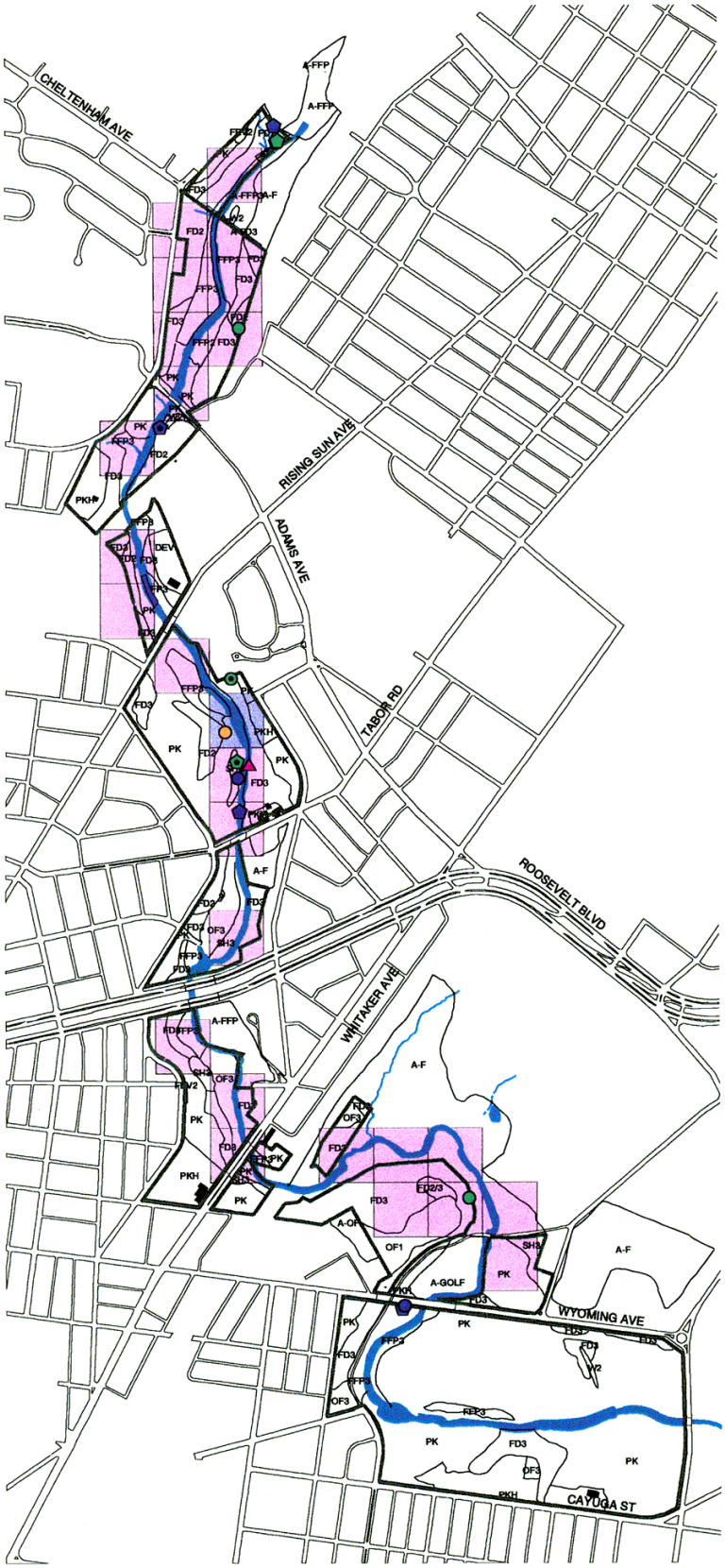
- Low
- Moderate
- High

- High Richness Significant Bird
- Moderate Richness Significant Bird
- Low Richness Significant Bird

- Park Boundary
- Park Buildings
- Streams

Vegetation Classification
A - Adjacent Land
DEV - Developed Land
PK/PKH - Managed Park Land
AG - Agricultural Land
F - Undifferentiated Forest
FD - Mixed Deciduous Forest
FEV - Evergreen Forest
FFP - Floodplain Deciduous Forest
SH - Shrubland
W - Wetland
OF - Herbaceous Cover
Water

Disturbance Class
1 Minimal Disturbance
2 Moderate Disturbance
3 Heavy or Extensive Disturbance



FAIRMOUNT PARK COMMISSION

TACONY CREEK PARK
Natural Lands Restoration Master Plan
HABITAT QUALITY

N

500 0 500 Feet

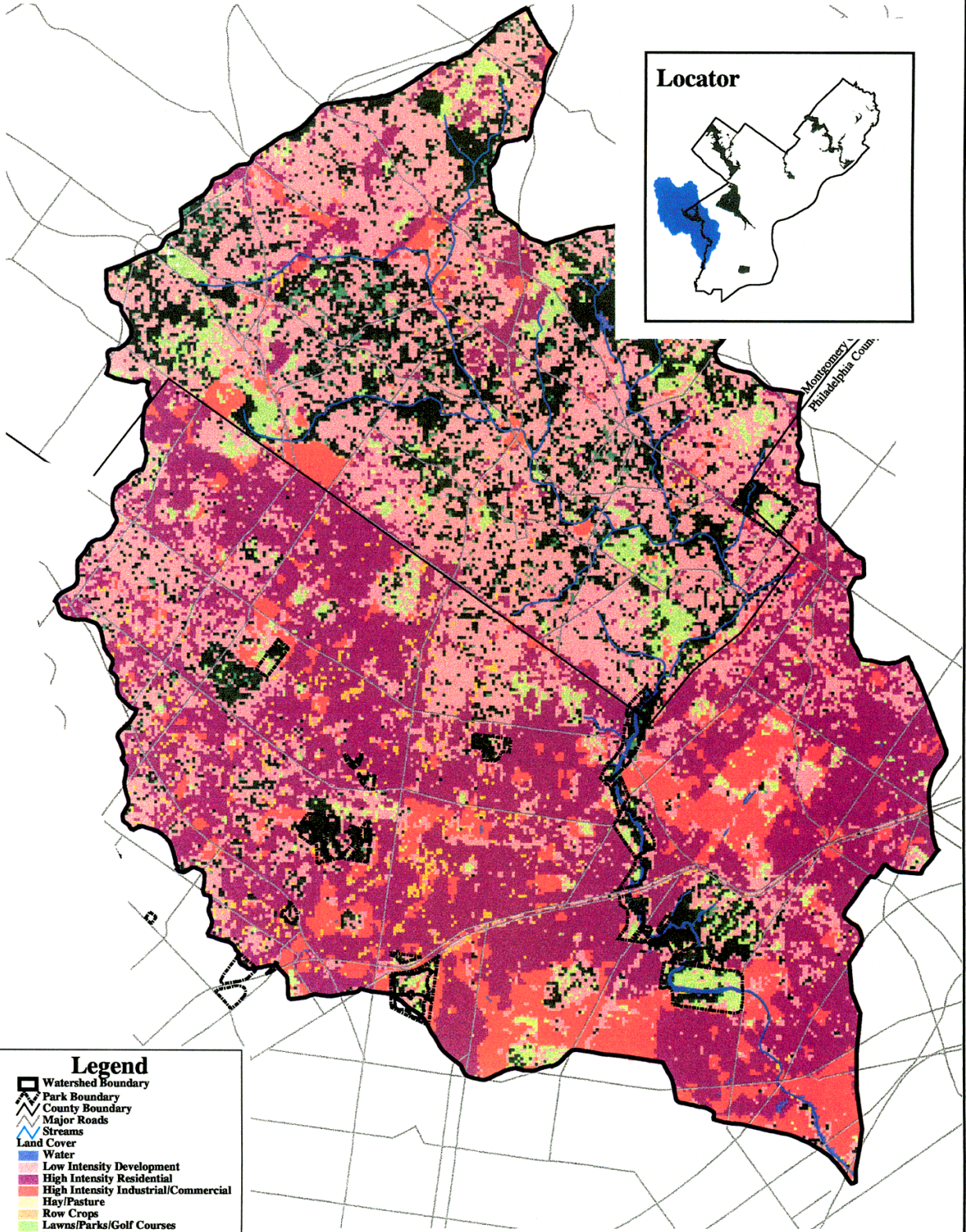
1 inch = 1100 feet

Prepared for: Fairmount Park Commission Natural Lands Restoration and Environmental Education Program

Prepared by: The Academy of Natural Sciences, Patrick Center for Environmental Research

Date: August 1999

Base Map Data: Roads from Phila. Water Department Digital Data Set; Park Boundaries from the Phila. Planning Commission with updates by PCER; Hydrology from the Phila. Water Department Digital Data Set with updates from PCER



Legend

- Watershed Boundary
- Park Boundary
- County Boundary
- Major Roads
- Streams

Land Cover

- Water
- Low Intensity Development
- High Intensity Residential
- High Intensity Industrial/Commercial
- Hay/Pasture
- Row Crops
- Lawns/Parks/Golf Courses
- Evergreen Forest
- Mixed Forest
- Deciduous Forest
- Woody Wetlands
- Emergent Herbaceous Wetlands
- Strip Mines/Quarries/Sand-Gravel Pits
- Rock/Sand
- Transitional/Barren/No Data

FAIRMOUNT P·A·R·K COMMISSION

TACONY CREEK PARK
Natural Lands Restoration Master Plan
WATERSHED MAP

N

2000 0 2000 Feet

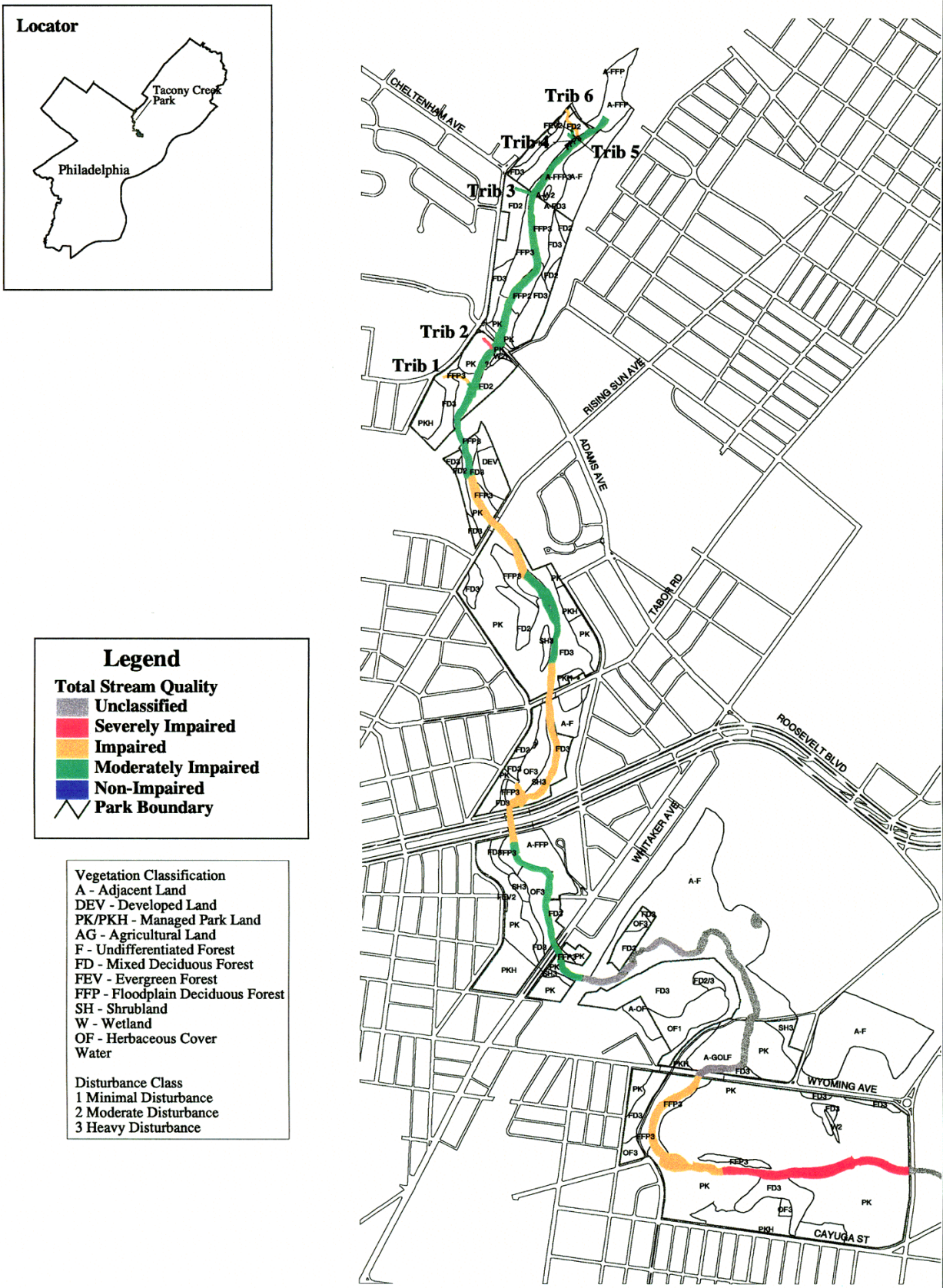
1 inch = 4000 feet

Prepared for: Fairmount Park Commission
Natural Lands Restoration and Environmental Education Program

Prepared by: THE ACADEMY OF NATURAL SCIENCES
Patrick Center for Environmental Research

Date: August 1999

Base Map Data: Park Boundaries from the Phila. Planning Commission with updates by PCER.
Hydrology from the Phila. Water Department Digital Data Set with updates from PCER.



TACONY CREEK PARK
Natural Lands Restoration Master Plan
STREAM QUALITY

FAIRMOUNT P·A·R·K COMMISSION

N

500 0 500 Feet

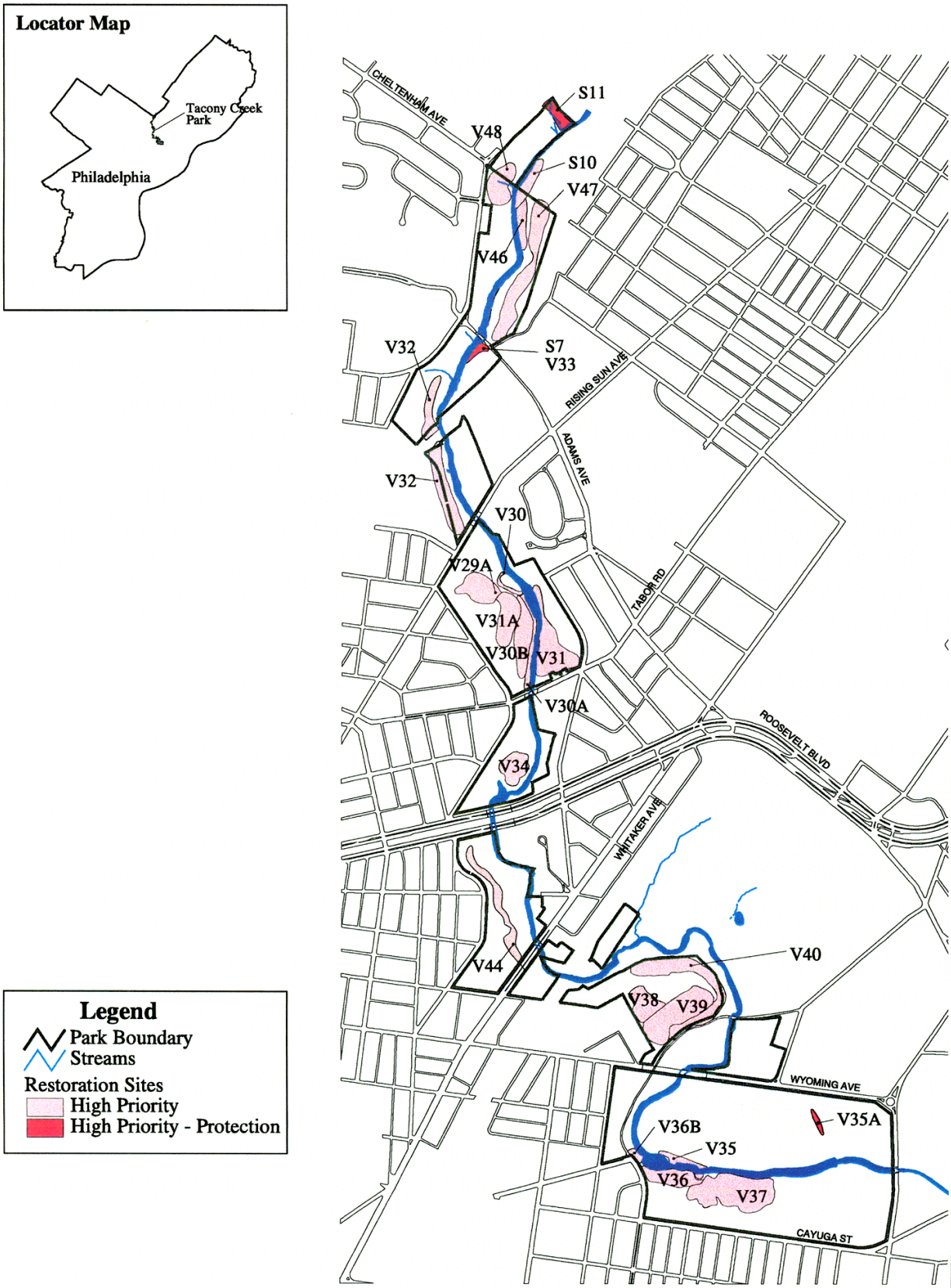
1 inch = 1100 feet

Prepared for: Fairmount Park Commission Natural Lands Restoration and Environmental Education Program

Prepared by: The Academy of Natural Sciences, Patrick Center for Environmental Research

Date: August 1999

Base Map Data: Roads from Phila. Water Department Digital Data Set; Park Boundaries from the Phila. Planning Commission with updates by PCER; Hydrology from the Phila. Water Department Digital Data Set with updates from PCER.



TACONY CREEK PARK
Natural Lands Restoration Master Plan
RESTORATION SITES

FAIRMOUNT PARK COMMISSION

N

500 0 500 Feet

1 inch = 1100 feet

Prepared for: Fairmount Park Commission Natural Lands Restoration and Environmental Education Program

Prepared by: The Academy of Natural Sciences, Patrick Center for Environmental Research

Date: August 1999

Base Map Data: Roads from Phila. Water Department Digital Data Set; Park Boundaries from the Phila. Planning Commission with updates by PCSR; Hydrology from the Phila. Water Department Digital Data Set with updates from PCSR.

Fairmount Park Restoration Sites

Tacony Creek Park

Park: TC **Restoration Site ID:** S10 **Site Name:** Tookany, Cheltenham west creek banks

Location: Tookany, Cheltenham west creek banks

General Location: North of Adams

Disturbance/Condition: Erosion/Scour

Restoration Category Stream

Restoration Type: Channel **Constraints:**

Acreage: 1.85

Site Priority: H **Location Criteria:** Affects ecolog. Significant site

Description:

This streambank is covered with Japanese knotweed. We recommend removal of the exotics, followed by stabilizing banks with bioengineering techniques, and then replanting with native vegetation.

Restoration Options:

ID	Action	Priority	Proportion
A	Bank Stabilization/Regrade	H	100%

Park: TC **Restoration Site ID:** S11 **Site Name:** Tributary 4

Location: Upper section of park near Tookany Pkwy.

General Location: North of Adams

Disturbance/Condition: None/Minimal

Restoration Category Stream

Restoration Type: Channel **Constraints:** OL

Acreage: 1.19

Site Priority: HP **Location Criteria:** Affects ecolog. Significant site

Description:

This groundwater-fed stream has good wetland species should be protected. We recommend that FPC protect the tributary in the following ways: 1) do not alter hydrology; 2) maintain with garbage clean-ups; and 3) increase the public's awareness of this important area by using signs and by publicizing it at the environmental education center.

Restoration Options:

ID	Action	Priority	Proportion
A	Protect/Monitor	HP	100%

Park: TC **Restoration Site ID:** V29A **Site Name:** Cedar Grove Upland Forest

Location: Top of Slope off Olney Ave.

General Location: Tabor-Rising Sun

Disturbance/Condition: Maintained Lawn/Mowed Field

Restoration Category Vegetation

Restoration Type: Forested Upland **Constraints:** Sledding Hill

Acreage: 2.64

Site Priority: H **Location Criteria:** No distinctive

Description:

At this site, it is recommended that the two forest communities on the slopes be connected by planting the open field which separates the two areas. The area should be managed as a meadow. This requires less frequent mowing and replanting of some native herbaceous species. This hill is used as a sledding hill in the winter. The recommended management would not impede this use, but the site should be monitored for ecological damage in the spring.

Restoration Options:

ID	Action	Priority	Proportion
C	Meadow Management	H	100%

Park: TC **Restoration Site ID:** V29 **Site Name:** Cedar Grove Dam Wetland

Location: Right bank Tacony Creek next to Cedar Grove Dam

General Location: Tabor-Rising Sun

Disturbance/Condition: Invasive/Exotic Vegetation

Restoration Category Vegetation

Restoration Type: Wetland **Constraints:**

Acreage: 0.59

Site Priority: HV **Location Criteria:** No distinctive

Description:

This area is overrun with Japanese knotweed. The habitat could be greatly improved by controlling the knotweed. This could be done by volunteers, possibly supplemented by herbicide application done by park staff.

Restoration Options:

ID	Action	Priority	Proportion
B	Invasive-Exotic Control	HV	100%
C	Replant Native Herbs	L	100%
A	Structure Building (Boardwalk)	L	100%

Park: TC **Restoration Site ID:** V30A **Site Name:** Cedar Grove Flood Plain

Location: Between Cedar Grove Dam and Tabor Road Right Bank

General Location: Tabor-Rising Sun

Disturbance/Condition: Invasive/Exotic Vegetation

Restoration Category Vegetation

Restoration Type: Riparian Zone **Constraints:**

Acreage: 1.19

Site Priority: H **Location Criteria:** No distinctive

Description:

The area is overrun with Japanese knotweed. The habitat could be greatly improved by controlling knotweed and replanting native tree, shrub, and herbaceous species.

Restoration Options:

ID	Action	Priority	Proportion
B	Replant Native Forest Species	H	100%

Park: TC **Restoration Site ID:** V30B **Site Name:** Cedar Grove Flood Plain

Location: below dam west bank

General Location: Tabor-Rising Sun

Disturbance/Condition: Invasive/Exotic Vegetation

Restoration Category Vegetation

Restoration Type: Riparian Zone **Constraints:**

Acreage: 2.87

Site Priority: H **Location Criteria:** No distinctive

Description:

This area presents a remarkable opportunity to use natural process in conjunction with landscape plantings to reforest the floodplain while augmenting the planting with native species. Japanese knotweed should be removed, and a riparian strip should be planted to increase the width of the riparian forest to 35 feet. Part of the mowed area should be maintained as meadow by infrequent mowing.

Restoration Options:

ID	Action	Priority	Proportion
C	Replant Native Forest Species	H	50%

Park: TC **Restoration Site ID:** V30 **Site Name:** Cedar Grove Depression

Location: Right bank of Tacony next to dam-depressed area

General Location: Tabor-Rising Sun

Disturbance/Condition: Invasive/Exotic Vegetation

Restoration Category Vegetation

Restoration Type: Riparian Zone **Constraints:** Mill Race ?

Acreage: 0.37

Site Priority: H **Location Criteria:** Near other cultural resources

Description:

The depressed area that rings site V29 is a good site for planting with native, herbaceous wetland species. Careful attention must be given to any archeological resources. Knotweed and goutweed carpet the depression. . There is also trash and debris on the site which could be removed by volunteers. Vehicle use on the site has been observed, and control of access will be important to the success of the restoration.

Restoration Options:

ID	Action	Priority	Proportion
C	Replant Native Herbs	H	100%

Park: TC **Restoration Site ID:** V31A **Site Name:** Cedar Grove Cliff

Location: West of Cedar Grove Dam

General Location: Tabor-Rising Sun

Disturbance/Condition: None/Minimal

Restoration Category Vegetation

Restoration Type: Slope **Constraints:**

Acreage: 2.82

Site Priority: H **Location Criteria:** No distinctive

Description:

Red and white oak saplings along with black cherry, slippery elm and sassafras comprise the native understory. Replanting native shrubs would increase diversity of forest, as a native shrub layer is presently lacking.

Restoration Options:

ID	Action	Priority	Proportion
B	Replant Native Shrubs	H	25%
C	Gully Repair	M	100%

Park: TC **Restoration Site ID:** V31 **Site Name:** Olney Avenue Forest

Location: Between Rising Sun and Tabor off meadow on Olney

General Location: Tabor-Rising Sun

Disturbance/Condition: Invasive/Exotic Vegetation

Restoration Category Vegetation

Restoration Type: Forested Upland **Constraints:**

Acreage: 4.81

Site Priority: H **Location Criteria:** No distinctive

Description:

The forest has many native species, including regenerating oaks. However, exotics, including mulberry, Japanese honeysuckle and multiflora ros, are prevalent at this site. The forest has thin fragile soils on the slopes and is carpeted with goutweed. The understory is very disturbed. Controlling exotics and replanting native forest species would greatly improve biodiversity. The trails also need to be improved, as they are eroded and gullies are created during storms.

Restoration Options:

ID	Action	Priority	Proportion
D	Replant Native Forest Species	H	100%
E	Trail Improvement	H	100%

Park: TC **Restoration Site ID:** V32A **Site Name:** Rising Sun Flood Plain

Location: Between Rising Sun and Reading Railroad

General Location: Rising Sun-Adams

Disturbance/Condition: Invasive/Exotic Vegetation

Restoration Category Vegetation

Restoration Type: Riparian Zone **Constraints:**

Acreage: 0.85

Site Priority: HV **Location Criteria:** No distinctive

Description:

This site has had an almost continuous band of Japanese knotweed along the banks of Tacony Creek. Volunteers have used a variety of methods to control the knotweed. To date, these efforts have been remarkably successful. The removal of the knotweed has not only created habitat for native plants, but has opened up the vista of the valley. This effort should be continued by the volunteer groups to ensure that the knotweed does not grow back on the site.

Restoration Options:

ID	Action	Priority	Proportion
A	Invasive-Exotic Control	HV	100%
B	Replant Native Forest Species	L	100%

Park: TC **Restoration Site ID:** V32 **Site Name:** West bank slopes

Location: Slopes west of creek, near Reading RR

General Location: Rising Sun-Adams

Disturbance/Condition: Slope Erosion

Restoration Category Vegetation

Restoration Type: Slope **Constraints:**

Acreage: 5.19

Site Priority: H **Location Criteria:** Near other restorations

Description:

The slopes in this area contain forst with some patches of diverse, native understory, including spring ephemeral herbs. Exotics, including Japanese knotweed, are present as well. There are some erosion gullies at this site. They need to be repaired and the slope should be replanted with native species. Due to the proximity to the building at the top of the slope, there is not much room to use berms to control erosion. If feasible, expansion of the forest at the lower end would provide a more viable forest.

Restoration Options:

ID	Action	Priority	Proportion
D	Erosion Control	H	50%
B	Replant Native Trees	M	50%
C	Replant Native Shrubs	L	100%

Park: TC **Restoration Site ID:** V33 **Site Name:** Adams Ave. Wetlands

Location: Area adjacent to Adams Ave and Reading Railroad

General Location: Rising Sun-Adams

Disturbance/Condition: Invasive/Exotic Vegetation

Restoration Category Stream/Vegetation

Restoration Type: Wetland **Constraints:**

Acreage: 0.67

Site Priority: H **Location Criteria:** No distinctive

Description:

This wetland is located between Adams Avenue and the rail road. It was a picnic area but is no longer maintained and benches and other furnishings need to be removed. This area is one of the few remaining wetlands in Tacony Creek Park. It is dominated by cattails, but could be enhanced by wetland plantings. The area should be protected from development and should not be mowed.

Restoration Options:

ID	Action	Priority	Proportion
D	Protect/Monitor	HP	100%
C	Trash Removal	H	100%

Park: TC **Restoration Site ID:** V34 **Site Name:** Bingham Street Old Ball Field

Location: Between Roosevelt and Tabor

General Location: Roosevelt Blvd.-Tabor

Disturbance/Condition: Invasive/Exotic Vegetation

Restoration Category Vegetation

Restoration Type: Wetland **Constraints:** Desire to maintain as open

Acreage: 2.06

Site Priority: H **Location Criteria:** No distinctive

Description:

This site is currently an overgrown field, covered with a mix of exotic and native old field plants. The area was formerly maintained as a ball field. Residents said that the area retains water after storms. This was said to be recent, possibly due to floodplain deposition by Hurricane Agnes. The site represents an opportunity for wetland creation. At the minimum, creation of a wetland would entail excavation to ensure hydrology along with planting the area with native wetland herbs. A more complex design involving water control structures would improve hydrology. A intake on the creek above base flow levels to the upstream part of the wetland would provide water to the wetland during high flows. A one-way valve (e.g., a flap gate) would prevent return flow as the creek level fell. A outlet pipe would control water discharge from the wetland back into the creek, and a spillway would handle high flows. Monitoring for exotics is necessary to ensure success.

Restoration Options:

ID	Action	Priority	Proportion
A	Wetland Creation	H	100%

Park: TC **Restoration Site ID:** V35A **Site Name:** Golf Course Wetland

Location: North of Green#7 on Juniata Golf Course

General Location: South of Wyoming

Disturbance/Condition: Golf Course Impacts

Restoration Category Vegetation

Restoration Type: Wetland **Constraints:** Proximity to Golf Course

Acreage: 0.35

Site Priority: HP **Location Criteria:** No distinctive

Description:

This site is a small wetland, comprised mostly of cattails at the south end. The whole wetland is surrounded by a small early sucessional patch of woods (box elder, ash, cherry). A golf hole is almost touching the wetland. This area could be improved by managed mowing around the wetland and maintenance of the surrounding woods. Also, some informative signs posted around the wetland may improve understanding of the habitat in the middle of the golf course.

Restoration Options:

ID	Action	Priority	Proportion
B	Protect/Monitor	HP	100%

Park: TC **Restoration Site ID:** V35 **Site Name:** Juniata Golf Course

Location: East of Green #3 on Frankford Creek

General Location: South of Wyoming

Disturbance/Condition: Erosion/Scour

Restoration Category Vegetation

Restoration Type: Riparian Zone **Constraints:**

Acreage: 0.88

Site Priority: H **Location Criteria:** Near environmental Center

Description:

The grass is mowed up to the edge of the stream and the bank is a high, steep, and eroding. This site is an ideal site to begin to address the issues of golf course impact on the environment. Coordination with golf course management should be done to establish a forested riparian zone.

Restoration Options:

ID	Action	Priority	Proportion
C	Regrade	H	100%
A	Replant Native Forest Species	H	100%

Park: TC **Restoration Site ID:** V36B **Site Name:** Open field/Kudzu site

Location: Intersection of Ramona and "I" Sts.

General Location: South of Wyoming

Disturbance/Condition: Invasive/Exotic Vegetation

Restoration Category Vegetation

Restoration Type: Non-Forested Upland **Constraints:**

Acreage: 0.55

Site Priority: H **Location Criteria:** Near environmental Center

Description:

This site is dominated by Kudzu. The plant is taking over the open field area and the edge of the forest to the north. Controlling the kudzu and managing the area as a meadow is recommended. Kudzu can be difficult to remove and will likely require repeated efforts. Volunteers have already begun removal. Meadow management could be done using natural regeneration, with meadow maintained by periodic mowing or burning. The site is reported to contain concrete debris, which may need to be removed as part of restoration. Signage would allow site interpretation.

Restoration Options:

ID	Action	Priority	Proportion
A	Meadow Management	H	100%

Park: TC **Restoration Site ID:** V36 **Site Name:** Woods Adjacent to Juniata Golf Course

Location: Juniata Park

General Location: South of Wyoming

Disturbance/Condition: Channel Gully

Restoration Category Vegetation

Restoration Type: Forested Upland **Constraints:**

Acreage: 1.50

Site Priority: H **Location Criteria:** Near environmental Center

Description:

This site contains a large erosion gully that is cutting the slope and threatening a fairly intact forest community. This gully needs to be repaired by filling it in with soil, stabilizing the soil, and replanting native forest species. The trails should be better defined to reduce erosion.

Restoration Options:

ID	Action	Priority	Proportion
D	Gully Repair	H	20%
A	Slope Stabilization	H	80%
B	Trail Improvement	H	100%

Park: TC **Restoration Site ID:** V37 **Site Name:** Cayuga and Ramona Streets Forest

Location: Behind Rec. Center

General Location: South of Wyoming

Disturbance/Condition: Slope Erosion

Restoration Category Vegetation

Restoration Type: Slope **Constraints:**

Acreage: 7.07

Site Priority: H **Location Criteria:** Near environmental Center

Description:

The site is located at the bend of Tacony Creek and includes the slopes from Tacony Creek up to the plateau, where the Ferko Recreation Center is located. The site includes a large storm water culvert. The site has a mix of woods and open areas. Red oak is regenerating in the woods, and bluestem grass grows in open areas. The woods are more dense near the top of the slope. The woods are adjacent to the maintained area around the recreation center, which contains mowed lawn with mature native trees. The site is very attractive, but shows combined effects of water and trail erosion on the slopes.

The thin soil on the slopes is eroded in many places, for example over the storm water culvert. Several large gullies are present on the site. The top of the plateau does not hold water during storms, leading to slope erosion. Trail erosion further destroys vegetation and compacts soil, leading to further erosion. There are a number of rogue trails leading to the top of the culvert. A chain link fence encloses the site, but has several holes and does not keep people out.

The site needs erosion control, including water holding devices, such as berms, at the top of the slope. Gullies need to be filled, stabilized and replanted. Trail issues will need to be addressed.

Restoration Options:

ID	Action	Priority	Proportion
D	Erosion Control	H	25%
A	Replant Native Shrubs	H	80%
E	Replant Native Trees	H	20%

Park: TC **Restoration Site ID:** V38 **Site Name:** Andropogon Meadow Hill

Location: Wyoming Ave. West of Ramona Ave.

General Location: Wyoming-Whitaker

Disturbance/Condition: Vehicle Damage

Restoration Category Vegetation

Restoration Type: Non-Forested Upland **Constraints:**

Acreage: 2.13

Site Priority: H **Location Criteria:** Affects ecolog. Significant site

Description:

The meadows consists of an bluestem meadow divided into a large meadow with a smaller one to the north of it, with a distinct elevation in the center of it. This site (V38) includes the northern part and hill. The southern part isV39. The area and surrounding thickets contain a variety of native plant species. This is an unusual habitat type in the park and should be maintained. Residents report occasional burning, which may maintain the meadow vegetation. The site has been impacted by trail erosion and vehicular traffic. Cars are regularly abandoned on the site. Roads around the hill are heavily eroded. Control of vehicular access is essential to maintaining the site. Following control of access, the bald areas should be replanted with native herbs. Since the surrounding area supports native plants, extensive soil modification should not be done, since that may encourage exotic plants. Periodic maintenance (mowing, burning, cutting of trees and shrubs) may be necessary to maintain the meadow habitat. Part of the adjacent area outside the park is also meadow, with brush invading. Preservation and management of this adjacent area would increase the value of this area.

Restoration Options:

ID	Action	Priority	Proportion
A	Meadow Management	H	100%
B	Trash Removal	H	100%

Park: TC **Restoration Site ID:** V39 **Site Name:** Andropogon Meadows

Location: Off Wyoming North of Ramona

General Location: Wyoming-Whitaker

Disturbance/Condition: Vehicle Damage

Restoration Category Vegetation

Restoration Type: Non-Forested Upland **Constraints:**

Acreage: 5.50

Site Priority: H **Location Criteria:** Affects ecolog. Significant site

Description:

The large meadow habitat at this site is unlike any other in the park and should be maintained. The area and surrounding thickets contain a variety of native plant species. Residents report occasional burning, which may maintain the meadow vegetation. The site has been impacted by trail erosion and vehicular traffic. Cars are regularly abandoned on the site. Areas around the cars are virtually devoid of vegetation. Residents stated that the vehicular damage to the area has increased greatly in the last few years. The community mapping project identified the area as a site of paint ball games. Control of vehicular access is essential to maintaining the site. Following control of access, the bald areas should be replanted with native herbs. Since the surrounding area supports native plants, extensive soil modification should not be done, since that may encourage exotic plants. Periodic maintenance (mowing, burning, cutting of trees and shrubs) may be necessary to maintain the meadow habitat. It is clear that abandoned cars have been present for sometime and that vehicular traffic is destroying the field. A planting for the erosion gully accompanied by a meadow management plan would improve this area along with trash removal. The entire site should be monitored over time to determine management needs. Part of the adjacent area outside the park is also meadow, with brush invading. Preservation and management of this adjacent area would increase the value of this area.

Restoration Options:

ID	Action	Priority	Proportion
D	Gully Repair	H	20%
B	Meadow Management	H	50%
A	Trash Removal	H	100%

Park: TC **Restoration Site ID:** V40 **Site Name:** Slope Forests adjacent to Andropogon Meadows

Location: Between Andropogon meadows and Friends inholding

General Location: Wyoming-Whitaker

Disturbance/Condition: Slope Erosion

Restoration Category Vegetation

Restoration Type: Slope **Constraints:**

Acreage: 6.06

Site Priority: H **Location Criteria:** Affects ecolog. Significant site

Description:

The forest on the north facing slopes adjacent to the bluestem meadow is showing sign of stress due to erosion. The erosion is causing gullies to form which are eroding long sections of the woods. This erosion to the already fragile soil is exacerbated by the dumping of cars, vehicular recreational traffic and poor trail maintenance. Prior to any replanting or filling of gullies, the underlying problems mentioned will need to be addressed. The woods have a variety of native plant species, but many exotic plants as well.

Restoration Options:

ID	Action	Priority	Proportion
A	Gully Repair	H	10%
D	Invasive-Exotic Control	HV	100%
C	Replant Native Trees	M1	100%
B	Trash Removal	M2	100%

Park: TC **Restoration Site ID:** V43 **Site Name:** Bingham Street Forest

Location: South of Roosevelt Blvd adjacent to meadow

General Location: Whitaker-Roosevelt Bvld

Disturbance/Condition: Invasive/Exotic Vegetation

Restoration Category Vegetation

Restoration Type: Slope **Constraints:**

Acreage: 4.07

Site Priority: HV **Location Criteria:** No distinctive

Description:

Trash accumulation and invasion of exotic species plagues this area. The invasive trees should be removed. These activities could be done by volunteer groups. Trash dumping should be stopped.

Restoration Options:

ID	Action	Priority	Proportion
A	Invasive-Exotic Control	HV	100%
C	Trash Removal	HV	100%
B	Replant Native Trees	M	100%

Park: TC **Restoration Site ID:** V44 **Site Name:** Bingham Street Fields

Location: Open mowed lawns on Bingham Street

General Location: Whitaker-Roosevelt Bvld

Disturbance/Condition: Maintained Lawn/Mowed Field

Restoration Category Vegetation

Restoration Type: Slope **Constraints:** Possible open space use

Acreage: 2.77

Site Priority: H **Location Criteria:** No distinctive

Description:

This mowed area has been maintained as mowed lawn. Since the area appears to be seldom used, the lawn should be allowed to develop into a meadow. The edges of the forest should be allowed to expand to help keep the water at the top of the slope, which will reduce the stress to the slopes adjacent to the meadow.

Restoration Options:

ID	Action	Priority	Proportion
C	Release/Widen	H	100%
A	Replant Native Trees	M1	100%
B	Replant Native Herbs	M2	100%

Park: TC **Restoration Site ID:** V46 **Site Name:** Trim path flood plain forest

Location: Left bank of creek

General Location: North of Adams

Disturbance/Condition: Disturbed Floodplain

Restoration Category Vegetation

Restoration Type: Riparian Zone **Constraints:**

Acreage: 1.62

Site Priority: H **Location Criteria:** Affects ecolog. Significant site

Description:

This area is a flood plain forest that appears to be a place where people frequently gather, crating forest disturbance. The area should be supplemented with native flood plain forest planting. Trash should be removed.

Restoration Options:

ID	Action	Priority	Proportion
B	Replant Native Forest Species	H	30%
C	Trash Removal	HV	100%

Park: TC **Restoration Site ID:** V47A **Site Name:** Trim path riparian zone

Location: Along trim path north of Adams

General Location: North of Adams

Disturbance/Condition: Invasive/Exotic Vegetation

Restoration Category Vegetation

Restoration Type: Riparian Zone **Constraints:**

Acreage: 0.55

Site Priority: H **Location Criteria:** Affects ecolog. Significant site

Description:

This site could be improved by removing the Japanese knotweed and replanting native forest species. Many of these restoration efforts could be accomplished through the use of volunteers.

Restoration Options:

ID	Action	Priority	Proportion
B	Replant Native Forest Species	H	100%
A	Invasive-Exotic Control	HV	100%
D	Regrade	L	100%

Park: TC **Restoration Site ID:** V47 **Site Name:** Swimming hole Forest

Location: Left bank of Tacony Creek

General Location: North of Adams

Disturbance/Condition: Slope Erosion

Restoration Category Vegetation

Restoration Type: Slope **Constraints:**

Acreage: 5.57

Site Priority: H **Location Criteria:** Affects ecolog. Significant site

Description:

This site is adjacent to high quality forest and opening with a variety of native species. This site is being impacted by vehicles, gully formation and eroding trails. The slopes should be planted with native species to control erosion and vehicle access should be controlled. Trail issues will need to be addressed.

Restoration Options:

ID	Action	Priority	Proportion
A	Gully Repair	H	20%
B	Trail Improvement	H	100%

Park: TC **Restoration Site ID:** V48 **Site Name:** Tookany Creek Pkwy. Cliffs

Location: North of Adams west of creek

General Location: North of Adams

Disturbance/Condition: Slope Erosion

Restoration Category Vegetation

Restoration Type: Slope **Constraints:**

Acreage: 2.50

Site Priority: H **Location Criteria:** Affects ecolog. Significant site

Description:

The path going through this site has banks that need to be stabilized by filling in gullies and planting native plant species. Trash should be removed on an on-going basis.

Restoration Options:

ID	Action	Priority	Proportion
D	Gully Repair	H	20%
B	Trash Removal	HV	100%

Park: TC **Restoration Site ID:** V49 **Site Name:** Cayuga Street Forest

Location: Behind Rec. Center. On Frankford Creek

General Location: South of Wyoming

Disturbance/Condition: Slope Erosion

Restoration Category Vegetation

Restoration Type: Slope **Constraints:**

Acreage: 0.15

Site Priority: H **Location Criteria:** Near environmental Center

Description:

Lage gullies have been caused by slope drainage and trail use. The gullies should be filled and the bare slopes should be stabilized and planted with native shrubs and herbs. Trail issues need to be addressed.

Restoration Options:

ID	Action	Priority	Proportion
B	Gully Repair	H	100%

Park: TC **Restoration Site ID:** V51 **Site Name:** Tacony Creek Park

Location: Entire Park

General Location: Tacony Creek Park-All areas

Disturbance/Condition: Deer Damage

Restoration Category Vegetation

Restoration Type: Park Wide **Constraints:**

Acreage: 1.00

Site Priority: Hwhole **Location Criteria:** Affects ecolog. Significant site

Description:

Although deer do not appear to be causing a major disturbance in Tacony Creek Park, deer damage should be monitored to determine whether deer management needs to be considered and to help plan restorations involving replanting. At low deer densities, a low level assessment of browse damage is appropriate. If there is evidence of a strong increase in deer populations or deer damage, more intensive monitoring and assessment would be needed to develop management recommendations.

Restoration Options:

ID	Action	Priority	Proportion
A	Deer Monitoring	H	100%

Park: TC **Restoration Site ID:** V53 **Site Name:** Control Access

Location: Several

General Location: Tacony Creek Park-All areas

Disturbance/Condition: Vehicle Damage

Restoration Category

Restoration Type: Park Wide **Constraints:**

Acreage:

Site Priority: H **Location Criteria:**

Description:

Use of park roads and trails by cars, motorcycles and all-terrain vehicles (ATV's) is causing damage throughout the park. Vehicle use needs to be controlled. The control of vechicle access is particularly important south of Roosevelt Boulevard, and north of Adams on the slopes of the left bank of Tacony Creek.

Restoration Options:

ID	Action	Priority	Proportion
B	Control ATV/Dirt Bike Access	H	100%
A	Gully Repair	L	100%