Fairmount Park System

Natural Lands Restoration Master Plan

V O L U M E I I

Park-Specific Master Plans

Woodland path.

Cobbs Creek Park

For more information about the Fairmount Park System Natural Lands Restoration Master Plan,
please contact the offices of the
Natural Lands Restoration and Environmental Education Program
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1.A. TASKS ASSOCIATED WITH RESTORATION PLANNING

1.A.1. Introduction

Input from park staff and the community was sought throughout the inventory and planning process. At the start of the project in October 1997, through January 1998, site visits were conducted in each of the seven watershed parks 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 Cobbs 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 Cobbs Creek Park.

1.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 Cobbs Creek Park, held on November 30, 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 Cobbs Creek Park was held on January 11, 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 Cobbs 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.

1.A.3. Community Mapping

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 Cobbs Creek Park. The idea behind community mapping is to actively engage residents of the neighborhoods adjacent to Cobbs 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:

1. Increase the effectiveness of restoration activities within the park.
2. Increase the FPC staff awareness of the community's use of the park.
3. Increase the community's understanding of the park's natural areas.
4. 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 Cobbs 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 Cobbs 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 Cobbs Creek Park.

1.B. COBBS CREEK ASSESSMENT AND RESTORATION PLANNING

Bluebell Tavern.

1.B.1. Executive Summary

The Cobbs Creek valley has a long history of development, dating from early Swedish and Dutch settlement. The creek was used to power mills, and the valley was farmed. The lower portion of the park (786) acres between Woodland Avenue and Market Street was purchased over a 24-year period beginning in 1904, with subsequent additions. Much of the area was farmland at the time of establishment, so the vegetative communities are relatively young. However, the park has several patches of relatively old forest which pre-date park establishment.

In the 1998 assessment, factors that pose a threat to native biodiversity in Cobbs Creek Park were identified. The factors include an increase in the presence of exotic species, disturbed hydrology and human misuse of natural areas. All have contributed to the decreased number of native species in the park. The vegetative communities and levels of disturbance are shown in Vegetation Classification Map, Volume II, Section 1.

Very little faunal information on Cobbs Creek Park was located, and the inventory done as part of this study provides the most thorough assessment to date. The data on the park indicate that it contains a variety of animals, comprising the typical, widespread fauna of the region. For example, the breeding bird survey found several of the relatively habitat-specific woodland species, some in relatively high abundance, but found few rare species and a preponderance of species typical of suburbs and disturbed woods. Cobbs Creek Park is also used by migrating and wintering birds (1983 Master Plan and other observations). Similarly, the reptile/amphibian survey found several species occurring throughout the park, but only a few records of less common species. An important aspect of the park is the apparent low density of deer. While deer are present in the park, significant damage to vegetation was not noted. Anecdotal observations by Fairmount Park Commission (FPC) staff and park users suggest an increase in the frequency of deer and signs of deer 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 1.C.3.7) is important in future management of the park.

Cobbs Creek is located on the western edge of Philadelphia, draining 22 square miles of Philadelphia and surrounding areas such as Upper Darby. There are nearly 13 miles of stream in Cobbs Creek Park that eventually drain to the Delaware River. Most of this length is the main stem, 8.2 miles in total, while the rest of the total stream length is made up of tributaries such as Indian Creek and its tributaries, and smaller, un-named streams. The Cobbs Creek watershed covers more than 5.5 square miles in the City of Philadelphia. However, Cobbs Creek Park only occupies approximately 6% of the watershed. In fact, the majority of the watershed (about 77%) is developed land and only 15% of the watershed is forested. Interestingly, the Cobbs Creek watershed has a higher percentage of grassy areas than all of the other Fairmount Park system watersheds. Grassy areas such as golf courses and mowed lawns account for 7% of the total watershed area.

A stream is only as healthy as the watershed from which it flows. Cobbs Creek and its tributaries show the effects 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 Cobbs 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 into ground water which subsequently replenishes surface waters. Groundwater is depleted, causing low base flows (perennial, dry-season flows) in Cobbs Creek, while storms generate much runoff which leads to significantly increased stream flows. These changes to stream flow have altered stream channels to the point where some streams and portions of streams in Cobbs Creek Park cannot provide adequate aquatic habitat. However, several small streams are in better condition. Some streams have watersheds almost completely within the park boundaries, which protect them from some of the impacts of urbanization. The Stream Quality Map presented in Volume II, Section 1 illustrates the habitat quality and the urbanization impacts on each stream in Cobbs Creek Park, as determined by the screening-level assessment.

In addition to the physical, water quantity-related problems, parts of Cobbs Creek and its tributaries have severely degraded water quality. Although water quality is not specifically addressed by this restoration plan, it did arise as an issue for this park. 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 Cobbs Creek's water quality include typical urban pollutants such as vehicle fluids (oils, antifreeze) and household and lawn chemicals (detergents, fertilizers, pesticides). Still other impacts to some streams of Cobbs Creek Park come from Cobbs Creek and Karakung Golf courses. Those streams running through and adjacent to the golf courses are at a high risk of having water quality and water quantity related problems. Pesticides and fertilizers used on the courses may drain into the streams causing poor water quality. Furthermore, many of the streams within the golf course lack a forested riparian buffer, and in some cases the maintained grass is mowed to the edge of a stream bank. This practice does not allow beneficial stream-side vegetation to take root, and consequently stream banks can be very unstable.

A stream quality index (SQI) was developed to rate habitat quality of tributaries in Cobbs Creek Park. The SQI combines information on channel morphology, aquatic habitat (as indicated by macroinvertebrates) and riparian condition. Based on the SQIs, the majority of Cobbs tributary reaches were impaired, with several severely impaired reaches and no slightly or nonimpaired reaches. In comparison, over the entire Fairmount Park system, the majority of reaches were classed as moderately impaired.

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.

The 68 sites recommended as high priority for restoration include approximately 124 acres, composing 26% of the natural lands of Cobbs Creek Park and 15% 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 1. These areas include Morris Park, where wetland creation, control of invasive vegetation and forest replanting is recommended to build on high quality flood plain and slope forest. Bank stabilization, invasive control, replanting and trash removal are recommended in natural areas in Cobbs Creek Golf Course in order to enhance high quality woods and the Cobbs Creek channel. Activities in these upper areas will benefit the entire park, since these areas protect the upstream reaches of Cobbs Creek and its tributaries. A number of stream and restoration projects are recommended in the area between 63rd Street and Lansdowne Avenue. Projects include removal or modification of the Millbourne Dam, channel modification and bank stabilization in tributaries to reduce erosion, wetland enhancement, trash removal, invasive control and replanting. Wetland creation and improvement of flood plain forests is recommended in the area around the stable, which will house a new environmental education center. Coordination with the Philadelphia Water Department to control erosion which has exposed a sewer line south of Marshall Road is also recommended. Several restoration projects to control water runoff and repair gullies and slopes are recommended in the area around Whitby Avenue. The area north and south of 65th Street contains a variety of woods, tributaries, wetlands and flood plain habitats. Recommended restoration work in this area include invasive control, replanting, repair of gullies and eroded slopes, and wetland enlargement. At the southern end of the park, removal or modification of the dam above Woodland Avenue is recommended to improve conditions in the creek. In addition to these projects, control of invasive vegetation, especially Japanese knotweed, is recommended along much of the banks of Cobbs Creek. Vehicle use, including ATVs, motorcycles and cars, and associated dumping of trash, are major problems in much of the park. Control of vehicular access is vital to enhancing the park.

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.

1.B.2. Introduction

The Cobbs Creek Park watershed, hereafter referred to as Cobbs Creek Park (Cobbs Creek Watershed Map, Volume II, Section 1.F.), includes the contiguous lands along Cobbs Creek, including Cobbs Creek Park proper, Morris Park and Carroll Park. The park is located at the western edge of the city and includes lands outside the city in Delaware and Montgomery counties. The park extends to Woodland Avenue. Cobbs Creek joins Darby Creek about 4,500 feet below Woodland Avenue. The lower part of the Darby drainage is tidal and includes extensive tidal marshland in the John Heinz National Wildlife Refuge at Tinicum. Cobbs Creek is managed as part of FPC District 4, which also has responsibility for managing the ground of Bartram's Garden and street trees in much of West Philadelphia.

The main part of Cobbs Creek Park was established between 1904 with subsequent additions in 1911 (Morris Park) and 1929 (Carroll Park). Most of the park is a narrow corridor along the creek, sometimes along both banks and sometimes including only the east bank. The widest parts of the park are in the north, much of which is occupied by the Cobbs Creek and Karakung Golf courses (established in 1920). Both courses contain significant amounts of riparian, slope and upland woods in addition to the active golf course areas. Other relatively large blocks of land are in Morris Park, east of Karakung Golf Course (north of the creek, west of 63rd Street) and north of 65th Street (the "bocce facility woods").

For the most part, the park consists of a flood plain along the creek, low slopes and a narrow upland plateau. Wooded tributary ravines occur in the wider parts of the park, such as in the golf courses, the bocce facility woods, and the 65th Street woods. The flood plain varies in width, and parts of the flood plain, especially the west bank above and below West Chester Pike/Market Street, are outside the park and are developed. Parts of the flood plain in the park are mowed, such as north and south of Whitby Avenue. Most of the slopes are wooded and most of the upland plateau is mowed and landscaped. These upland areas include recreation areas (e.g., around Haverford and Lansdowne Roads, at Baltimore Pike, and around Whitby Avenue) with ball fields, playgrounds, and landscaped areas. Some of these areas, particularly those along roads or with picnic facilities (e.g., Lansdowne and 66th Street, and along Race Street), are heavily used at times for picnics. The park contains several buildings, including Bluebell Tavern (an historic site at Woodland Avenue), the stable (which will become a new environmental education center), small recreation pavilions, a bocce facility, and the golf course buildings. A few ruins, presumably mill buildings and spring houses are in the park. Morris Park has two old quarry sites, one of which is used as a log dump. There are two dams, one above Woodland Avenue and the Millbourne Dam above Market Street/West Chester Pike.

Cobbs Creek Park is accessible for much of its length from surface roads (especially Cobbs Creek Parkway) which parallel and cross the creek. Most notable is Cobbs Creek Parkway which parallels the park's eastern edge within Philadelphia. There is a network of paths in the park, though these do not form a well-defined trail system. Unpaved roads exist along parts of the creek, such as parts of one or both banks from 65th Street north to Karakung Golf Course, the west side of the West Branch of Indian Creek, and the east side of the East Branch of Indian Creek. Un-maintained

connectors between city streets and these paths occur in many places. These connectors cross slopes and are often highly eroded. They provide access to vehicles, which is a safety concern.

The upper part of the park consists of the valleys of the East Branch of Indian Creek, the West Branch of Indian Creek (also called Indian Run) and Cobbs Creek above Indian Creek. All are relatively small streams with steep sections where the creeks fall over bedrock and boulder substrates. The Millbourne Dam is presumably built on the most downstream of the steep drops over bedrock. There is a boulder riffle below the dam. Below this, the channel contains large amounts of shallow, gravel-sand-silt runs, with some deeper pools and cobble-gravel riffles. The creek rises quickly following rains and falls quickly to low base flows. While there are small wetlands along the creeks and main stem, these are mostly shallow and perched above the stream channel. Skunk cabbage wetlands occur along seeps in woods near the bocce facility and north of 65th Street. The lowest part of the creek in the park is mainly a long, shallow pool behind the dam at Woodland Avenue. Naylor's Run is the largest tributary in the lower creek. While the upper reaches of Naylor's Run (in Havertown and Upper Darby townships) are open, the lower part is contained in buried pipes and forms a stormwater outlet. There is a short, open reach in the park. The headwaters of Naylor's Run contain a Superfund site which is in the process of remediation. No human or wildlife health risks associated with the site have been identified within the park (EPA Citizen's Meeting, Superfund Site, Havertown, PA).

The current vegetation of the natural lands is affected by the historical land use within the drainage. Native American use of the area now in the park is not well documented, although artifacts and historical accounts indicate use at least as hunting and fishing areas by the Lenape Indians (Barrett 1975). Cobbs Creek was one of the early areas of settlement in the region, with a Swedish mill in 1646. Early estates were developed along the watershed, such as the Grange (built 1682 with a number of subsequent additions), which is located across from park lands in Delaware County. Over the next several generations much of the watershed was farmed and a number of industrial mills were built in the valley. A number of textile mills were built in Darby and Cobbs creeks to provide textiles for the War of 1812 (Barrett 1975), including several in the park, such as the Clinton textile mill in Carroll Park. Grist mills, saw mills and gunpowder mills were also located in the valley (Eckfeldt n.d., Barrett 1975). These used local wood for lumber or for fuel and depletion of wood eventually caused closing of some mills (Barrett 1975). Willows were planted around the gunpowder mills as a source of fuel (Barrett 1975). Mills typically involved construction of a dam and millrace, and creation of an impoundment, generating channel changes which may affect the flood plain and channel long after disappearance of the buildings or dam.

Aerial photographs taken in 1927 provide information on land use and vegetative communities in the valley not long after park establishment. Much of land was fields (crop or pasture) and small residential clusters. There was a narrow band of forest along much of the creek, corresponding to the older forests on the steep slopes. There were a few larger patches of woods as well. From the photographs, they appear to have been relatively large deciduous trees forming a closed canopy. One patch was on the east side of the creek below City Avenue. Much of this patch, identified as the "Wyndale" woods within Cobbs Creek Golf Course, is still present and was identified as significant habitat in the 1983 Master Plan. The area along the East Branch Indian Creek in Morris Park was a large wooded tract, which is still present. Another patch was on the west side of the creek south of West Chester Pike. A fragment of these woods is still present. A patch also occurred on the west side of the creek around Mt. Moriah Cemetery. Much of this woodland is still present. The area north of the creek, west of 63rd Street and south of Race Street (the bocce facility woods), which is now one of the larger woods in the park, was largely open, with small, open groves of large trees. Examination of current conditions (i.e., extent of woods, presence of old roads, open-grown tree

forms, etc.) and maps and photos indicate reforestation of other areas, such as the area between the West Branch and East Branch of Indian Creek.

1.B.3. Existing Conditions Inventory and Assessment

1.B.3.1. Introduction

Existing information and new information collected as part of the 1998 inventory are discussed in Section 4 of Volume 1. 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 Cobbs Creek Park are presented. This section focuses on condition and disturbance of 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.

1.B.3.2. Vegetation and Flora

This section focuses mainly on the existing condition and problems and issues associated with the severe alteration of the natural vegetative communities of Cobbs Creek Park. The Vegetation Classification maps (Section 1.F., Volume II) illustrate the vegetation classification and levels of disturbance for Cobbs Creek Park. Despite these problems, the park still supports a myriad of plant and animal species that would otherwise be absent from the area.

Description of Vegetation. The description of park vegetation in the 1983 Master Plan (Rhoads 1983) provides a basis for comparison with current conditions. The woodlands of Cobbs Creek Park were reported to be impacted both by erosion of soils from stormwater runoff and compaction of the soils from recreational activities. The common canopy species found on upland areas and slopes were oaks, ash tulip and beech. The understory was reported to be sparse due to human disturbance, but where understory was present, it consisted of cherry and ash saplings and spicebush. It was also reported that Japanese honeysuckle vine was a problem in the wooded areas. The mature flood plains contained ash, willow and sycamore, while the more disturbed flood plain areas consisted mainly of ash and box elder. The golf courses were reported to support a few large stands of forest containing oak beech and tulip poplar and were said to have an understory of dogwood and witch-hazel. Those forested areas which were visibly disturbed by the runoff from golf courses contained sassafras, black locust and black cherry. There is no mention in past reports of the Japanese knotweed on the banks of Cobbs Creek. This may indicate that the problem began sometime after the 1983 survey and was exacerbated by the increased human disturbance of the area. A specimen of an uncommon shrub (*Elephantopus carolinianus*) was found in Morris Park.

Numerous and varied habitats can be found in Cobbs Creek Park. This park contains large forested areas, wetlands, disturbed streambanks and riparian zones, and small, fragmented woods, which are dominated by exotic species. It also contains two large golf courses, Cobbs Creek Golf Course and Karakung Golf Course, which support a few stands of mature forest. One area in particular, between the Cobbs and Karakung golf courses, is a forest of mixed oak, hickory and beech. There are also beech-maple communities in this section of the woods. These woods have a rich understory of spring ephemerals, though of relatively low diversity compared to undisturbed forest. Overall, this section of the golf course is very diverse and free of exotic species. However, the neighboring forest is overrun with *Ailanthus*, Norway maple, mile-a-minute (*Polygonum perfoliatum*) and multiflora rose. Healthy, mature forest also grows between the Cobbs Creek Golf Course, Daggett Street and the creek (the bocce facility woods). While this area has mature canopy trees and regenerating saplings, it has a low diversity of native herb and shrub species. The impacts from human disturbance are also beginning to show in the areas surrounding the dense forest. Yard

waste and overall dumping of large appliances is commonplace at the 66th and Daggett streets site. The few wetlands in Cobbs Creek Park were either marshes containing the invasive species common reed (*Phragmites australis*) and cattail (*Typha latifolia*), wet areas composed of Japanese stilt grass (*Microstegium vimineum*), lesser celandine (*Ranunculus ficaria*), sedges and other wetland forbs, or small seeps with skunk cabbage (*Symplocarpus foetidus)*. The riparian zones and streambanks of Carroll Park and Morris Park, particularly along the East Branch Indian Creek and West Branch Indian Creek (Indian Run), are inundated with the exotic species Japanese knotweed (*Polygonum cuspidatum*). Other riparian zone and flood plain species observed were tulip poplar (*Liriodendron tulipifera*), red maple (*Acer rubrum*), silver maple (*Acer saccharinum*), box elder (*Acer negundo),* green ash (*Fraxinus pennsylvanica*), sassafras (*Sassafras albidum*), black cherry (*Prunus serotina*), black walnut (*Juglans nigra*) and black locust (*Robinia pseudoacacia*). Small fragmented areas of woods exist in the southern end of the park. The forests in these areas are relatively young and show signs of disturbance due to the impacts from ATVs and other human activities. The plant species most commonly found in these areas are successional species such as cherry, ash, and box elder. A larger patch of woods is found north of 65th Street. This area has mature beech, tulip poplar and oaks, but has many exotics in more disturbed parts of the woods. It has a dense understory of spring ephemerals. The exotic species Norway maple (*Acer platanoides*) is common along the edges of the park, particularly near Sherwood Avenue and along the southern part of the park**.**

Cobbs Creek Park has a low density of deer. Therefore, despite the human disturbance in this park, the understory is not as affected as it is in parks that are overpopulated with deer. Human impact is obvious in the park. Dumping of cars and trash, especially in the southern end of the park and on the slopes at 66th and Daggett streets area, causes erosion of the slopes and also affects the understory and regeneration of canopy species considerably. Once the canopy is open in these disturbed areas, exotic and invasive species are able to outcompete native species which do not flourish in open light situations (e.g., oaks and hickories). In this situation, exotic vine species such as oriental bittersweet (*Celastrus orbiculatus*) and Japanese honeysuckle (*Lonicera japonica*) have invaded the canopy, as well as the native, but aggressive species of grape (*Vitis* spp.) and poison ivy (*Toxicdendron radicans*). In one site in particular, the exotic species *Akebia quinata* has invaded approximately four acres of forest canopy. Species of trees, shrubs, vines and herbs found in the 1998 survey of all of the parks are listed in Appendix A-1.1 in Volume III.

Exotics/Invasives. Increased disturbance has led to a decrease in native plant species. Wetlands that do occur in the park are often too small to perform the function of water purification or storage and rarely support diverse wetland species. Most riparian zones and many flood plains contain Japanese knotweed, many of them being dominated by this species. The riparian zones of Carroll Park demonstrate how this exotic species has outcompeted native streambank vegetation. An exotic-dominated understory is common in wooded areas of Cobbs Creek Park even where the canopy contains native tree species such as oaks and hickories. Some of the most common exotic tree species that occur in Cobbs Creek Park are Norway maple (*Acer platanoides*), which occurs primarily along the edge of the park, in particular adjacent to areas where large street trees have been planted, tree-of-heaven (*Ailanthus altissima*) and paper mulberry (*Broussonetia papyifera*). Exotic shrubs that are prevalent include multiflora rose (*Rosa multiflora*), winged Euonymus (*Euonymus alatus*), wineberry (*Rubus phoenicolasius*) and Amur honeysuckle (*Lonicera maackii*). Herbaceous species include lesser celandine (*Ranunculus ficaria*), goutweed (*Aegopodium podagraria*), Japanese hops (*Humulus japonicus*), garlic-mustard (*Alliaria petiolata*), and Japanese stiltgrass (*Microstegium vimineum*), which are all commonly found in both forests and wet areas of the flood plains and riparian zones. Exotic woody vines, especially Japanese honeysuckle (*Lonicera japonica*) and Oriental bittersweet (*Celastrus orbiculatus*) and wisteria (*Wisteria floribunda*) are abundant throughout the park. In Morris Park, the exotic vine *Akebia quinata* has taken over approximately

four acres of land, covering not only the herbaceous layer, but extending into the canopy as well. The herbaceous vine mile-a-minute (*Polygonum perfoliatum*) occurs in small patches at several sites, mainly near the branches of Indian Creek and the bocce facility.

Human Impact. The areas surrounding Cobbs 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.

Many parts of the park, especially in the central and southern ends, are deemed unsafe by community members and are therefore less extensively used for walking, biking or observing nature. Instead, these areas are used as places to dispose of stolen cars, as obstacle courses for all-terrain vehicles (ATVs) and motorcycles, and as trash-dumping sites. ATVs disturb the soil and destroy any vegetation which may be growing in the area. In doing so, they either create open habitats which are ideal for aggressive non-native plant species or create packed soil on which nothing grows. The effect of this activity is most apparent on slopes, where ATV use fosters erosion. Once these areas are disturbed and free of ground cover they serve as conduits for stormwater runoff. Stormwater flows down the slopes and into the creek taking with it any pollutants from city streets. This certainly has a major impact on water quality and the biota within the creek. Restriction of unauthorized vehicle access, such as by concrete barriers at points of access, is necessary to maintain the integrity of the natural lands.

1.B.3.3. **Community Mapping Results**

The community mapping initiatives in Cobbs Creek Park resulted in the mapping of over 300 items throughout the park. The Community Results map in Volume II, Section 1.F., shows 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 exercises.

Trail/Barriers. An extensive network of trails throughout Cobbs Creek Park was mapped. It was often difficult to determine formal, marked trails from 'rogue,' or unofficial trails. Too many trails throughout the park can cause fragmentation of habitats, erosion and ecosystem damage. Barriers to access exist in only a few spots throughout the park. Some are man-made (e.g., poles, fences, concrete 'Jersey' barriers) and some are natural (e.g., fallen trees, steep slopes). Some trail entrances, or 'heads,'are difficult to find because they have become overgrown.

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. Few trash cans were found throughout the park. Adding trash cans to the park, however, is not always the answer to the presence of trash because people often place their household garbage in the receptacle, thus, actually increasing the amount of trash within the park. Larger-scale dumping of items such as household appliances and construction debris occur at several locations. Dumping was generally concentrated in the central and northern sections of the park, such as south of Marshall Road, north of Market Street and near 66th Street at the bocce facility. Most dump sites are on low traffic streets with poor lighting or those streets that dead end at the park. A sewer line runs the length of Cobbs Creek Park and sewer smells were reported in several locations. It is important to note, however, that sewer smells are not always indicative of a problem. Evidence of pollution in the stream was found both north and south of Market Street.

Graffiti. Graffiti was found throughout the park, although it tended to be concentrated towards the northern end. Graffiti typically occurred on bridges, foundations, rock outcrops and some trees. A particularly 'scarred' graffiti area is under and around the Marshall Road bridge. Graffiti tended

to be less prevalent in the southern end of the park, perhaps because this portion is narrower and therefore more visible from the adjacent streets and neighborhoods. There are also fewer structures (targets) in this section of the park.

Cars/Fire Sites. These two items were grouped together because abandoned cars often become the targets of fire. Cars are typically abandoned in a few selected sites throughout the park, such as north of Haverford Avenue, Marshall Road, around Mt. Moriah Cemetery and in the vicinity of south 65th Street. FPC staff periodically removes all abandoned cars from the park and is constantly trying methods to keep abandoned cars from entering the park.

Invasive Plants. Non-native invasive plants were found throughout Cobbs Creek Park. Typical landscape plants such as English ivy, pachysandra, bamboo and honeysuckle were found throughout the middle and upper sections of the park. These are probably the result of people throwing their yard clippings into the park. A large, 4-5 acre stand of the invasive vine *Akebia* is located at 68th and Malvern streets. Other invasives found include Japanese knotweed, Norway maple, oriental bittersweet, mile-a-minute vine, garlic-mustard and wild grape.

All-terrain Vehicles. 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 Cobbs Creek Park. ATVs appear to enter the park from adjacent city streets and seem to prefer long trails with challenging terrain. 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: 68th and Malvern, Market St. to south of Marshall Road, around the proposed environmental education center site, Mt. Moriah Cemetery and north of Baltimore Avenue. The southern end of Cobbs Creek Park appeared to be less impacted by ATVs, perhaps because of the narrow shape of the park.

Illegal/Unsafe Use. This category includes party sites, hangouts, reported areas of drug activity, physical hazards and other safety concerns. Participants noted a concern for personal safety along trails with dense vegetation and reported illegal activity in the area around Whitby Avenue. Party sites, evidenced by trash, cans and bottles, usually occurred in areas along low use trails and areas of dense vegetation. Reports of drug activity were noted in some sections of the park. However, no evidence of this activity was found.

Positive Features. During the community mapping initiatives, participants noted many positive features throughout Cobbs Creek Park. Three forts and three tree houses where children play were noted. Additionally, the park is used extensively for picnicking, running, walking, hiking, horseback riding, dog walking and fishing. Many native plant species, including mayapple, white oak, black oak and tulip poplar were noted during the mapping initiatives.

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

1.B.3.4. **Fauna**

The following sections provide specific information on the fauna of Cobbs Creek Park, as indicated by the ANSP 1998 inventory and other sources of information. The Habitat Classification maps (Volume II, Section 1.F.) illustrates 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. Cobbs Creek Park was surveyed for birds on 10 and 24 June 1998. Additional observations were compiled from other survey elements. An interesting aspect of the park that

contrasts with Wissahickon and Pennypack parks is the absence of deer. This absence of deer does not necessarily help bird species dependent on large areas, because the forested tracts in Cobbs Creek are small. However, deer absence does allow higher quality forest habitat for species such as Wood Thrushes and Red-eyed Vireos that don't require large areas.

The forest in most of Cobbs Creek Park is relatively young compared to that in the Wissahickon valley or Pennypack Creek Park. Much of the park is currently modified for recreational purposes and the abundance of birds like Kingbirds, Robins, Catbirds, and Chipping Sparrows reflects this. The forests that do exist in the upper half are in varying states of condition. Along the East and West Branches of Indian Creek, there is an abundance of Japanese knotweed and Norway maple, particularly near Sherwood Avenue. Forest remnants between the golf course, Daggett Street and the creek are attractive, but the size of the area appears to be limiting bird diversity. On the lower stretches of the park, impacts from ATVs and other human activities limit the availability of quality habitat.

Of the 48 summer residents observed in Cobbs Creek Park, 43 are considered to be probable breeders. A total of 173 individuals of the indicator species were observed during the survey (see Appendix A-2.1 in Volume III).

Mollusks. Limited historical information on Cobbs Creek makes it difficult to assess changes in the fauna. The 1998 inventory found eight species, including only three native species of mollusks (see Volume I, Section 4). As throughout the park, much of the native fauna is rare or absent. Introduced slugs of several species and the introduced snail *Discus rotundatus* are common, even in the larger, less disturbed forests of the park.

Crane Flies. Two sites (CF33 and CF34) in the upper portion of Cobbs Creek Park were sampled by aerial netting in July 1998. Sampling was carried out in conjunction with the herpetological and mollusk surveys. Both sites had very low diversity of crane flies typical of stream, stream edge, and wooded habitats, and no crane flies typical of marsh habitats. The low diversity is striking given that these sites are in the upper portions of the Cobbs watershed and that one of the sites contains some relatively undisturbed woods and flood plain habitats.

CF33: This site encompassed Carroll Park, the extreme upper portion of Cobbs Creek. A total of 9 species was found, a low number when compared with other sites sampled at the same time (e.g., CF27 in Pennypack with 25 species). Stream species were depauperate with only larvae of *Tipula* (*Nippotipula*) and *Antocha* found, both from the separate quantitative study and this sampling. Few stream-edge species were seen. No species were found that would be restricted to shaded or open marsh habitats, indicating the absence of these habitats. Four species of *Nephrotoma* were the only terrestrial soil species and few species were found that use wet or drier decaying wood habitats. The capture of one terrestrial species, *Nephrotoma cornifera*, represents the first for this species in this region and was not found in any other park during 1998.

CF34: This site includes the upper portion of East Branch Indian Creek in Morris Park, just above and below Sherwood Avenue. Only four species were found based on adults, a very low number when compared to other sites sampled at similar times. In addition to the adults sampled, the quantitative macroinvertebrate sampling recorded *Antocha* larvae close by this site in the West Branch Indian Creek. The few species, although representing aquatic stream, stream edge and terrestrial habitats, indicate poor stream and woodland environments and the absence of any marsh habitat.

Other Areas: During the aquatic macroinvertebrate sampling, the flood plain of Indian Creek within Karakung Golf Course was noted to have numerous troughs of standing water. These vernal habitats, even if man-made originally, may be good habitat for a group of insect species

adapted to intermittent aquatic habitats. For example, six species of crane flies use this environment. Unfortunately, these species are adults in September and October and were not evident during the Cobbs Creek sampling period in July 1998.

Herpetofauna. A few species of reptiles and amphibians are probably widespread in the park, especially in larger tracts of land north of Market Street/West Chester Pike, where most observations were made. Redbacked salamanders are widespread in wooded parts of the park and two-lined salamanders are common along the streams in the northern part of the park. The snapping turtle, eastern garter snake, northern water snake and brown snake are probably widespread, though there are relatively few records of each. Green frogs and bullfrogs are found in the main creek and are common even in the southern part of the park. Children were observing, catching or keeping tadpoles in this area. The only black racer observed during the inventory was seen in Cobbs Creek Golf Course. The northern dusky salamander was observed in a skunk cabbage seep in the park. This species is uncommon in the park, although it is often a common species in undisturbed streams. The tributaries north of the park, outside of the city, may provide sources for some species. For example, painted turtles are common in a pond along the West Branch Indian Creek. Species dependent on breeding ponds (spring peeper, American toad, some salamanders), spring runs, and associated streams (red salamander) were not found in Cobbs Creek Park. Most of these species are local within the entire Fairmount Park system. Most species of reptiles and amphibians are vulnerable to habitat modification (especially draining of wetlands, soil compaction, understory disturbance), predation (e.g., by birds, domestic and wild mammals), and mortality (crossing roads, collection or killing by people). The distribution of reptiles and amphibians in Cobbs Creek Park indicates the importance of maintaining large areas of different habitats for these species.

Fish. No historical information was located on the fishes of Cobbs Creek. Some recent collections by Normandeau Inc. and R. Horwitz provided information on fish in the northern end of the park. As part of the ANSP 1998 inventory, collections were made at the mouth of Naylor's Run, in the West Branch of Indian Creek (also known as Indian Run), and in the main stem below Marshall Road (see Appendix A-5.3 in Volume III). Incidental observations of fish were also made in various parts of the park, such as Indian Creek above its mouth and in the main stem of the creek. Cobbs Creek drains into Darby Creek in the tidal reach of Darby Creek, below the park section of the creek. Collections of fishes have been made by Pennsylvania Fish and Boat Commission (PFBC) and the Pennsylvania Department of Environmental Protection (PADEP) in Darby Creek and tributaries, providing reference comparisons to a less urban drainage. These data are summarized in Appendix A-5.3 in Volume III.

East Branch Indian Creek, West Branch Indian Creek (Indian Run) and Cobbs Creek above Indian Creek are relatively small with a mix of fast, shallow areas with rocky substrates (riffles), relatively deep areas with slow current (pools), and areas of moderate depth and current velocity (runs) areas providing habitat for the typical small stream fish species. Where sampled, the upper reaches had moderately large numbers of several species of fish (e.g., blacknose dace, creek chub, common shiner, and white sucker) which are the most common and widespread small stream species in the area. A few other species were caught or have been recorded in these reaches as well. Eels, which are born in the ocean and ascend streams as small juveniles, have been caught in upper Cobbs Creek, well upstream of the dam above Market Street. However, eels were not caught in the West Branch Indian Creek sample. Although these sites have a mix of habitats containing a variety of fish, the streams show impairment which can affect fish communities. The disturbed flow regime (high storm flows and low base flows) can affect fishes by disturbing spawning, increasing summer water temperatures and decreasing summer habitat volume. The streams have poor macroinvertebrate faunas, which, along with terrestrial insects which fall into the stream, provide the major part of stream fish food. Episodic mortality has been reported in the last few years. Fish kill resulted from

an illegal pesticide release in the West Branch of Indian Creek upstream of the city and from a water main break in Cobbs Creek. While these events have been local and fish have recolonized the sites, such events may impair the fish communities. Such events may have been more common in the past, and current distribution may reflect historical events.

The downstream samples, in Naylor's Run and in the main stem below Marshall Road, had most of the same species found upstream, plus large numbers of swallowtail shiner (at both sites) and mummichog (at both sites and observed elsewhere in the main channel). The swallowtail shiner is a native species typical of shallow sand-silt habitats. It has apparently increased in the area, presumably with the increase in sedimentation and decrease of vegetated pools. The mummichog is an abundant estuarine species in both freshwater and brackish tidal marshes and channels. Adults eat algae, decaying plant material (detritus) and aquatic invertebrates. Its common occurrence in nontidal freshwater streams could reflect its tolerance to dissolved salts, its ability to adapt to rapidly changing flow conditions, and/or its ability to feed on algae. In Naylor's Run, it was found in small eddies and runs among riffles. In any case, its occurrence is probably linked to the impaired hydrology or water quality of the creek. In addition to the species collected, there were reports of fishermen catching bullheads and carp in the lower creek.

Several species which are common in the region have not been recorded from Cobbs Creek. These include the spotfin shiner, satinfin shiner, longnose dace, banded killifish and tessellated darter. The cutlips minnow is common in Darby Creek, but has not been recorded in Cobbs Creek or other drainages to the east of Cobbs Creek. These species are not known to be especially sensitive to water quality and apparently suitable habitat is present. The spotfin shiner is common in Tacony Creek, which has many of the same disturbances as Cobbs Creek. Introduction of some of these (especially spotfin shiner or satinfin shiner, and tessellated darter) could increase the natural fish diversity of this system.

Wetlands along the creek are small, shallow and do not have permanent stream connections to the creek. As a result, they are insignificant to fish. Riparian wetlands can be important to fish in the region. Some species, like the Eastern mudminnow (*Umbra pygmaea*) and bluespotted sunfish (*Enneacanthus gloriosus*), occur mainly in such habitats in southeastern Pennsylvania. Creation of permanent wetlands could provide habitat for these and other species.

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.

The only data available on the east branch of Indian Creek was from an October 1989 Rapid Bioassessment Protocol screening (RBP, a USEPA sampling protocol for screening small screens for impairment) in which a total of eight taxa with two EPT taxa were found (see EPT index in Section IV.F.8).

Data are available from West Branch of Indian Creek from several dates and locations. In 1993, three locations on the stream were examined in response to a chemical contamination event. These surveys described mollusks, worms and chironomid midges to the genus level. The

"unaffected" or control site had 11 taxa, whereas 0.1 miles down stream only 3 taxa and no EPT taxa were found. Near this study site, six taxa and one tolerant EPT taxon were found.

The West Branch of Indian Creek was also sampled as part of the survey of Pennsylvania's Unassessed Waters Program in October 1998. These state investigators found 10 taxa and 2 EPT taxa.

The reach of stream designated as the main stem of Indian Creek was sampled as part of an incident investigation in 1978. Most of the survey focused on Cobbs Creek, and the only Indian Creek site sampled was near the main stem Indian Creek site. Nine taxa and two EPT taxa were collected.

The benthic macroinvertebrates of the main stem of Indian Creek were also sampled as part of the survey of Pennsylvania's 1998 Unassessed Waters Program in August. These state investigators found 12 taxa and 3 EPT taxa.

The only other streams with available benthic macroinvertebrate data in Cobbs Creek Park were Cobbs Creek itself and Naylor's Run. Cobbs Creek was first surveyed in 1978 as part of an incident investigation. In August, four locations between City Line Avenue and Lansdowne Avenue were surveyed and 6, 3, 2, and 6 taxa (in down stream order) were found. The numbers of EPT taxa collected from the sites were 2, 1, 1, and 3 (also a downstream progression).

Cobbs Creek was also surveyed as part of an ecological assessment sponsored by Philadelphia Suburban Water Company. Sampling was done above and below Manoa Road as well as near City Line Avenue in May 1997. In a downstream progression of sites, 7, 7, and 9 taxa were collected. The numbers of EPT taxa represented at the sites were 2, 1, and 2, respectively.

The most recent assessment of Cobbs Creek was an August 1998 survey for the PADEP's Unassessed Waters Program. The study location was near the Wooden Bridge (i.e., near the stables) where 10 taxa and 2 EPT taxa were found.

Naylor's Run was sampled twice. First in March 1975, as part of an incident investigation, the DEP found 7, 0, and 1 taxa along the length of Naylor's Run. The station with EPT taxa was the one with 7 taxa. The data did not denote the exact sample locations.

Naylor's Run was also sampled for the PADEP's Unassessed Waters Program in August 1998. Investigator collected 5 taxa and 2 EPT taxa.

No data for the other Cobbs Creek Park tributaries were found.

1998 Benthic Macroinvertebrate Survey: Although the PADEP provided some very current data, it is considered "historic" because it was not part of the ANSP survey and employed different methods. This section deals exclusively with the results of ANSP's 1998 benthic macroinvertebrate survey. The benthic macroinvertebrate communities of the 32 streams from 3 different analytical perspectives were examined. This section details the results from the five locations examined in Cobbs Creek Park. As discussed in Section 4.F.8 in Volume I, Ecological Community Metrics, Community Stress Metrics, and Functional Feeding Group analysis were used to describe the condition of benthic macroinvertebrate communities in the Fairmount Park system. In interpreting the results for individual streams, it is important to note that streams are heterogeneous and patchy by nature. Replicate samples were not analyzed for this study because that aspect was not within the scope of this study. The replicate samples remain on hand for subsequent analysis at another time, pending funding. Meanwhile, the results for individual streams should be considered with caution.

Indian Creek drains into Cobbs Creek and is formed from the subterranean confluence of two branches. As described above, East Branch Indian Creek is used for one branch (also variously known as Indian Creek and Indian Run), and West Branch Indian Creek is used for the western branch (also variously known as Indian Run and Little Indian Run). Within the park, the East Branch of Indian Creek flows from City Avenue (between 66th and 69th Streets) to a culvert at Lansdowne Avenue. Under Lansdowne and Haverford Avenues, the East and West Branches merge into the main stem of Indian Creek.

Sampling occurred upstream of the culvert representing the downstream boundary of the East Branch. The samples were collected within 100 meters of the culvert. The site is exposed to several combined sewer overflow (CSO) outfalls within the park and perhaps several beyond the city limits. On several visits to the stream, a septic odor, or a chlorine odor emanated from the stream.

Total abundance of macroinvertebrates was low (160 organisms/m^2) and taxa richness (7) 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. There were only two EPT taxa represented in the samples and Chironomid midges made up about 80% of the community. Non-insects composed an additional 7%, so that 87% of the community was made up of these opportunistic groups.

Functional groups were dominated by collector-gatherers (90%) and collector-filterers (9%), so that 99% was composed of collectors. The remaining 1% was represented by predatory invertebrates, which are also generalists of a sort. The community lacks shredders, which are the specialists that define small streams. Additionally, populations of scrapers should also occur here.

Although the stream exhibits impaired biota and degraded habitat, it is not believed that habitat restoration will significantly improve the diversity or integrity of benthic communities until water quality issues, especially sewage, are addressed.

Within the park, the West Branch of Indian Creek flows from City Avenue (near 72nd Street) to a culvert at the softball field near Haverford and Lansdowne avenues. The subterranean confluence of East and West branches of Indian Creek occurs in this culvert and forms the main stem of Indian Creek.

Sampling occurred about 75 meters upstream of the culvert. Within the park there is at least one suspect combined sewage outfall (CSO), but there may be additional sources upstream of the park boundary. Extensive growth of filamentous green algae on most cobble-sized stones at the sampling site provides evidence of some source of excessive nutrient runoff. Additionally, the stream banks appear to be comprised of fill material, as distinct strata of trash and leaf materials are exposed in the banks.

Total macroinvertebrate abundance was low (approximately 135/ m^2). Taxa richness was low (8), but about average for the streams studied in this survey. Diversity and evenness were higher than for all other streams in Cobbs Creek Park, but still lower than expected. There were only two EPT taxa collected and chironomids made up about 49% of the community. Both were about average for this survey, but both also suggest significant environmental degradation. Non-insects composed about 8% of the community and the Hilsenhoff's Biotic Index (HBI) score was 4.99. These are about average for the survey, but somewhat higher than typical.

Functional groups were dominated by collector-gatherers (84%) and collector-filterers (13%), so that 97% of the community was dominated by collectors. The remaining 3% was composed of predators (2%) and shredders (1%).

Although the stream exhibits impaired biota and degraded habitat, it is not believed that habitat restoration will significantly improve the diversity or integrity of benthic communities until water quality issues, especially sewage, are addressed.

On the main stem Indian Creek, samples were collected from a riffle area downstream of a golf cart bridge, which was located about 100 meters upstream of the confluence with Cobbs Creek. The site was subject to additional sewage inputs, as standing grey water was evident in pools upstream of the Cobbs Creek Golf Course. The upper end of this reach was characterized by deeply incised banks and shopping carts, children's toys and debris dams in the stream. The golf course may also contribute to loads of nitrate and pesticides in the stream.

Total macroinvertebrate abundance was high (1408/m^2). Taxa richness was low (6), both relative to other sites in this survey and in terms of expected levels for similar streams. Diversity (1.11) and evenness (0.62) were about average for this survey, but lower than expected for similar streams. The two EPT taxa collected were fewer than typically collected. Chironomids made up about 60% of the community and non-insects composed an additional 6%. The HBI score of this stream was 5.16, suggesting organic enrichment.

Functional groups were dominated by collector-gatherers (94%) and collector-filterers (6%). Collectors made up 100% of the community.

Although the stream exhibits impaired biota and degraded habitat, it is not believed that habitat restoration will significantly improve the diversity or integrity of benthic communities until water quality issues, especially sewage, are addressed. However, riparian restoration of the banks in the golf course could benefit streams in the future.

Cobbs Tributary 3, a small, unnamed tributary, flows from about 77th Street and Woodcrest Avenue, through Cobbs Creek Golf Course and into Cobbs Creek. The confluence with Cobbs Creek is formed by a concrete artificial riffle in Trib. 3. Sampling occurred between the artificial riffle and a golf cart bridge. The sampled reach was open to sunlight and incised.

Total macroinvertebrate abundance in Cobbs Tributary 3 was moderate (923/m^2). Taxa richness was low (10), but high relative to the other streams considered in this survey. Diversity (1.34) and evenness (0.58) were about average for this survey, but lower than expected for similar streams. The three EPT taxa collected were fewer than typically collected but were the greatest observed in Cobbs Creek Park. Chironomids made up about 49% of the community and non-insects composed an additional 15%. The HBI score of this stream was 5.18, suggesting organic enrichment.

Functional groups were dominated by collector-gatherers (97%) and collector-filterers (2%). Collectors made up 99% of the community. The remaining 1% was made up of predators.

Although the stream exhibits impaired biota and degraded habitat, it is believed that habitat restoration will significantly improve the diversity and integrity of benthic communities. Riparian restoration of the banks in the golf course could enhance the quality of the stream relatively rapidly, perhaps within a few years.

Cobbs Tributary 12, a small, unnamed tributary, flows from about Ferrington and Brockton roads, through both Cobbs Creek and Karakung golf courses before draining into Cobbs Creek. The confluence with Cobbs Creek is formed by a deeply incised channel and a short vertical drop into the creek. Sampling occurred near the golf cart bridge about 50 meters from the confluence with Cobbs Creek (FB-17). The sampled reach was open to sunlight and incised, with grasses imposing on the channels flow.

Total macroinvertebrate abundance was moderate (832/m^2). Taxa richness was low (6). Diversity (0.88) and evenness (0.49) were about average for this survey, but lower than expected for

similar streams. No EPT taxa were collected from the stream, suggesting degradation. Chironomids made up about 75% of the community and non-insects composed the remaining 25%. The HBI score of this stream was 5.89, suggesting organic enrichment.

Functional groups were dominated by collector-gatherers (91%). The remaining 9% was made up of predators (non-insect flat worms). The relative lack of filterers is noteworthy and indicative of disturbance. Recall that filterers probably occur in the stream, but that their abundance is small relative to these dominant groups.

Although, the stream exhibits impaired biota and degraded habitat, it is believed that habitat restoration will significantly improve the diversity and integrity of benthic communities. Riparian restoration of the banks in the golf course could enhance the quality of the stream relatively rapidly, perhaps within a few years.

Summary. Of the five streams sampled in Cobbs Creek Park, it is believed that two could be considered candidates for restoration. These two streams are Cobbs Tributaries 3 and 12. Their small size maximizes their dependance on the riparian community. The communities of these streams are sufficiently impaired that even marginal improvements in the community should be resolved by biomonitoring soon after restoration.

The other surveyed streams in Cobbs Creek Park were probably too influenced by water quality or storm flow problems to benefit from riparian restoration alone.

1.B.3.5. **Streams/Stormwater**

Outfall structure.

Cobbs Creek Park

Cobbs Creek drains 22 square miles of Philadelphia and surrounding areas such as Upper Darby. There are nearly 13 miles of stream in Cobbs Creek Park that eventually drain to the Delaware River. Most of this length is the main stem, 8.2 miles in total, while the rest of the total stream length is made up of tributaries such as Indian Creek and its branches, and smaller, un-named streams. The Cobbs Creek watershed covers more than 5.5 square miles in the City of Philadelphia. However, Cobbs Creek Park only occupies approximately 6% of the watershed. In fact, the majority of the watershed (about 77%) is developed land and only 15% of the watershed is forested. Interestingly, the Cobbs Creek watershed has a higher percentage of grassy areas than all of the other Fairmount Park system watersheds. Grassy areas such as golf courses and mowed lawns account for 7% of the total watershed area.

A stream is only as healthy as the watershed from which it flows. Cobbs Creek and its tributaries show the effects of an urbanized watershed. The streams have 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 the streams of Cobbs Creek Park 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 Cobbs Creek, while storms generate much runoff which leads to significantly increased stream flows. These changes to stream flow have

altered stream channels to the point where some streams and portions of streams in Cobbs Creek Park cannot provide adequate aquatic habitat. However, several small streams are in better condition. Some streams have watersheds almost completely within the park boundaries, which protects them from some of the impacts of urbanization. The Habitat Quality Map, Volume II, Section 1, illustrates the habitat quality and the urbanization impacts of each stream in Cobbs Creek Park, as determined by the screening-level assessment.

In addition to the physical, water quantity-related problems, parts of Cobbs Creek and its tributaries have severely degraded water quality. Although water quality is not specifically addressed by this restoration plan, it did arise as an issue for this park. A known source of pollution comes from combined sewer overflows (CSOs), which contribute untreated wastewater to the creek during storm events. Undoubtedly, other impairments to Cobbs Creek's water quality include typical "urban" pollutants such as vehicle fluids (oils, antifreeze) and household and lawn chemicals (detergents, fertilizers, pesticides). Still other impacts to some streams of Cobbs Creek Park are the effects of the Cobbs Creek and Karakung golf courses. Those streams running through and adjacent to the golf courses are at a high risk of having water quality and water quantity related problems. Pesticides and fertilizers used on the courses may be running off into the streams causing poor water quality. Furthermore, many "golf course streams" lack a forested riparian buffer, and in some cases the maintained grass will be mowed to the edge of a streambank. 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 Volume I, Section 5.C.4.1.

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 1.B.1). In addition, the resulting SQIs for Cobbs Creek Park stream reaches are presented visually in the Stream Quality maps in Volume II, Section 1.F.

Table 1.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 - Cobbs Creek Park
Severely Impaired	0 to 75	11 (3%)	3 (7%)
Impaired	76 to 150	164 (38%)	27 (60%)
Moderately Impaired	150 to 225	248 (58%)	15 (33%)
Slightly or Non-impaired	226 to 300	3 (1%)	0 (0%)
Totals	0 to 300	426 (100%)	45 (100%)

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

The main stem of Cobbs Creek was not assessed using the SQI, but was surveyed by the ANSP to locate specific restoration sites and activities (see section II-E). Therefore, the stream reaches classified using the SQI are the small tributaries that flow into Cobbs Creek. Overall the Cobb Creek Park tributaries are moderately impaired to 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 Cobbs Creek Park.

The small tributaries in the southern end of the park (between Whitby Avenue and Woodland Avenue) are impaired or severely impaired. This portion of the park is very narrow and all of the streams enter the park through culverts and tend to be highly impacted by excessive stormwater runoff from Upper Darby and West Philadelphia. One exception is Tributary 4 which starts as a groundwater seep within the park and does not have storm sewer inputs. Tributary 5 (directly upstream of Tributary 4) has been targeted for restoration through improvement of the stormwater outfall and repairing the stream banks. Also in this section of the park, ANSP has recommended the removal of the Woodland Avenue dam.

The middle portion of the park (between Market Street and Whitby Avenue) has very few tributaries. Naylor's Run, which was classified as impaired, enters the park from Upper Darby and is underground for part of its length, except when it enters the park for a short stretch. The remaining two tributaries (Tributaries 10 and 11) in this portion of the park only flow during storm events and were not classified using the SQI. In the flood plain across from the site of the new environmental education center, ANSP has recommended the creation of a billabong (or flood plain wetland) to provide important wetland habitat, improve water quality, and to alleviate some of Cobbs Creek's excessive storm flows.

Within the upper portion of Cobbs Creek Park (above Market Street), there are several proposed restoration activities as well as protect/enhance sites along the main stem of Cobbs Creek. The Millbourne Dam near Race and Daggett streets has been recommended for removal. Just downstream of the dam, there is a scenic stretch of the Cobbs Creek with large boulders that has been designated as a protect/enhance site. There is another protect/enhance site on the main stem between the Cobbs Creek and Karakung Golf courses. Finally, a riparian or streamside forest restoration and bank stabilization project has been recommended for a stretch of the main stem in Cobbs Creek Golf Course (near Hole 5).

The upper portion of Cobbs Creek Park is much wider than the lower portions and has many tributaries. The bocce facility tributary, just upstream of the dam, is classified as moderately impaired to impaired, but much of its watershed is within park boundaries. In addition, the surrounding forest is considered high quality. Therefore, several restoration activities are recommended for this tributary, including: trash removal, stream bank restoration, trail/stream crossing improvement, and exotic plant control.

The next two tributaries upstream, Tributaries 1 and 2, originate in the Karakung Golf Course and flow through forest to Cobbs Creek. These streams are classified as impaired to moderately impaired. Both of these streams are rapidly incising due to headcut migration from their confluence with Cobbs Creek. The base elevation of the Cobbs Creek channel has lowered over time due to the impacts of urbanization and possibly degradation of the Millbourne. The tributaries are adjusting themselves to the new elevation of Cobbs Creek by downcutting and incising. ANSP recommended restoration activities to stabilize these streams and prevent further downcutting. In addition, a wetland enhancement and expansion has been recommended at the headwaters of Tributary 1 to help control golf course runoff, reduce erosion, and to create important habitat.

Indian Creek, the largest tributary to Cobbs Creek, drains portions of Montgomery County and West Philadelphia. Indian Creek and Indian Run flow through Morris Park and converge beneath

Lansdowne and Haverford Avenues. Below Lansdowne Avenue, Indian Creek flows through Karakung and Cobbs Creek Golf courses to its confluence with the main stem of Cobbs Creek. Both Indian Creek and Indian Run are moderately impaired to impaired. Indian Run has a scenic waterfall that has been listed as a protect/enhance site. ANSP studies suggest that, while the upper portions of Indian Creek are currently morphologically stable, increased stormwater flows could significantly destabilize the stream channel. Indian Creek just above and below Lansdowne Avenue has been channelized and its flood plain has been eliminated over the years with the dumping of fill and debris.

Further upstream on Cobbs Creek, Tributary 12 and Tributary 3 flow through Cobbs Creek Golf Course. Tributary 12 is classified as severely impaired (1 of only 11 in the entire Fairmount Park system). It lacks a forested riparian buffer for almost its entire length. The stream's geomorphology and habitat are significantly impacted by the golf course and stormwater runoff. Tributary 3 has similar problems, since it flows through the golf course and has a highly urbanized watershed. ANSP has recommended restoration to the portion of Tributary 3 that flows through the golf course. The restoration will included stream-side plantings to establish a riparian buffer of native vegetation.

There are two additional tributaries (Tributary 13 and Tributary 14) in Carroll Park upstream of City Line Avenue. Tributary 14 runs parallel to City Line Avenue and is classified as an impaired stream. It appears that this channel was straightened or channelized in the past and now serves mostly as a drainage ditch for City Line Avenue. Tributary 13, in the central portions of Carroll Park, is impaired to moderately impaired. The stream starts at a storm sewer culvert at the park boundary and flows through the remains of an old pond before reaching Cobbs Creek. The channel above the pond is eroding and incised due to excessive runoff from impervious surfaces upstream. The pond has been filled with sediment over time and no longer holds water. The area is now more characteristic of a wetland.

1.C. APPLICATION OF RESTORATION GOALS

1.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 Cobbs Creek Park. 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 Cobbs Creek Park. 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.

1.C.2. General Restoration Activities

1.C.2.1. Exotic Control

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 layer in forests with native canopy species and on disturbed slopes. Exotic species that were found invading natural lands of Cobbs Creek Park during the 1998 survey are included in Appendix A-1.1 in Volume III. 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. A summary of appropriate control methods for some of the common exotic species in the park is being developed by NLREEP and ANSP for use by NLREEP volunteer groups. 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. In the list of restoration activities, exotic/invasive control refers to control without planting.

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 species.

1.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.

1.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. The slope behind the bocce facility located at the intersection of Daggett and Vine streets, in Cobbs Creek Park demonstrates the negative impacts of trash dumping on the surrounding ecosystem. This slope is badly eroded in this area and is littered with household appliances, used automobile parts, and yard waste. The forest adjacent to this slope and a small wetland located near the site have been affected by this disturbance, as is evident from various exotic plant species present. The first recommendation at this site is to block access. 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, providing sites 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. Cleanup 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.

1.C.3. Habitat-Specific Restoration Activities

1.C.3.1. **Forested Uplands**

Thriving and reproducing understory, Cobbs Creek Park.

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 plants and animals, it also acts as a buffer for stormwater runoff and prevents slope erosion. In Cobbs Creek Park 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. Large stands of

woods can be found in Morris Park, Cobbs Creek Golf Course, and near the bocce facility, but this habitat type is less common at the southern end of the park, due to the narrowness of the natural lands. 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 Cobbs 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. The goal of the protect/enhance recommendation is to recognize the area as a high quality site and to protect it from development or degradation.

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 and shrubs. 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.

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

Meadow, Cobbs 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. 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. The lands within Cobbs Creek Park at the edges of woods should be managed as meadows to protect forested areas from stormwater and golf course related activities. Non-native forbs such as goutweed (*Aegopodium pedagraria*), garlic-mustard (*Alliaria petiolata*), and Canada thistle (*Cirsium arvense),* 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 native grasses, rushes, sedges, and forbs such as milkweeds, asters and goldenrods. Meadow management encompasses: removal of exotics and the replanting of natives, and prescribed burning or 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.

1.C.3.3. **Slopes**

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.

In Cobbs Creek Park, slope erosion is prevalent throughout the park, but is particularly important south of Market Street, where there is little or no buffer between mowed lawns or streets and slopes. 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.

1.C.3.4. **Riparian Zones**

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 zone of small tributary, Cobbs Creek Park.

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. This is evident in Carroll Park along the Cobbs Creek main stem and in Morris Park along the banks of Indian Creek and Indian Run and along lower Cobbs Creek. 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. The restoration activities for riparian zones in this project include removing Japanese knotweed and other invasives, regrading the banks and replanting with native forest corridors at least 35 feet in width to serve as a functional riparian zone.

1.C.3.5. **Wetlands**

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. The majority of the wetlands present in the park are dominated by skunk cabbage (*Symplocarpus foetidus*), while some in open areas are dominated by common reed (*Phragmites australis*). The hydrologic conditions essential for maintaining the wetland plant communities have 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. 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.

Several types of wetland projects have been identified in Cobbs Creek Park. In some areas with existing wetland hydrology, control of exotics and planting native herbs would be sufficient. Some old ponds which have filled in can be managed as wetlands following removal of sediment. Excavation of soil may be sufficient to create wetlands in a few areas; these are likely to be intermittently wet. More complex designs mimic natural wetlands which fill during storm events.

Construction of input and outflow culverts can improve water management in constructed wetlands. A pipe taking water from the main creek above base flow water levels will allow the wetland to capture storm flows without drawing off base flows. A flap gate or similar device can be used to prevent return flow from the wetland into the creek after the creek falls. An outlet can be used to control water level within the wetland.

1.C.3.6. **Channel**

Main stem of Cobbs 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 (Volume II, Sections 1 and 2 - Restoration Sites). 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 Cobbs Creek fit these criteria, we selected sites where restoration efforts can make a difference. For example, many of the problems on the main channel of Cobbs Creek are caused by watershed-level or upstream impacts that require

watershed-level solutions which are beyond the scope of NLREEP's funding. 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 (e.g., 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.

1.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 the other 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 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. 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, and stream channel restoration; reptiles and amphibians for wetland creation and restoration; fishes for dam removal and restoration in larger wetlands and streams; birds for woodland restorations, meadow restoration, and 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 (Section 1.C). 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.

Fish: In the assessments of Cobbs Creek Park, several species were not found which are widespread in other tributaries and in the region. Habitat and water quality appear suitable for these species. While it is possible that these species are limited by unknown or episodic events, it is likely that these result from historic changes in water quality. In these streams, water quality was probably impacted by sanitary and stormwater; better control of these pollutants has likely improved water quality. However, tidewater and dams on Cobbs Creek and Tacony Creek may prevent colonization of the upper reaches by some species.

Introduction of these species can be made from local sources, e.g., Darby Creek (of which Cobbs Creek is a tributary), Wissahickon or Pennypack Creek. Because of the local source, issues concerning disease and genetic differentiation are insignificant. The nearby source material makes introduction logistically easy as well.

Introduction would need approval by the Pennsylvania Fish and Boat Commission. In addition, collection of fish would be best done under a scientific collecting permit in order to use efficient collecting techniques and to collect enough fish.

Introduction could probably be done successfully at various times during the year, but would probably be easiest and most successful in early to mid spring. At this time, holding and transport of fish would be safer, since lower water temperatures reduces risks of handling mortality. The source and receiving water would be at similar temperatures, easing acclimation. Introduction at this time would also allow spawning during the first year.

The species under consideration are small (adults about 1.5 to 3 inches in total length) and often abundant, so that they can be collected in numbers and handled easily. Collection would best be done with electroshocking, since this can reduce stress (e.g., from scale loss in nets and traps). After collection fish would be held and transported in aerated containers. Given the short distance of transport, special transportation containers would not be needed. To provide a good number of fish and minimize impacts on the source stream, about 50-200 individuals would probably be an appropriate number of fish to stock. Stocking of adult fish would allow earlier reproduction within

the receiving stream, and would make evaluation of success (occurrence of juveniles) easier to monitor. Stocking should be done by simple release, following a short period of mixing of source and receiving water. Tagging of fish could be done, but would increase stress on fish.

Release in a few sites would be useful, in case suitable conditions do not exist throughout the stream. For example, within Cobbs Creek, potential sites for release would include the main stem above the dam (e.g., within Cobbs Creek Golf Course), the main stem just below the dam, and the main stem farther downstream, e.g., around 65th Street.

Wetland creation is recommended for one or more sites in Cobbs Creek. 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.

1.C.3.8. **Golf Courses**

The golf courses of Cobbs Creek Park present a special opportunity for protection, restoration and management of natural lands. They border the main channel of Cobbs Creek, as well as Indian Creek and smaller tributaries, and they contain significant tracts of 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 Cobbs Creek and Karakung courses were developed and presented to the managers of the courses. Relevant parts of these recommendations are presented in Appendix C-3 in Volume III.

1.D. RECOMMENDED RESTORATION ACTIVITIES

1.D.1. Restoration Site Overview

Proposed restoration activities at different sites in Cobbs 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 1.D.1. More complete descriptions of the high priority sites are presented in Section 1.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 1.C).

A total of 68 sites covering approximately 124 acres are recommended as high priority for restoration. This constitutes about 26% of the natural lands of Cobbs Creek Park and about 15% of the total area of the Fairmount Park system. 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 in approximate upstream-downstream order.

Table 1.D.1. List of sites in Cobbs 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
S2	Channel	Gully downstream from 65th Street	East side of Cobbs Creek	L	0.31
		Action		**Priority**	
		Daylighting		L	
		Structural Improvement (SW)		L	
S3	Channel	Lower Cobbs Creek	Lower Cobbs Creek	L	
		Action		**Priority**	
		Trash Removal		L	
S4	Channel	Lower Cobbs Creek	Lower Cobbs Creek	L	
		Action		**Priority**	
		Trash Removal		L	
S5	Channel	Tributary 4	Near West Cobbs Creek Parkway and Connell Ave	LP	0.40
		Action		**Priority**	
		Protect/Monitor		LP	
S6	Channel	Tributary 5	@ Cobbs Ck Parkway between Cypress and Fern Sts	H	0.43
		Action		**Priority**	
		Bank Stabilization/Regrade		H1	
		Structural Improvement (SW)		H2	
S7	Channel	Tributary 6	enters @ Cobbs Ck. Parkway n of Fern	L	0.76
		Action		**Priority**	
		Modify Channel		L	
S8	Channel	Lower Cobbs Creek	Lower Cobbs Creek	L	
		Action		**Priority**	
		Trash Removal		L	
S9	Channel	Old sewer line in Cobbs Creek	Near Cobbs Creek Pkwy. and Florence Ave.	L	0.19
		Action		**Priority**	
		Structural Improvement (SW)		L	
S14	Channel	Eroded trail, left bank of Cobbs Creek	Near Cobbs Creek Parkway and Thomas Ave.	L	0.10
		Action		**Priority**	
		Structural Improvement (Trails)		L	
		Bank Stabilization/Regrade		L	
S15	Channel	Cobbs Creek (EE Center)	Near the Stables upstream of the walking bridge	L	0.46
		Action		**Priority**	
		Bank Stabilization/Regrade		L	

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Site ID	Restoration Type	Site Name	Location	Priority	Acreage
S16	Channel	Naylor's Run Meadow	Directly behind Environmental Center	L	6.67
		Action		**Priority**	
		Bank Stabilization/Regrade		L	
S17	Channel	Exposed Sewer Line in Cobbs Creek	300 feet south of Marshall Road	H	0.31
		Action		**Priority**	
		Bank Stabilization/Regrade		H1	
		Structural Improvement (SW)		H2	
		Trash Removal		H3	
S18	Channel	Marshall Bridge gully erosion	Directly under Marshall Road Bridge	L	0.79
		Action		**Priority**	
		Structural Improvement (SW)		L	
S19	Channel	Culvert (CU-24) on Cobbs Creek	Near where Arch and Race St. meet	L	0.30
		Action		**Priority**	
		Structural Improvement (SW)		L	
S20	Channel	Cobbs Creek Boulder	Near Daggett and Race Sts., downstream from dam	HP	0.20
		Action		**Priority**	
		Protect/Monitor		HP	
S21	Channel	Cobbs Creek Dam	Downstream of mouth Bocce tributary	H	0.49
		Action		**Priority**	
		Dam Removal		H1	
		Trash Removal		H2	
S22	Channel	Bocce tributary culvert (CU-02)	West of Bocce Courts	L	0.16
		Action		**Priority**	
		Structural Improvement (SW)		L	
S23	Channel	Bocce tributary clogged culvert	West of Bocce Courts, Vine and Daggett Sts.	H	0.14
		Action		**Priority**	
		Structural Improvement (Trails)		H	
		Bank Stabilization/Regrade		H	
		Trash Removal		H	
S24	Channel	Bocce tributary clean-up	West of Bocce Courts, Vine and Daggett Sts.	H	0.24
		Action		**Priority**	
		Bank Stabilization/Regrade		H	
		Trash Removal		H	

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Site ID	Restoration Type	Site Name	Location	Priority	Acreage
S25	Channel	Bocce tributary trail work	West of Bocce Courts, near Cobbs Creek	H	0.29
		Action	**Priority**		
		Trash Removal	H1		
		Bank Stabilization/Regrade	H2		
		Structural Improvement (Trails)	H3		
S27	Channel	Tributary 2	Edge of Bocce court woods & Karakung golf course	L	0.27
		Action	**Priority**		
		Modify Channel	L		
S28	Channel	Tributary 1	Hole #2 of Karakung Golf C, east of Indian Creek	H	0.46
		Action	**Priority**		
		Modify Channel	H		
S29	Channel	Morris Park, Indian Creek	North of Sherwood Avenue	HP	0.47
		Action	**Priority**		
		Protect/Monitor	HP		
S30	Channel	Indian Run Waterfall	Approximately 1000 feet north of Haverford Ave.	HP	0.38
		Action	**Priority**		
		Protect/Monitor	HP		
		Trash Removal	HV		
S31	Riparian Zone	Indian Run	Right bank of Indian Run near Woodcrest Ave.	L	0.36
		Action	**Priority**		
		Replant Native Forest Species	L		
S32	Channel	Tributary 12	Karakung Golf Course (bet. Lansdowne & Cardington	L	4.79
		Action	**Priority**		
		Bank Stabilization/Regrade	L		
S33	Channel	Cobbs Creek	Between Karakung and Cobbs Golf Courses	HP	1.40
		Action	**Priority**		
		Protect/Monitor	HP		
S34	Channel	CC Golf Course bridges	Mainstem of Cobbs Creek, near hole #5	L	0.41
		Action	**Priority**		
		Trash Removal	L		
		Structural Improvement (Trails)	L		

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Site ID	Restoration Type	Site Name	Location	Priority	Acreage
S35	Channel	Tributary 3	77th and Woodcrest (Cobbs Ck Golf Course)	H	0.94
		Action		**Priority**	
		Bank Stabilization/Regrade		H	
S36	Channel	CC Golf Course Riparian Restoration	CC Golf Course, near hole #5	H	1.67
		Action		**Priority**	
		Bank Stabilization/Regrade		H	
S37	Channel	Carroll Park Pond	Carroll Park	L	1.25
		Action		**Priority**	
		Structural Improvement (SW)		L	
		Bank Stabilization/Regrade		L	
		Detention Basin		L	
S38	Channel	Woodland Ave Dam	Cobbs Creek above Woodland Avenue	H	0.20
		Action		**Priority**	
		Dam Removal		H	
V56	Riparian Zone	Woodland Ave. riparian zone	Cobbs Creek Parkway to creek, north of Woodland	HV	1.67
		Action		**Priority**	
		Invasive-Exotic Control		HV	
		Release/Widen		M	
		Replant Native Forest Species		L	
V58	Riparian Zone	Wetlands North of 65th Street	Wetlands North of 65th Street	H	0.43
		Action		**Priority**	
		Replant Native Forest Species		H	
V59	Slope	Cobbs and 65th Gully	Cobbs and 65th	H	0.78
		Action		**Priority**	
		Gully Repair		H	
V60	Slope	Fern Street Forest	North of Cobbs Creek Parkway at Fern St.	H	5.75
		Action		**Priority**	
		Gully Repair		H	
		Replant Native Trees		H	
V60A	Riparian Zone	Cobbs and 65th w bank riparian strip	Between Cobbs Creek Parkway and north. of 65th St.	H	1.19
		Action		**Priority**	
		Replant Native Forest Species		H	
		Replant Native Herbs		L	
		Replant Native Shrubs		L	

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Site ID	Restoration Type	Site Name	Location	Priority	Acreage
V60B	Riparian Zone	Cobbs Creek Pwky & 65th Street Forest	North of 65th St., west bank	H	2.84
		Action		**Priority**	
		Replant Native Forest Species		H	
V61	Wetland	Fernwood Street Wetland	400 feet SW of Fernwood and Cobbs Creek Parkway	H	1.37
		Action		**Priority**	
		Replant Native Herbs		H	
V62	Riparian Zone	Mt. Moriah Floodplain Forest, e (L) bank	North of 65th Street flood plain forest	H	3.44
		Action		**Priority**	
		Replant Native Forest Species		H	
V63	Forested Upland	Whitby Street Playground	North of Whitby St., west of Cobbs Creek Parkway	H	1.23
		Action		**Priority**	
		Trash Removal		H	
		Meadow Management		H	
V64	Riparian Zone	Stables flood plain	Open area north of stables at bottom of the slopes	H	2.82
		Action		**Priority**	
		Replant Native Forest Species		H	
V65	Wetland	Stable Meadows	West bank Cobbs Creek, across from Stables	H	6.67
		Action		**Priority**	
		Replant Native Herbs		H	
		Wetland Creation		H	
V66	Riparian Zone	Naylor's Run Meadow	Behind Environmental Center on Naylor's Run	H	2.19
		Action		**Priority**	
		Replant Native Herbs		H	
		Wetland Creation		H	
V66A	Riparian Zone	Naylor's Run riparian strip	Naylor's Run	H	0.56
		Action		**Priority**	
		Replant Native Forest Species		H	
V67	Wetland	Bocce Court Pond	In woods 300 feet behind Bocce Courts	H	0.37
		Action		**Priority**	
		Trash Removal		H	
		Replant Native Herbs		H	

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Site ID	Restoration Type	Site Name	Location	Priority	Acreage
V67A	Forested Upland	Bocci Court Woods	Bocce Court Woods	H	17.55
		Action		**Priority**	
		Replant Native Shrubs		H	
		Protect/Monitor		H	
		Replant Native Herbs		H	
		Replant Native Trees		H	
V68	Wetland	Bocce Court Wetlands	On creek 1,350 feet west of dam	H	3.36
		Action		**Priority**	
		Replant Native Herbs		H	
V68A	Riparian Zone	Cobbs riparian, South of Bocce Woods	Off of Karakung Golf Course	HV	1.06
		Action		**Priority**	
		Invasive-Exotic Control		HV	
		Replant Native Forest Species		M	
V69	Forested Upland	Bocce Court Slopes	Directly behind bocce courts	H	2.46
		Action		**Priority**	
		Trash Removal		H	
V71	Forested Upland	Akebia patch	Control Akebia and replant gaps in the forest	HV	4.93
		Action		**Priority**	
		Invasive-Exotic Control		HV	
		Replant Native Trees		L	
V71A	Riparian Zone	72nd St. and Woodbine Ave. Floodplain	Indian Run, 72nd and Woodbine	H	0.89
		Action		**Priority**	
		Replant Native Shrubs		H	
V72	Wetland	Sherwood Road Wetland	North of Sherwood	HV	0.47
		Action		**Priority**	
		Invasive-Exotic Control		H	
		Wetland Creation		HV	
		Replant Native Shrubs		L	
V73	Slope	Karakung Golf Course Forest	Above lower Indian Creek, south of Haverford	L	6.44
		Action		**Priority**	
		Release/Widen		L	
		Replant Native Trees		L	

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Site ID	Restoration Type	Site Name	Location	Priority	Acreage
V74	Riparian Zone	Karakung Golf Course Flood plain	Karakung Golf Course	M	2.58
		Action		**Priority**	
		Replant Native Forest Species		M	
		Replant Native Herbs		L	
		Regrade		L	
V75	Slope	Karakung Golf Course east bank woods	Karakung Golf Course	M	0.73
		Action		**Priority**	
		Replant Native Trees		M	
		Replant Native Shrubs		L	
V77	Wetland	Karakung Golf Course Wetland	Hole One	H	0.05
		Action		**Priority**	
		Release/Widen		H	
		Replant Native Herbs		M	
V78	Forested Upland	Lansdowne and Cardington Exotics	West side of Lansdowne Ave.	H	2.77
		Action		**Priority**	
		Invasive-Exotic Control		H	
V79	Riparian Zone	Morris Park, Indian Creek	Indian Run	H	0.09
		Action		**Priority**	
		Trail Improvement		H	
		Replant Native Forest Species		L	
		Replant Native Herbs		L	
V79A	Slope	Morris Park slope woods	East bank of Indian Creek south of Sherwood	HP	0.92
		Action		**Priority**	
		Protect/Monitor		HP	
V80	Riparian Zone	Indian Creek mowed Riparian Zone	North of Sherwood Street	H	0.44
		Action		**Priority**	
		Release/Widen		H	
		Replant Native Forest Species		HV	
V81	Wetland	Lansdowne and Cardington Rd. Seep	Cardington and 75th Street, west corner	M	1.41
		Action		**Priority**	
		Invasive-Exotic Control		HV	
		Replant Native Trees		M	

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Site ID	Restoration Type	Site Name	Location	Priority	Acreage
V82	Riparian Zone	Overbrook Ave. Riparian Zone	North of Sherwood Ave.	L	0.44
		Action		**Priority**	
		Replant Native Forest Species		L	
V83	Slope	Cobbs Creek Golf Course Slopes	Cobbs Creek Golf Course, south facing slope	H	5.66
		Action		**Priority**	
		Replant Native Trees		H	
		Trash Removal		HV	
V84	Slope	Manoa Road Slopes	North facing slopes, east bank of Cobbs Creek	H	0.79
		Action		**Priority**	
		Erosion Control		H	
		Replant Native Shrubs		H	
		Trail Improvement		H	
V85	Wetland	Carroll Park pond	Old pond	H	0.62
		Action		**Priority**	
		Wetland Creation		H	
V86	Forested Upland	Wyndale Ave. Forest	Cobbs Creek Golf Course (north facing slope)	H	9.35
		Action		**Priority**	
		Replant Native Shrubs		H	
		Trash Removal		H	
V88	Riparian Zone	Bocce court Floodplain Left Bank	West of dam east of creek	HV	0.72
		Action		**Priority**	
		Invasive-Exotic Control		HV	
V89	Riparian Zone	Bocce Court Floodplain Right Bank	North of Dam west of creek	HV	1.77
		Action		**Priority**	
		Invasive-Exotic Control		HV	
V90	Riparian Zone	Carroll Park Floodplain	North of City Line Avenue	HV	2.02
		Action		**Priority**	
		Invasive-Exotic Control		HV	
		Replant Native Forest Species		L	
V91	Wetland	Sansom Street Wetlands	Enters north of Sansom St, right bank Cobbs	H	0.40
		Action		**Priority**	
		Trash Removal		H	

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Site ID	Restoration Type	Site Name	Location	Priority	Acreage
V92	Wetland	Wetland at Hole #2	Edge of Bocce court woods & Karakung golf course	H	0.52
		Action		**Priority**	
		Replant Native Herbs		H	
		Berms		H	
		Structural Improvement		H	
V93	Riparian Zone	City Line Avenue Riparian Zone	Indian Run riparian zone	HV	1.74
		Action		**Priority**	
		Invasive-Exotic Control		HV	
V94	Wetland	Karakung Wetland	Downstream on Cobbs from confluence with Indian Cr	H	0.76
		Action		**Priority**	
		Wetland Creation		H	
V95	Riparian Zone	Cardington Road Riparian Zone	Indian Creek	L	0.81
		Action		**Priority**	
		Replant Native Herbs		L	
V96	Riparian Zone	Angora Street Riparian Zone	North of the Railroad Line	HV	1.19
		Action		**Priority**	
		Invasive-Exotic Control		HV	
V97	Riparian Zone	Fernwood Street Riparian Zone		M	1.20
		Action		**Priority**	
		Replant Native Forest Species		M	
V98	Riparian Zone	Hoffman Avenue Riparian Zone	North of Whitby Ave., along right bank of Cobbs Ck	HV	2.11
		Action		**Priority**	
		Invasive-Exotic Control		HV	
		Replant Native Forest Species		L	
V99	Riparian Zone	Recreation Field Riparian Zone	Left bank of Cobbs Creek south of Whitby Ave.	HV	2.20
		Action		**Priority**	
		Invasive-Exotic Control		HV	
V100	Riparian Zone	Woodland-Church invasives (No mapped polygon)	Cobbs Creek Woodland-Church	HV	
		Action		**Priority**	
		Invasive-Exotic Control		HV	
		Replant Native Forest Species		M	

Table 1.D.1. List of sites in Cobbs 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
V101	Riparian Zone	Church-65th Invasives (No mapped polygon)	Cobbs Creek Church-65th St.	HV	
		Action		**Priority**	
		Invasive-Exotic Control		HV	
		Replant Native Forest Species		M	
V102	Riparian Zone	Invasive/Exotic Riparian Zones (No mapped polygon)	Cobbs Creek, Cobbs Creek Parkway to Baltimore	HV	
		Action		**Priority**	
		Invasive-Exotic Control		HV	
		Replant Native Herbs		M	
V104	Riparian Zone	Cobbs riparian, sw side Bocce Woods	Karakung Golf Course	H	1.48
		Action		**Priority**	
		Invasive-Exotic Control		H	
		Replant Native Forest Species		M	
V105	Forested Upland	Wyndale High Quality Woods	77th and Wyndale Sts.	H	4.46
		Action		**Priority**	
		Protect/Monitor		HP	
		Survey for Rare Flora and Fauna		H	
		Replant Native Herbs		H	
		Trash Removal		HV	
V106	Riparian Zone	Karakung Riparian Zone (Trib 12)	Karakung Golf Course	H	4.79
		Action		**Priority**	
		Release/Widen		H	
		Replant Native Forest Species		M	
V107	Park Wide	Fish Reintroduction (No mapped polygon)		H	1.00
		Action		**Priority**	
		Fish Reintroduction		H	
V108	Park Wide	Plant Reintroduction (No mapped Polygon)		H	1.00
		Action		**Priority**	
		Floral Reintroduction		H	
V109	Wetland	Church Lane Wetland	North of Church Lane, west side Cobbs Creek	H	0.16
		Action		**Priority**	
		Wetland Creation		H	
		Protect/Monitor		HP	
		Invasive-Exotic Control		HV	

Table 1.D.1. List of sites in Cobbs 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
V110	Park Wide	Cobbs Creek: Control Access	Parkwide, esp Morris Park, Bocce area, Whitby St.	H	
		Action		**Priority**	
		Structural Improvement		H	
		Gully Repair		M	
V111	Riparian Zone	Haverford Road Riparian Zones	N of Haverford Road along Indian Ck (no polygon)	H	
		Action		**Priority**	
		Release/Widen		H	
		Replant Native Forest Species		L	
		Gully Repair		L	
V200	Park Wide	Cobbs Creek Park	Entire Park	H	1.00
		Action		**Priority**	
		Deer Monitoring		H	

Two clusters are located in the upper parts of the park, above the confluence of Cobbs and Indian Creek. Restoration in these upstream areas is significant, since these sites affect conditions throughout the rest of the park, i.e., the sections downstream of these areas. These areas contain two of the largest, oldest and highest quality woods in Cobbs Creek Park, one in Cobbs Creek Golf Course, and the other along the East Branch of Indian Creek. The high gradient of the three main streams in these sections creates scenic drops. These woods and drops are singled out for protect/enhance status. The first cluster is in Morris Park, along the East Branch and West Branch of Indian Creek. This site contains flood plain and slope woods and steep drops along both streams. The site has scattered patches of several exotic species (*Akebia*, mile-a-minute), as well as more extensive stands of other exotics. Control of these is recommended. Wetland creation and improvement of riparian conditions can also improve tributary function, helping local and downstream conditions. There are important trail issues in this area, which should be addressed in the trail planning process.

The second cluster is in Cobbs Creek Golf Course. Restoration in this golf course (as well as in Karakung Golf Course) is important since: a) these courses contain large areas essentially maintained as natural lands; b) the active golf course areas have the potential for supporting good tributary conditions, since the courses have better hydrologic function than surrounding residential areas; c) in addition to golf, these areas support similar uses (walking, etc.) as other natural lands in the park; d) activities in these sections affects downstream conditions. Recommended restoration activities in this cluster include recognition of the high quality woods and stream sections (protect/enhance), control and replanting of areas containing exotic vegetation, stabilization of stream banks, trash removal, and management of woodland edges.

The third main area of restoration is in the area west of 63rd Street and east of Lansdowne Avenue. This area includes part of Karakung Golf Course, and the woods south of the bocce facility. This area has woods with mature and sapling canopy tree species. However, the area has severe disturbance which restoration would address, including trash dumping on the slope behind the Bocce Court, in the woods and in a tributary stream, invasive plants at the edges and in the flood plain, an old dam creating upstream problems, severe erosion in some tributaries, and low diversity of herb and understory species in the woods. Recommended restoration activities include removal of the dam, control of invasive plants, planting of appropriate plants in various habitats, trash removal, wetland enlargement, and structural modification of two tributaries to reduce erosion. This is an area where control of access to reduce dumping of trash, cars, etc., is essential to the overall success of restoration.

The fourth main cluster of restoration activities is near the stables, which will become the environmental education center. The proximity of the environmental education center will make these sites prime opportunities for learning, and for ongoing restoration and maintenance. The main recommended restoration is creation of one or two wetlands in parts of the mowed flood plain areas. These wetlands would provide habitat for a variety of plants and animals and would hold stormwater from the creek. Other activities in this area include planting of flood plain species. This general area is used for picnicking, and new athletic fields have been proposed. The combination of active and passive recreational facilities, the environmental education center and the enhancement of the natural lands will make this a major center of activity within Cobbs Creek Park. South of this area, bank erosion has exposed a length of sewer. The Philadelphia Water Department (PWD) has been made aware of this problem, and coordination with the PWD to increase the natural value of this area while fixing the immediate problem is recommended.

Several restorations are proposed for the area around the Whitby playgrounds. This area is heavily used for recreation, and the recommended activities here are primarily involved with control of stormwater and associated slope and gully erosion. Activities include repair of eroded slopes and

gullies and implementation of berms and meadows to control runoff. There is also a small wetland in this area.

The area north and south of 65th Street is recommended as a major site for restoration. The west side of the creek north of 65th Street has a relatively large woods with mature trees, diverse understory, wetlands and tributaries. The cemetery and other undeveloped lands adjacent to this area provides a buffer for the park lands. The west bank south of 65th Street has a small wetlands. There is a relatively broad flood plain with some native flood plain tree species. Several of the tributaries are impacted by stormwater, exotics dominate most of the flood plain, exotics are invading parts of the woods, and there is significant gullying and trampling associated with trails. Recommended restoration activities in this area include control of invasive plants in the woods and flood plain and replanting with appropriate species, stabilization of eroding stream banks, repair and replanting of gullies on slopes, and enlargement of the wetland. This is another site where trail issues, especially control of vehicular access and associated damage, are essential to the overall restoration.

The dam above Woodland Avenue creates a large pool behind it. Removal of the dam to improve upstream habitat conditions and accessibility is recommended.

The banks of Cobbs Creek along much of its length in the park are covered with invasive species, especially Japanese knotweed and oriental bittersweet. Control and replanting of these areas is impractical under the NLREEP program. Control, e.g., by periodic cutting, or cutting and herbicide treatment, is recommended to increase natural regeneration and reduce the spread of these species. Control has been started by volunteer groups, and such programs will aid the natural lands. Particular attention to control is recommended near other restoration sites, to reduce colonization of the restoration sites.

Several species of fish were not found in any of the Cobbs Creek Park streams, although these are regionally widespread and common in other park streams. Introduction of these, which is relatively simple because of their nearby occurrence, is recommended.

1.D.2. General Recommendations for Future Activities

The prior section described specific activities that are recommended for implementation in Cobbs 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 Cobbs 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 exotic 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.

1.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

projects 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.

1.E. RESTORATION SITE ASSESSMENTS

The individual restoration site assessments for Cobbs Creek Park are presented on pages II-50 through II-116. The high priority sites are also shown on the Restoration Sites maps in Volume II, Section 1.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

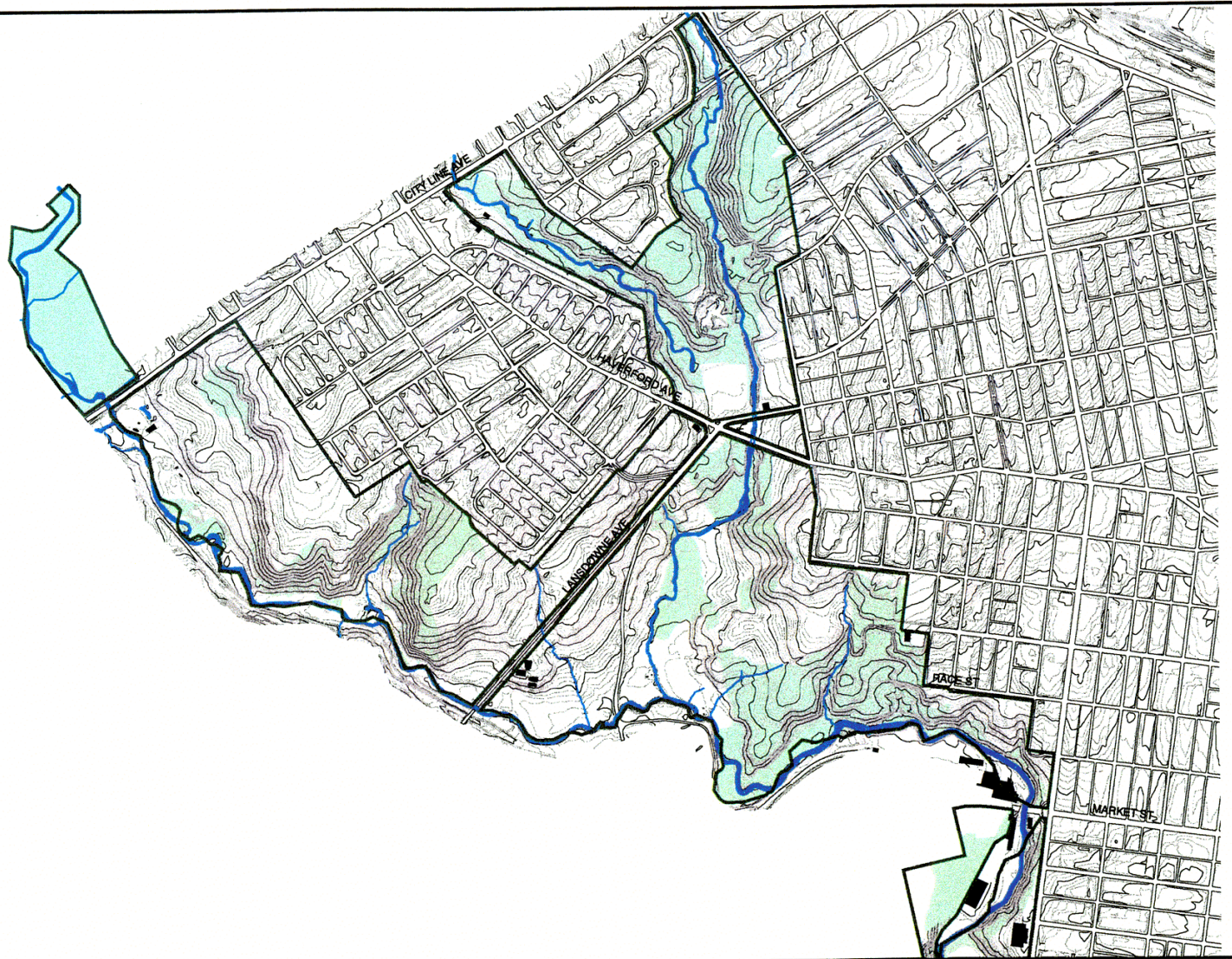
OM Ongoing mowing

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.

1.F. MASTER PLAN MAPS

The Master Plan Maps for Cobbs Creek Park follow.



Legend

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

FAIRMOUNT PARK COMMISSION

COBBS CREEK PARK
Natural Lands Restoration Master Plan
PARK BASE MAP

Map 1 of 2

N

500 0 500 Feet

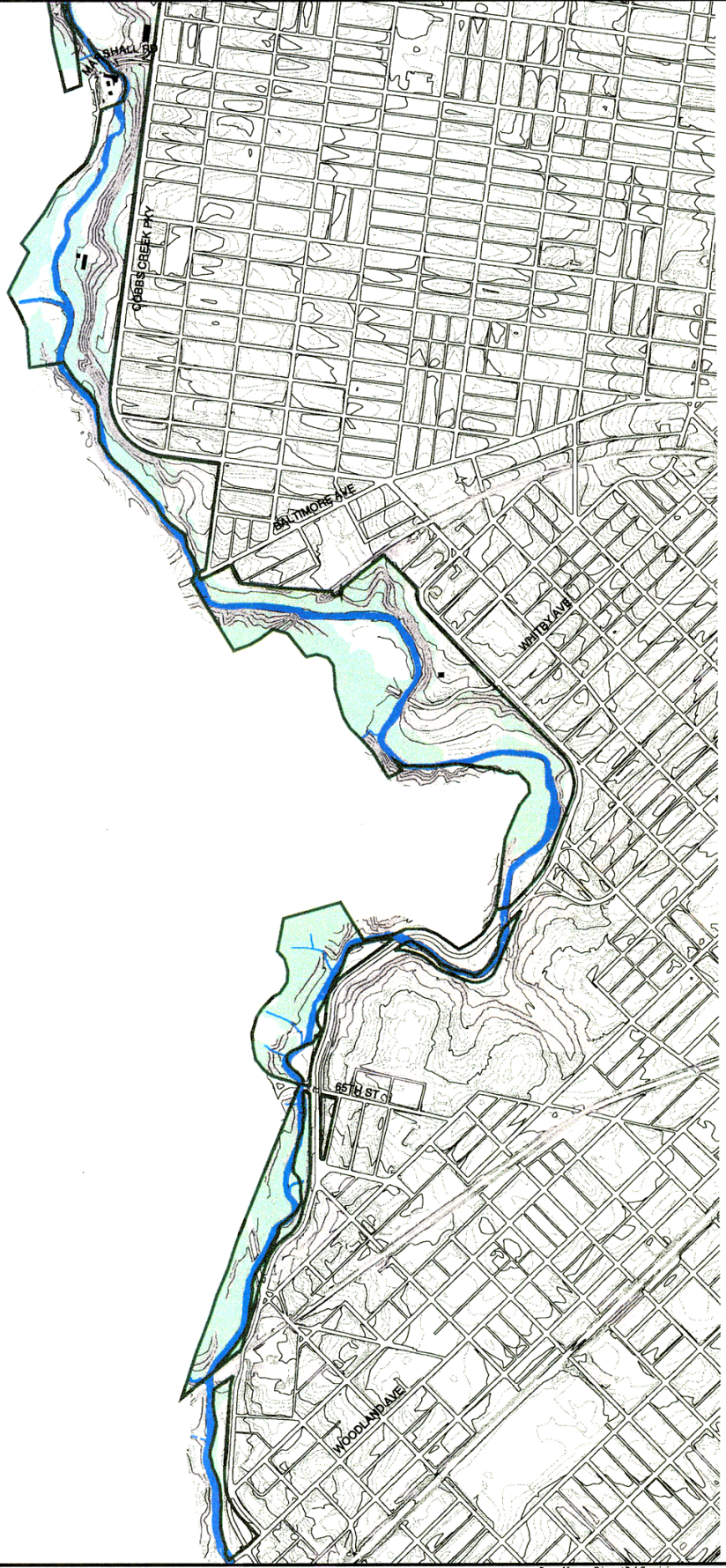
1 inch = 1100 feet

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



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COBBS CREEK PARK
Natural Lands Restoration Master Plan
PARK BASE MAP
Map 2 of 2

FAIRMOUNT P·A·R·K COMMISSION

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Natural Lands Restoration and
Environmental Education Program

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Legend

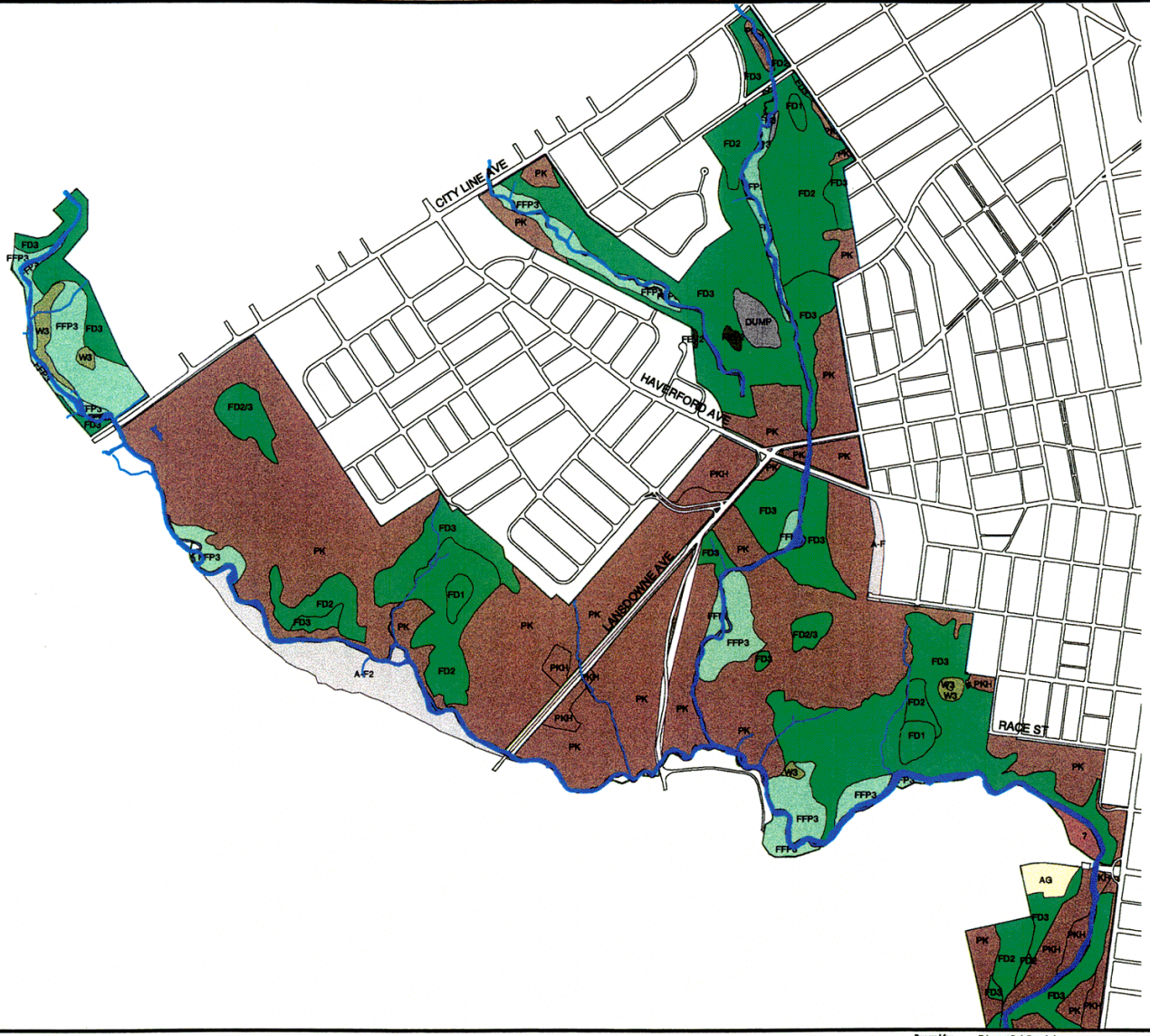
Streams
Park Boundary

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
- Trash/Dump

Disturbance Class

1 Minimal Disturbance
2 Moderate Disturbance
3 Heavy or Extensive Disturbance



COBBS CREEK PARK
Natural Lands Restoration Master Plan
VEGETATION CLASSIFICATION
Map 1 of 2

FAIRMOUNT PARK COMMISSION

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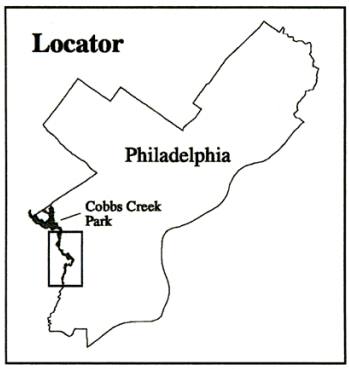

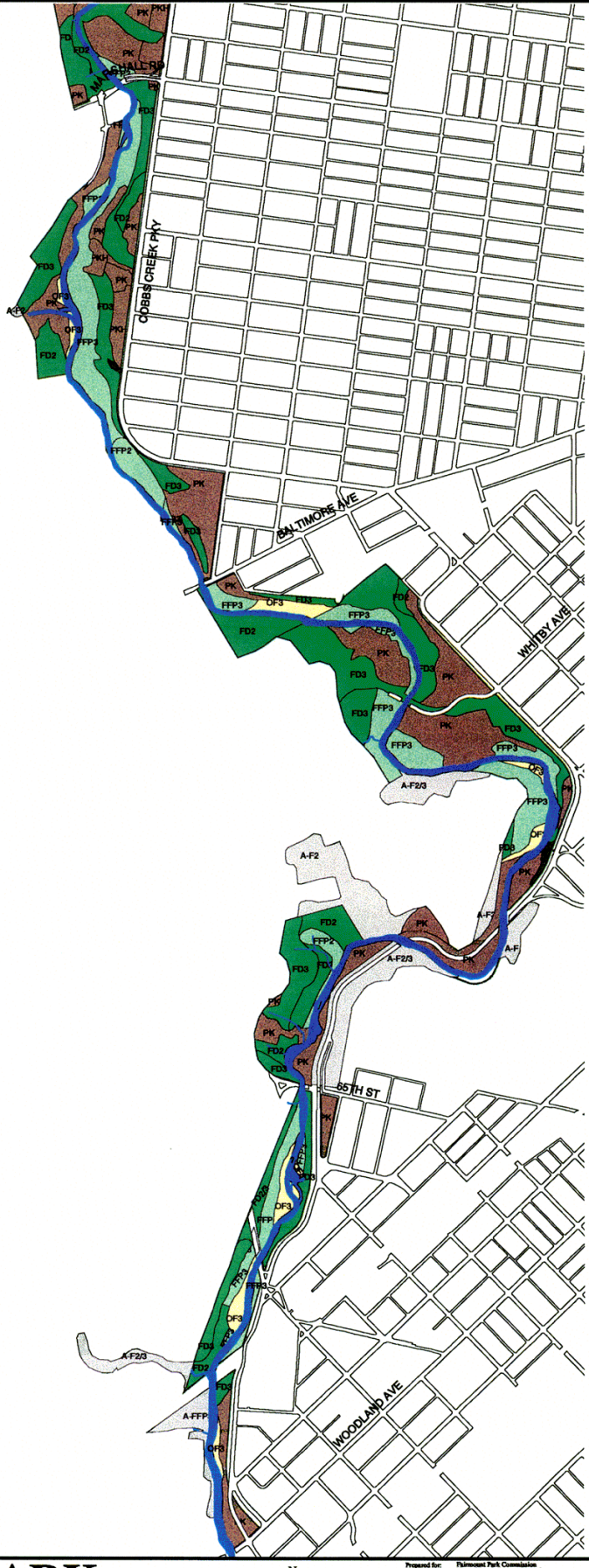

Legend

Streams
Park Boundary

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
- Trash/Dump

Disturbance Class

1 Minimal Disturbance
2 Moderate Disturbance
3 Heavy or Extensive Disturbance

COBBS CREEK PARK
Natural Lands Restoration Master Plan
VEGETATION CLASSIFICATION
Map 2 of 2

N

500 0 500 Feet

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

Date: August 1999

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Locator

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
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SH - Shrubland
W - Wetland
OF - Herbaceous Cover
Water

Disturbance Class
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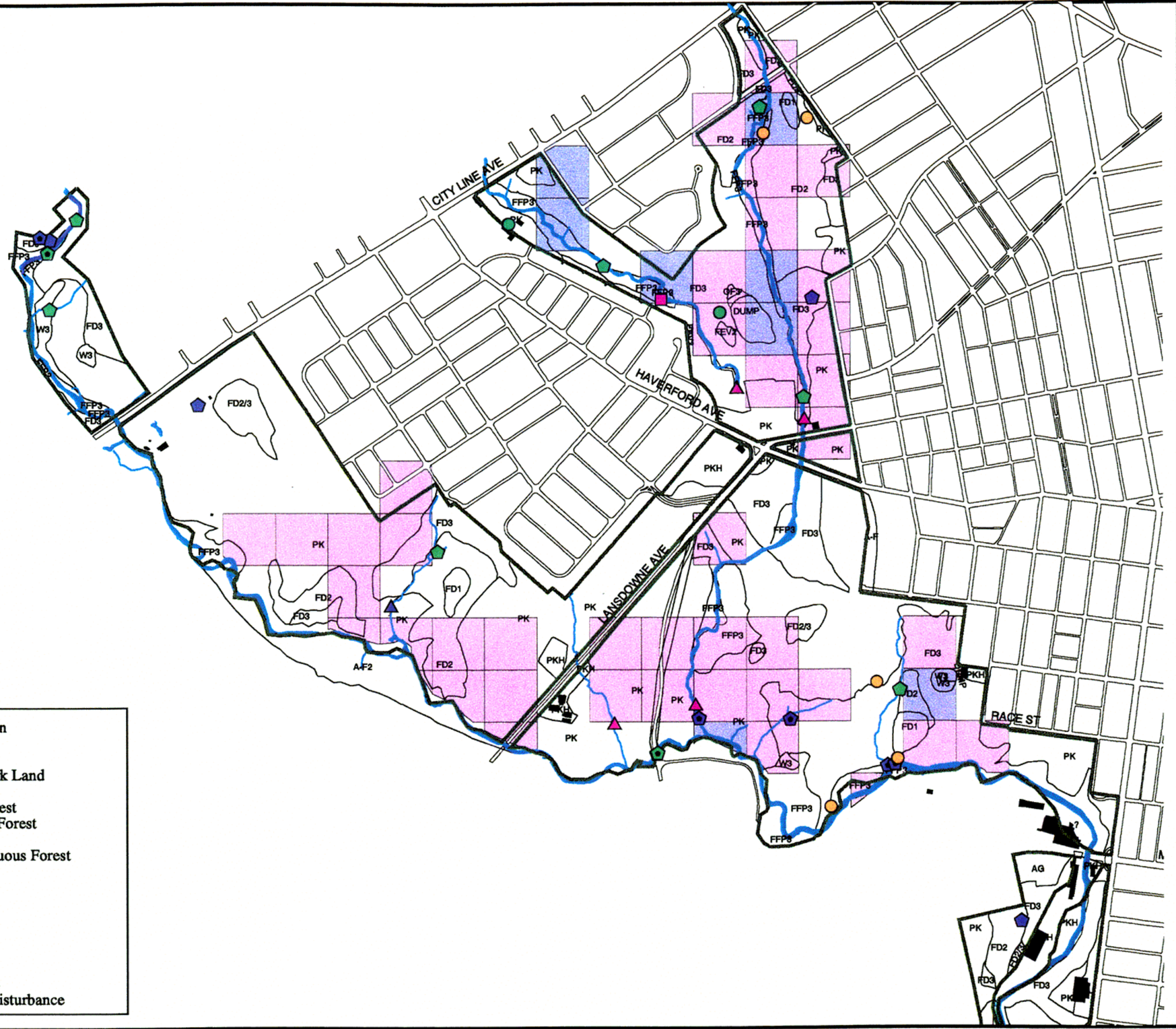
3 Heavy or Extensive Disturbance



COBBS CREEK PARK
Natural Lands Restoration Master Plan
HABITAT QUALITY
Map 1 of 2

N

500 0 500 Feet

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Natural Lands Restoration and Environmental Education Program

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Date: August 1999

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Legend

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- 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
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OF - Herbaceous Cover
Water

Disturbance Class
1 Minimal Disturbance
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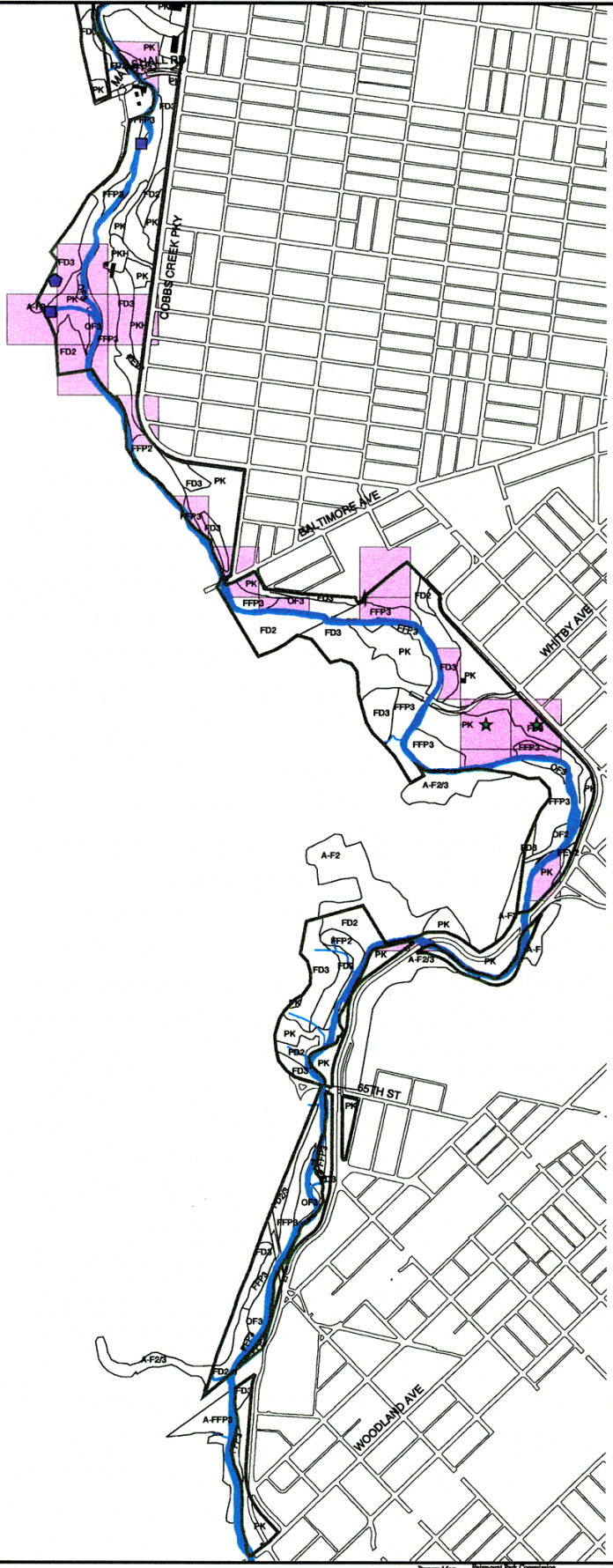

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COBBS CREEK PARK
Natural Lands Restoration Master Plan
HABITAT QUALITY
Map 2 of 2

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

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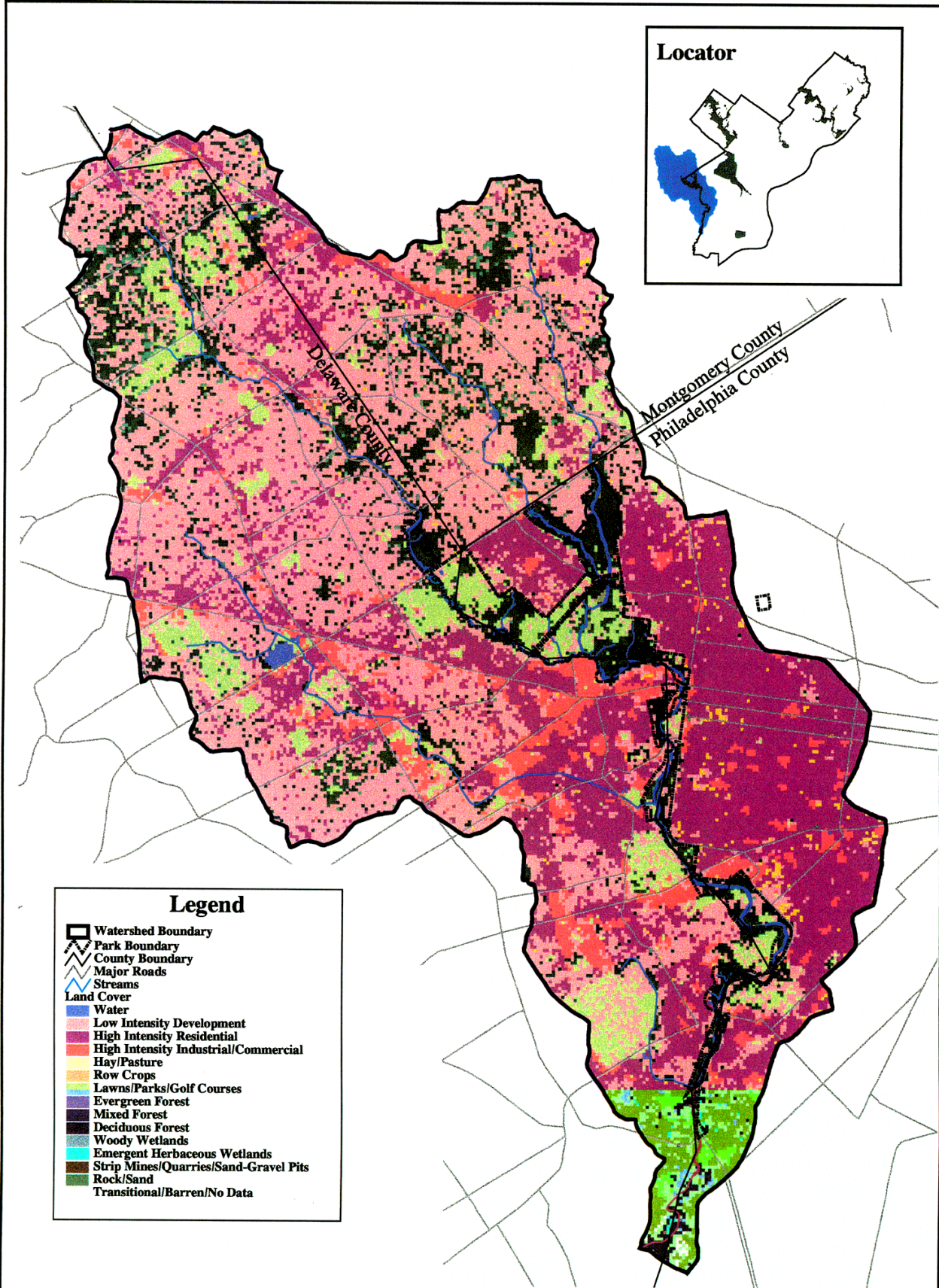

COBBS CREEK PARK
Natural Lands Restoration Master Plan
WATERSHED MAP

FAIRMOUNT P·A·R·K COMMISSION

N

2000 0 2000 Feet

1 inch = 3500 feet

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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.

Legend

Total Stream Quality

- Unclassified
- Severely Impaired
- Impaired
- Moderately Impaired
- Non-Impaired
- Park Boundary

Vegetation Classification
A - Adjacent Land
DEV - Developed Land
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Water

Disturbance Class
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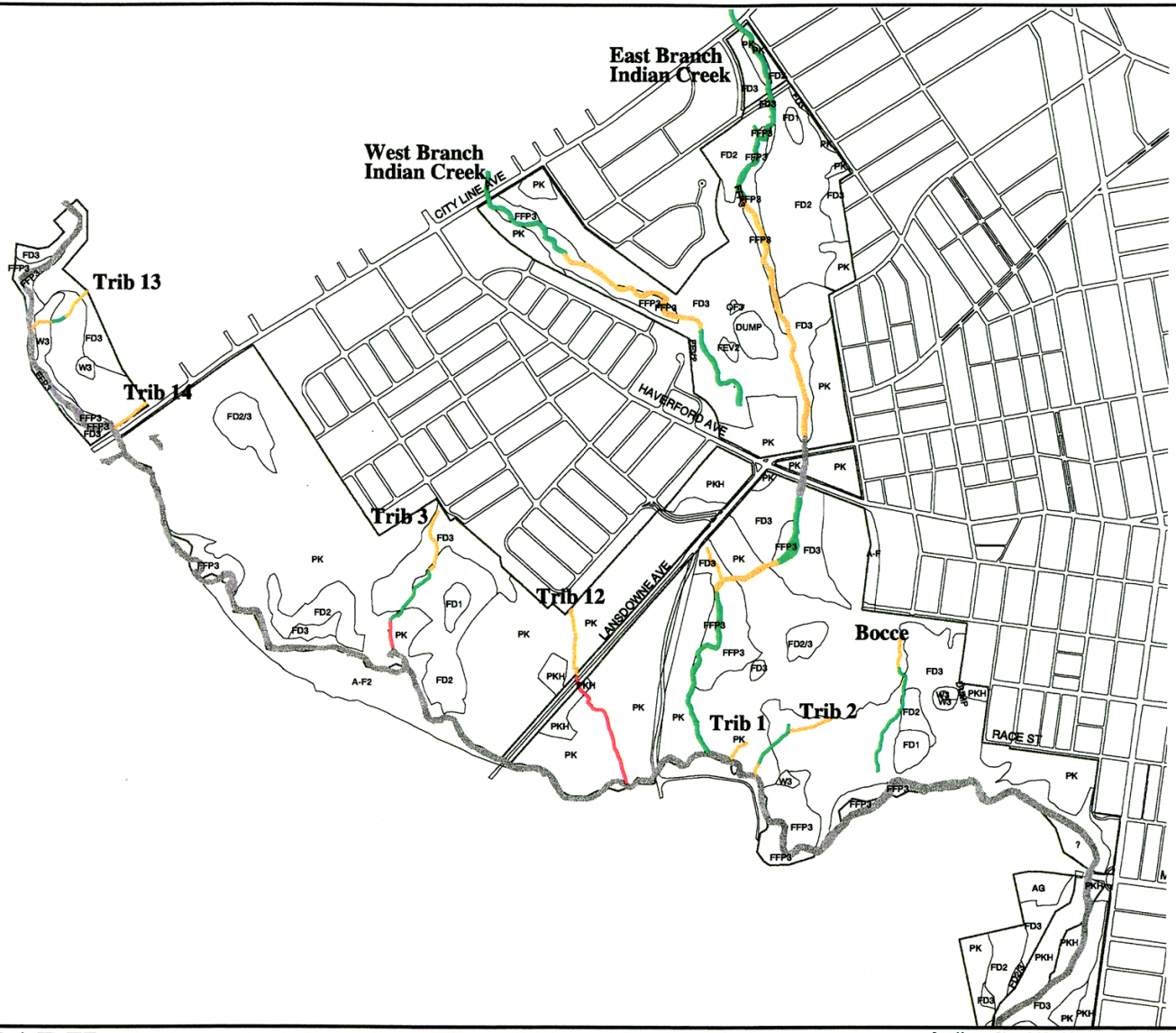

COBBS CREEK PARK
Natural Lands Restoration Master Plan
STREAM QUALITY
Map 1 of 2

N

500 0 500 Feet

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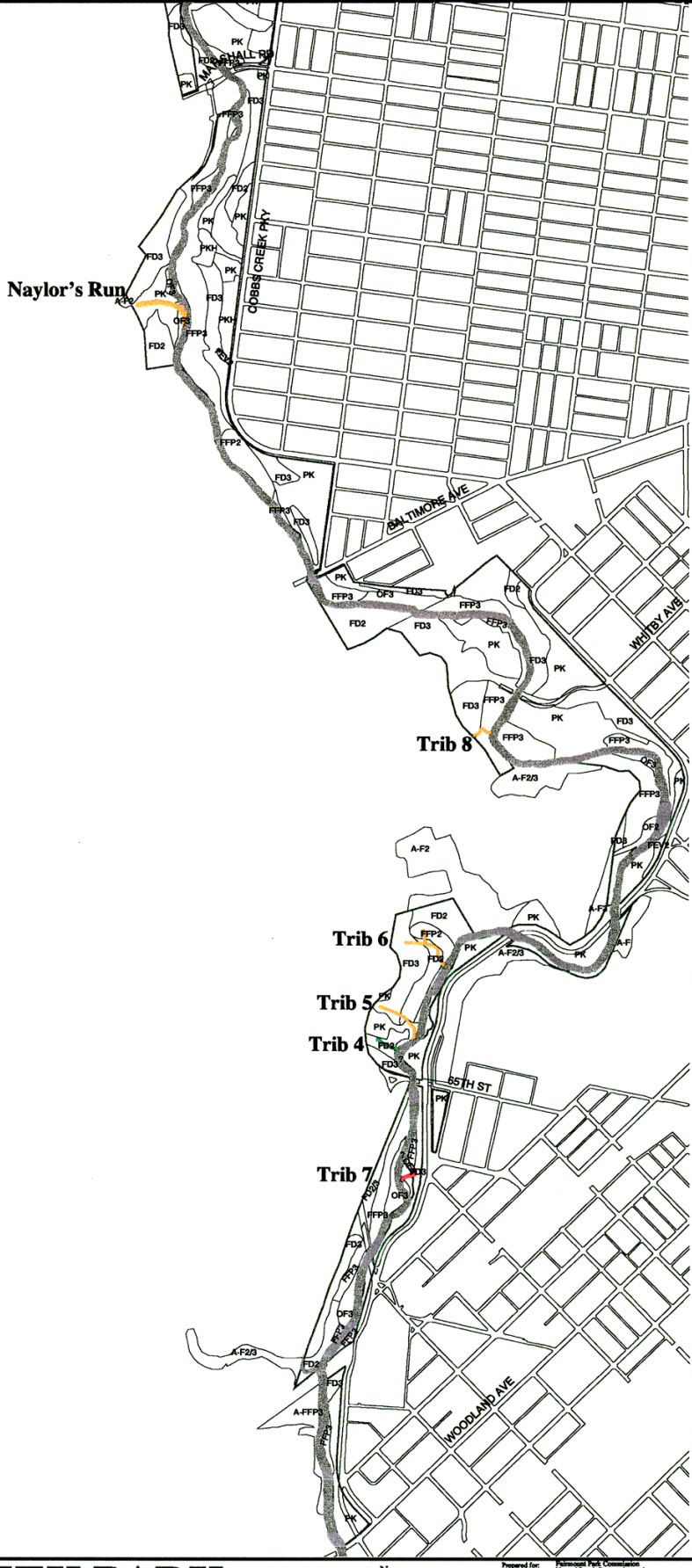

Legend

Total Stream Quality

- Unclassified
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- Impaired
- Moderately Impaired
- Non-Impaired
- Park Boundary

Vegetation Classification
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FAIRMOUNT P·A·R·K COMMISSION

COBBS CREEK PARK
Natural Lands Restoration Master Plan
STREAM QUALITY
Map 2 of 2

N

500 0 500 Feet

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Park Boundaries from the Phila. Planning Commission with updates by PCER
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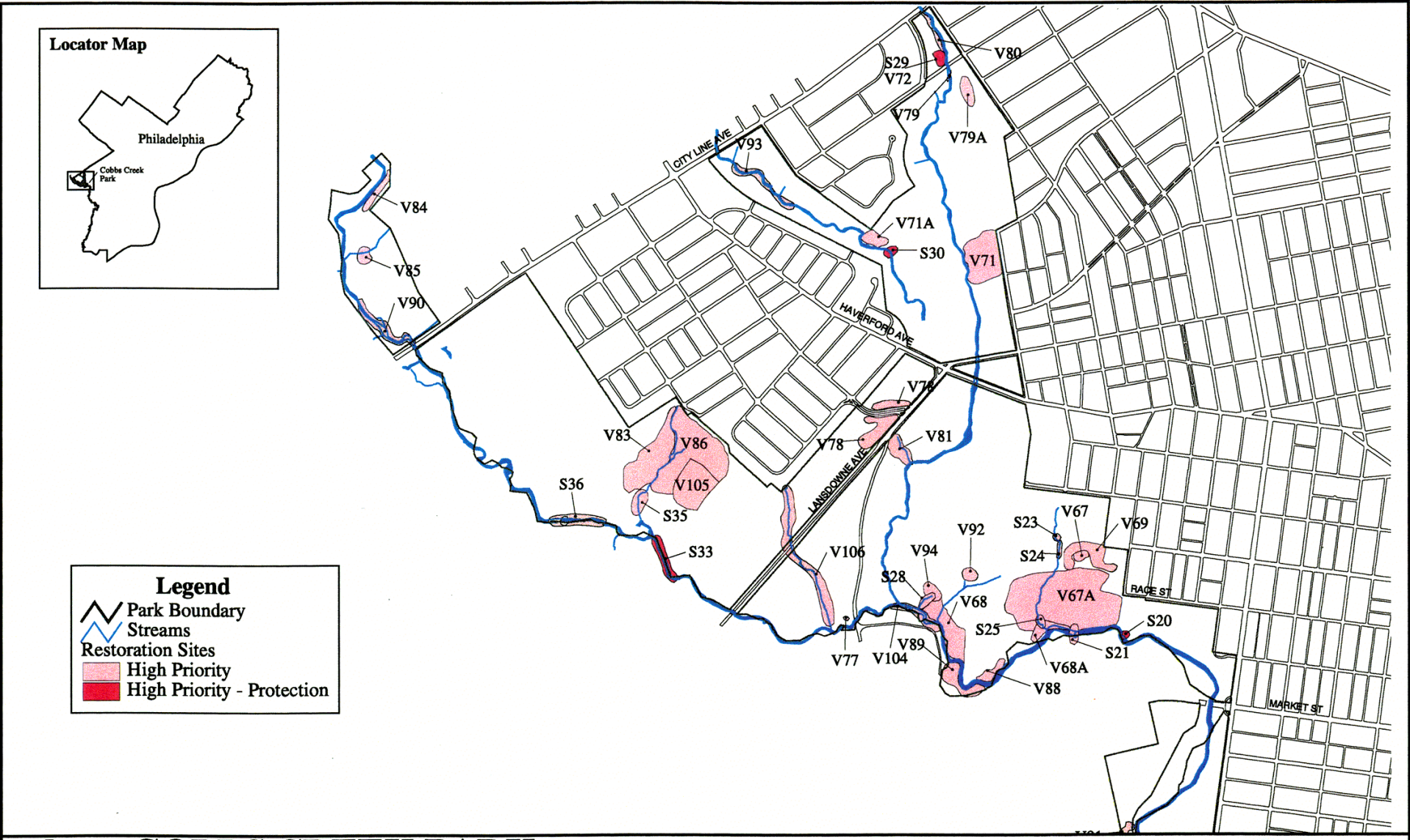


COBBS CREEK PARK
Natural Lands Restoration Master Plan
RESTORATION SITES
Map 1 of 2

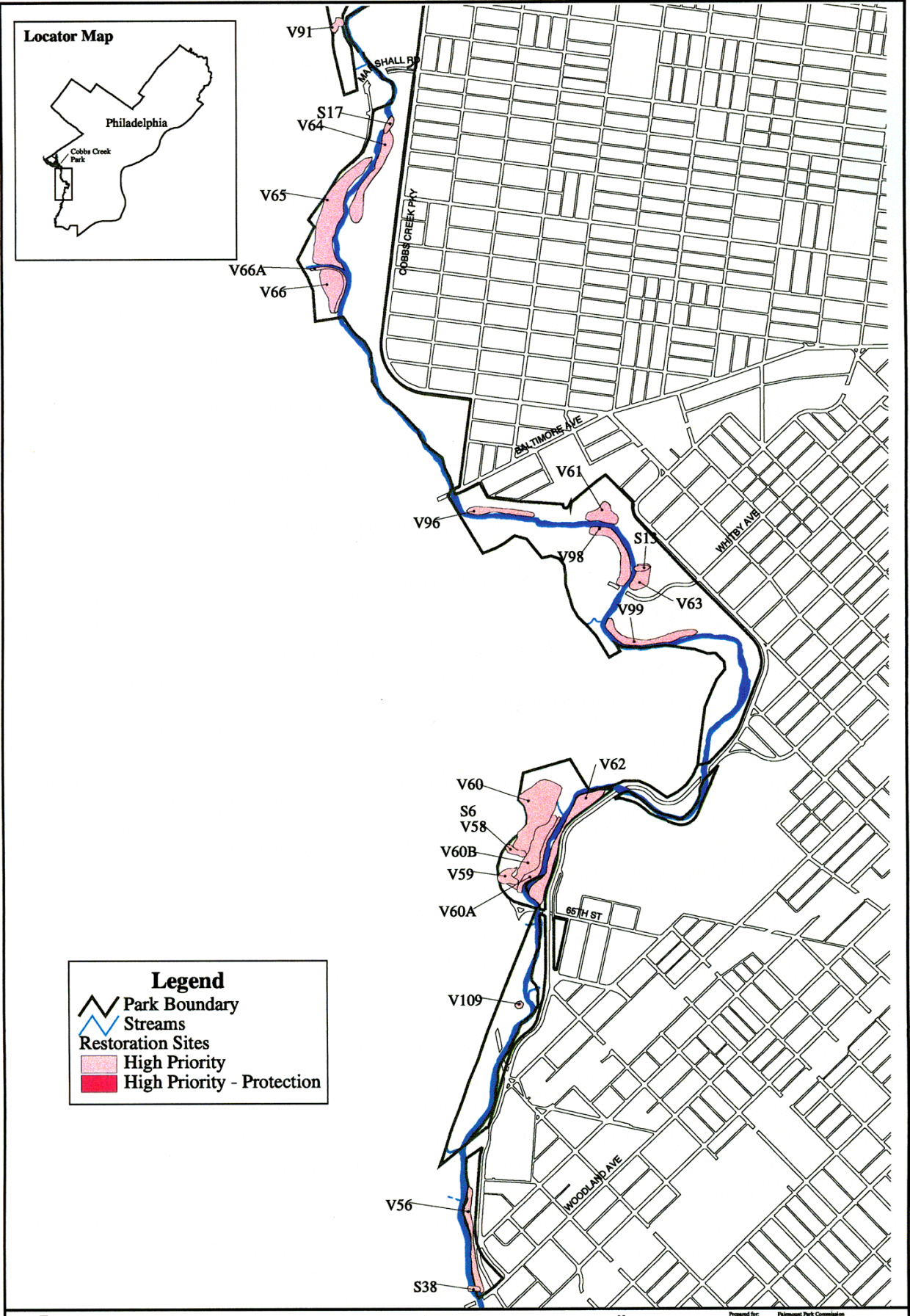
FAIRMOUNT PARK COMMISSION

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.



COBBS CREEK PARK
Natural Lands Restoration Master Plan
RESTORATION SITES
Map 2 of 2

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

Fairmount Park Restoration Sites

Cobbs Creek Park

Park: CC **Restoration Site ID:** S6 **Site Name:** Tributary 5

Location: @ Cobbs Ck Parkway between Cypress and Fern Sts

General Location: 65th-Cobbs Creek Parkway, west side

Disturbance/Condition: Erosion/Scour

Restoration Category Stream

Restoration Type: Channel **Constraints:**

Acreage: 0.43

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

Description:

The stormwater outfall at this site is no longer functioning properly and is causing severe scouring and erosion in the stream channel. The structure needs to be altered (check dams, drop structure design, new pipe or energy deflectors) to reduce stormwater impacts. Once the stormwater structure has been improved, the streambanks will need restoration using appropriate bioengineering techniques.

Restoration Options:

ID	Action	Priority	Proportion
B	Bank Stabilization/Regrade	H1	100%
A	Structural Improvement (SW)	H2	100%

Park: CC **Restoration Site ID:** S17 **Site Name:** Exposed Sewer Line in Cobbs Creek

Location: 300 feet south of Marshall Road

General Location: Baltimore-Marshall, east side

Disturbance/Condition: Erosion/Scour

Restoration Category Stream

Restoration Type: Channel **Constraints:**

Acreage: 0.31

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

Description:

Cobbs Creek forms two channels at this site. The right (west) channel is blocked by a large fallen tree trunk, which obstructs the flow. The left (east) channel now carries most of the flow, and has eroded into the left bank, exposing a brick sewer line (approximately 100 feet long). Since this site involves a PWD structure, the restoration should be a joint project with PWD. We recommend that the large tree and the debris dam in the right channel be removed to relieve some of the pressure on the left bank where the sewer line is exposed. The bank with the exposed sewer line should then be stabilized, preferably with bioengineering materials and native plantings.

Restoration Options:

ID	Action	Priority	Proportion
C	Bank Stabilization/Regrade	H1	100%
B	Structural Improvement (SW)	H2	100%
A	Trash Removal	H3	100%

Park: CC **Restoration Site ID:** S20 **Site Name:** Cobbs Creek Boulder

Location: Near Daggett and Race Sts., downstream from dam

General Location: Market-former Darby and Merion Road

Disturbance/Condition: None/Minimal

Restoration Category Stream

Restoration Type: Channel **Constraints:** D

Acreage: 0.20

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

Description:

This boulder site on Cobbs Creek should be a protected vista. We recommend that FPC protect this site in the following ways: 1) do not alter hydrology; 2) maintain with trash removal and graffiti removal; and 3) increase awareness and stewardship of this section of the stream by using signs and by publicizing it at the environmental education center.

Restoration Options:

ID	Action	Priority	Proportion
A	Protect/Monitor	HP	100%

Park: CC **Restoration Site ID:** S21 **Site Name:** Cobbs Creek Dam

Location: Downstream of mouth Bocce tributary

General Location: Market-former Darby and Merion Road

Disturbance/Condition: Dam

Restoration Category Stream

Restoration Type: Channel **Constraints:**

Acreage: 0.49

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

Description:

We suggest the removal of the dam at this site. As previously mentioned, dams are detrimental to a stream's health in many ways. In addition, this dam is causing a large debris pile to form upstream, which is in turn causing major erosion on the banks of Cobbs Creek. The clogged debris upstream of the dam would need to be removed prior to the removal of the dam structure to prevent further damage downstream. After the dam is removed, adjacent streambanks may need to be stabilized. Also, the mudflats that will become exposed upstream should be planted with native vegetation and be controlled for invasives and exotics. The mudflats should be planted no sooner than 6-12 months after the dam has been removed, since the stream will need to realign itself.

Restoration Options:

ID	Action	Priority	Proportion
A	Dam Removal	H1	100%
B	Trash Removal	H2	100%

Park: CC **Restoration Site ID:** S23 **Site Name:** Bocce tributary clogged culvert

Location: West of Bocce Courts, Vine and Daggett Sts.

General Location: Market-former Darby and Merion Road

Disturbance/Condition: SW Structure Malfunction/Problem

Restoration Category Stream

Restoration Type: Channel **Constraints:**

Acreage: 0.14

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

Description:

We suggest the removal of the clogged culvert. The culvert was once under the trail, but has since been clogged with sediment. At the present time, the stream infiltrates underground and seeps through an old rock pile where the culvert is. Once the culvert and the excess sediment have been excavated, the stream will essentially be rebuilt. The culvert should be replaced with a low-water crossing or a bridge structure. This restoration will have to be coordinated with the trails restoration team.

Restoration Options:

ID	Action	Priority	Proportion
B	Bank Stabilization/Regrade	H	100%
A	Structural Improvement (Trails)	H	100%
C	Trash Removal	H	100%

Park: CC **Restoration Site ID:** S24 **Site Name:** Bocce tributary clean-up

Location: West of Bocce Courts, Vine and Daggett Sts.

General Location: Market-former Darby and Merion Road

Disturbance/Condition: Trash Dumping

Restoration Category Stream

Restoration Type: Channel **Constraints:** D

Acreage: 0.24

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

Description:

There are many large items including appliances, shopping carts, and cars, that are causing destruction of the stream channel. This site needs a large-scale clean-up to remove the debris. In addition, to prevent future dumping, barriers should be installed at known and potential access points. In addition, the streambanks may need to be stabilized and replanted as a result of the clean-up.

Restoration Options:

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

Park: CC **Restoration Site ID:** S25 **Site Name:** Bocce tributary trail work

Location: West of Bocce Courts, near Cobbs Creek

General Location: Market-former Darby and Merion Road

Disturbance/Condition: Erosion/Scour

Restoration Category Stream

Restoration Type: Channel **Constraints:** D

Acreage: 0.29

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

Description:

A trail crosses the Bocce tributary and it is causing heavy erosion on the banks. We suggest that the trail be altered (i.e., add bridge, change route) to prevent further degradation of the stream channel. There are also several large concrete pipe segments in the stream that should be removed. The streambanks should then be repaired using bioengineering techniques and planted with native vegetation. There is a diverse oak forest nearby, which is threatened by the invasives/exotics on the floodplain of Cobbs Creek. The forested riparian buffer established by this project will help to protect the high quality forest from future disturbance.

Restoration Options:

ID	Action	Priority	Proportion
B	Trash Removal	H1	100%
A	Bank Stabilization/Regrade	H2	100%
C	Structural Improvement (Trails)	H3	100%

Park: CC **Restoration Site ID:** S28 **Site Name:** Tributary 1

Location: Hole #2 of Karakung Golf C, east of Indian Creek

General Location: former Darby and Merion Road to Cardington

Disturbance/Condition: Channel Gully

Restoration Category Stream

Restoration Type: Channel **Constraints:**

Acreage: 0.46

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

Description:

This stream is extremely incised and eroding due to a headcut moving upstream from the confluence with Cobbs Creek. The migrating headcut is approximately 3 ft up from the confluence with Cobbs. The huge gully that has formed has most likely been caused by the downcutting of Cobbs Creek itself. Cobbs Creel is now at a lower level than it was historically and this tributary is adjusting itself to the new elevation by downcutting. We recommend the creation of a natural drop structure, such as a waterfall or steps, to compensate for the elevation difference between the tributary and Cobbs Creek mainstem. This channel modification will allow the gullied stream channel to get down to Cobbs Creek's elevation in a more controlled way.

Restoration Options:

ID	Action	Priority	Proportion
A	Modify Channel	H	100%

Park: CC **Restoration Site ID:** S29 **Site Name:** Morris Park, Indian Creek

Location: North of Sherwood Avenue

General Location: Morris Park, Indian Creek

Disturbance/Condition: None/Minimal

Restoration Category Stream

Restoration Type: Channel **Constraints:**

Acreage: 0.47

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

Description:

PWD has considered using this area for some detention of Mill Creek (a cross-basin transfer). We strongly discourage this addition of storm flow to Indian Creek. Our detailed geomorphology measurements suggest that Indian Creek, while still relatively stable, is on the verge of becoming unstable due to an increasing urbanization of the watershed. The site now contains a small wetland that should be protected and enhanced (See notes for site V72). We recommend that FPC protect this site in the following ways: 1) do not alter hydrology; 2) maintain with trash removal and graffiti removal; and 3) increase awareness and stewardship of this section of the stream by using signs and by publicizing it at the environmental education center.

Restoration Options:

ID	Action	Priority	Proportion
A	Protect/Monitor	HP	100%

Park: CC **Restoration Site ID:** S30 **Site Name:** Indian Run Waterfall

Location: Approximately 1000 feet north of Haverford Ave.

General Location: Morris Park, Indian Run (West Br)

Disturbance/Condition: None/Minimal

Restoration Category Stream

Restoration Type: Channel **Constraints:**

Acreage: 0.38

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

Description:

This is a beautiful cascade that should be maintained and preserved as a scenic spot. We suggest that FPC protect this site in the following ways: 1) do not alter hydrology; 2) maintain with trash removal and graffiti removal; and 3) increase awareness and stewardship of this section of the stream by using signs and by publicizing it at the environmental education center.

Restoration Options:

ID	Action	Priority	Proportion
A	Protect/Monitor	HP	100%
B	Trash Removal	HV	100%

Park: CC **Restoration Site ID:** S33 **Site Name:** Cobbs Creek

Location: Between Karakung and Cobbs Golf Courses

General Location: Cardington to City Avenue, both sides

Disturbance/Condition: None/Minimal

Restoration Category Stream

Restoration Type: Channel **Constraints:** G

Acreage: 1.40

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

Description:

Nice section of Cobbs Creek between golf courses should be protected. We recommend that FPC protect this section of Cobbs Creek in the following ways: 1) do not alter the hydrology; 2) maintain forested riparian buffer; and 3) maintain with trash removal and invasive/exotic control.

Restoration Options:

ID	Action	Priority	Proportion
A	Protect/Monitor	HP	100%

Park: CC **Restoration Site ID:** S35 **Site Name:** Tributary 3

Location: 77th and Woodcrest (Cobbs Ck Golf Course)

General Location: Cardington to City Avenue, both sides

Disturbance/Condition: Mowed/No Riparian Zone

Restoration Category Stream

Restoration Type: Channel **Constraints:** G

Acreage: 0.94

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

Description:

Stream runs through the maintained Cobbs Creek Golf Course. The stream-side vegetation consists of grasses mown to the edge of the bank. We suggest planting a riparian forest buffer here. Golf course maintenance should allow the riparian zone to grow and survive. We believe that the addition of a riparian zone would not obstruct the fairway, since the stream is in a valley much lower than the tee and the hole. The buffer could be planted with smaller trees and shrubs as well as native grasses and sedges, to limit the obstruction to the fairway.

Restoration Options:

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

Park: CC **Restoration Site ID:** S36 **Site Name:** CC Golf Course Riparian Restoration

Location: CC Golf Course, near hole #5

General Location: Cardington to City Avenue, both sides

Disturbance/Condition: Mowed/No Riparian Zone

Restoration Category Stream

Restoration Type: Channel **Constraints:** G

Acreage: 1.67

Site Priority: H **Location Criteria:** Area with few other restoration opportunities

Description:

We recommend a stream bank/riparian restoration project at this site. Currently, this stretch of Cobbs Creek has mown grass to the edge of the creek. In addition, there is an old rock wall that used to line the channel, but is presently deteriorating and causing excessive streambank erosion to occur. The deteriorated walls should be removed and banks should be regraded where appropriate and stabilized with bioengineering techniques. A 10-35 foot riparian zone of native plants should be established. The project design and the selection of plants would take into consideration the fairway of the hole.

Restoration Options:

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

Park: CC **Restoration Site ID:** S38 **Site Name:** Woodland Ave Dam

Location: Cobbs Creek above Woodland Avenue

General Location: Woodland Ave-Church, both sides

Disturbance/Condition: Dam

Restoration Category Stream

Restoration Type: Channel **Constraints:**

Acreage: 0.20

Site Priority: H **Location Criteria:**

Description:

We recommend the removal of the Woodland Ave. Dam. After the dam has been removed, adjacent banks may need to be stabilized with bioengineering techniques. Mudflats that will appear upstream of the dam will need to be planted with native vegetation and controlled for invasives/exotics. The replanting of the mudflats should come 6-12 months after the dam removal to allow for the stream to realign itself.

Restoration Options:

ID	Action	Priority	Proportion
A	Dam Removal	H	100%

Park: CC **Restoration Site ID:** V56 **Site Name:** Woodland Ave. riparian zone

Location: Cobbs Creek Parkway to creek, north of Woodland

General Location: Woodland Ave-Church, both sides

Disturbance/Condition: Maintained Lawn/Mowed Field

Restoration Category Vegetation

Restoration Type: Riparian Zone **Constraints:** Active recreation area

Acreage: 1.67

Site Priority: HV **Location Criteria:** Area with few other restoration opportunities

Description:

This site is a riparian zone which is presently being mowed and maintained by park staff and could be expanded by less frequent mowing. This area is at the narrowest part of the park and is very close to the parkway. It is a highly disturbed area as is indicated by the presence of several exotic species including Japanese knotweed and multiflora rose. Grape vines are taking advantage of the gaps created by the mowing and are invading the canopy, which contains several representative native floodplain species such as black cherry, silver maple and American elm.

The higest priority recommendation for this site is that the exotic species be removed as part of a volunteer effort. If this site is mowed less frequently, and the exotics are controlled and monitored, it could serve as a functional riparian zone. Once exotics are removed, the area could be replanted with suitable native riparain zone species (see planting list).

Restoration Options:

ID	Action	Priority	Proportion
B	Invasive-Exotic Control	HV	100%
A	Release/Widen	M	100%
C	Replant Native Forest Species	L	100%

Park: CC **Restoration Site ID:** V58 **Site Name:** Wetlands North of 65th Street

Location: Wetlands North of 65th Street

General Location: 65th-Cobbs Creek Parkway, west side

Disturbance/Condition: Invasive/Exotic Vegetation

Restoration Category Vegetation

Restoration Type: Riparian Zone **Constraints:**

Acreage: 0.43

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

Description:

Exotic vegetation needs to be removed and banks replanted with native riparian species. The site would be best served if it was done in conjunction with a flood plain planting on adjacent lands. This area has a variety of habitat types, and a variety of restorations are recommended to enhance this significant area.

Restoration Options:

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

Park: CC **Restoration Site ID:** V59 **Site Name:** Cobbs and 65th Gully

Location: Cobbs and 65th

General Location: 65th-Cobbs Creek Parkway, west side

Disturbance/Condition: Channel Gully

Restoration Category Stream/Vegetation

Restoration Type: Slope **Constraints:**

Acreage: 0.78

Site Priority: H **Location Criteria:** Tied to storm water, watershed restoration

Description:

The gully on the slope is eroded and in need of repair. The plateau above the gully is mowed and adding storm water runoff to the slope and gully. Berms or other water retention devices on the top of the hill, filling and stabilization of the slope followed by understory plantings would control erosion and runoff.

Restoration Options:

ID	Action	Priority	Proportion
A	Gully Repair	H	100%

Park: CC **Restoration Site ID:** V60A **Site Name:** Cobbs and 65th w bank riparian strip

Location: Between Cobbs Creek Parkway and north. of 65th St.

General Location: 65th-Cobbs Creek Parkway, west side

Disturbance/Condition: Lack of understory/herbaceous layer

Restoration Category Vegetation

Restoration Type: Riparian Zone **Constraints:**

Acreage: 1.19

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

Description:

The forest between the immediate riparian strip and the steep slopes could benefit from additional plantings. This would be most beneficial if it were done in conjunction with invasive controls, regrading, and wetlands plantings. This general area has a variety of habitats which are not clearly demarcated. Several restoration projects are recommended for this area, which will enhance this significant area.

Restoration Options:

ID	Action	Priority	Proportion
B	Replant Native Forest Species	H	50%
C	Replant Native Herbs	L	100%
D	Replant Native Shrubs	L	100%

Park: CC **Restoration Site ID:** V60B **Site Name:** Cobbs Creek Pwky & 65th Street Forest

Location: North of 65th St., west bank

General Location: 65th-Cobbs Creek Parkway, west side

Disturbance/Condition: Disturbed Forest

Restoration Category Vegetation

Restoration Type: Riparian Zone **Constraints:**

Acreage: 2.84

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

Description:

The flood plain is unforested and planting of flood plain trees is recommended. This would be most beneficial if it were done in conjunction with invasive controls This general area has a variety of habitats which are not clearly demarcated. Several restoration projects are recommended for this area, which will enhance this significant area.

Restoration Options:

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

Park: CC **Restoration Site ID:** V60 **Site Name:** Fern Street Forest

Location: North of Cobbs Creek Parkway at Fern St.

General Location: 65th-Cobbs Creek Parkway, west side

Disturbance/Condition: Invasive/Exotic Vegetation

Restoration Category Vegetation

Restoration Type: Slope **Constraints:**

Acreage: 5.75

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

Description:

The forest has good structure in this location; however, Norway maple is becoming a problem. Native trees should be planted to outcompete the Norway maple. There are large canopy gaps which will become overgrown with vines if trees are not planted. Large gullies exist where soil is so compacted that it prohibits regeneration. Soil should be tilled, and gullies should be filled and replanted.

Restoration Options:

ID	Action	Priority	Proportion
C	Gully Repair	H	10%
B	Replant Native Trees	H	40%

Park: CC **Restoration Site ID:** V61 **Site Name:** Fernwood Street Wetland

Location: 400 feet SW of Fernwood and Cobbs Creek Parkway

General Location: Cobbs Creek Parkway to Baltimore, east side

Disturbance/Condition: No Vegetative Diversity

Restoration Category Vegetation

Restoration Type: Wetland **Constraints:**

Acreage: 1.37

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

Description:

Control of invasive plants and wetland planting is recommended in this small wetland. Planting of native wetland herbs (see planting list) will enhance vegetative diversity and will allow for holding of water during storm events. Existing herbs include: cup plant, stinging nettle, clearweed, jewelweed, and Japanese stilt grass.

Restoration Options:

ID	Action	Priority	Proportion
A	Replant Native Herbs	H	100%

Park: CC **Restoration Site ID:** V62 **Site Name:** Mt. Moriah Floodplain Forest, e (L) bank

Location: North of 65th Street flood plain forest

General Location: 65th-Cobbs Creek Parkway, west side

Disturbance/Condition: Perched Floodplain

Restoration Category Vegetation

Restoration Type: Riparian Zone **Constraints:**

Acreage: 3.44

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

Description:

This site is located at and upstream of the intersection of Cobbs Creek Parkway and 65th Street. The left bank of the creek is steep and severly eroded, and the disturbance has led to an overgrowth of Japanese Knotweed and Japanese hops. The recommendation at this site is to replant a native floodplain forest along the creek. Trees, shrubs and herbs appropriate for this type of restoration can be found on the planting list.

Restoration Options:

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

Park: CC **Restoration Site ID:** V63 **Site Name:** Whitby Street Playground

Location: North of Whitby St., west of Cobbs Creek Parkway

General Location: Cobbs Creek Parkway to Baltimore, west side

Disturbance/Condition: Trash Dumping

Restoration Category Vegetation

Restoration Type: Forested Upland **Constraints:** Rec area

Acreage: 1.23

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

Description:

This area is located on the edge of woods, next to a heavily used playground. It is recommended that the area be mowed less frequently and that a meadow buffer be planted in between the playground and the slopes which lead to the woods. A meadow here will act as a buffer to the adjacent woods and will attract birds and insects to the area. The soils are heavily compacted and eroded and the area lacks a herbaceous layer. The soils may need to be tilled before replanting to encourage growth of native meadow species. Monitoring would include a meadow management plan which would consist of a mowing schedule as infrequently as twice a year and the removal of any exotic species which may begin to grow.

The removal of trash and debris is also recommended at this site. A small fence or some kind of border should be placed around the new plantings to discourge further dumping and trampling.

The area around this site is heavily used by people, and cars are often parked on the mowed lawns. Runoff from the mowed areas down the slopes, eroding slopes and creating gullies, is a problem throughout this area. Gullying and erosion is also created by paths and roads crossing the slope. Berms and other erosion devices on the edge of the slopes would be valuable, and access, trail and parking issues need to be addressed as well.

Restoration Options:

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

Park: CC **Restoration Site ID:** V64 **Site Name:** Stables flood plain

Location: Open area north of stables at bottom of the slopes

General Location: Cobbs Creek Parkway to Baltimore, east side

Disturbance/Condition: Maintained Lawn/Mowed Field

Restoration Category Vegetation

Restoration Type: Riparian Zone **Constraints:** Picnic grove

Acreage: 2.82

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

Description:

This is an open area at the bottom of the slopes, north of the stables. The intersection of Cobbs Creek Park and Catharine Sts. provides a trail for entrance to the site. The area contains picnic tables which could be moved closer to stables to maintain the picnic area and allow for reforestation of the floodplain.

This area shouild not be mowed. Releasing the lawn and replanting of flood plain forest species would be a good example of the benefits of forest buffers, and would be an excellent way to demonstrate the concepts of biodiversity in the vicinity of the environmental center.

Restoration Options:

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

Park: CC **Restoration Site ID:** V65 **Site Name:** Stable Meadows

Location: West bank Cobbs Creek, across from Stables

General Location: Baltimore-Marshall, west side

Disturbance/Condition: Maintained Lawn/Mowed Field

Restoration Category Vegetation

Restoration Type: Wetland **Constraints:**

Acreage: 6.67

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

Description:

The mowed area behind the stables, on the west side of the creek (i.e., across the creek from the stables), is an excellent opportunity for wetlands creation. Presently, the area is mowed frequently and the vegetative community at the edge of the mowed area consists of several invasive species, including Japanese knotweed. Part of the mowed area is used for passive recreation, and there are plans for more intense recreational use of part of the area. A mix of mowed fields, meadow and wetlands can allow multiple use of this area. Planting of native meadow species is recommended and mowing should only be done once or twice a year, beginning the year after the initial planting.

The creation of the wetland will benefit those using the environmental center, will act as water storage and filtration during storm events and will provide wildlife habitat. The wetland would encompass part of site, e.g., at the southeast end, where elevations are lowest. 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. Erecting fences and putting up signs would aid in protecting the area and informing people. After establishment of vegetation, introduction of fish or other organisms may be desirable.

Restoration Options:

ID	Action	Priority	Proportion
B	Replant Native Herbs	H	30%
A	Wetland Creation	H	30%

Park: CC **Restoration Site ID:** V66A **Site Name:** Naylor's Run riparian strip

Location: Naylor's Run

General Location: Baltimore-Marshall, west side

Disturbance/Condition: Invasive/Exotic Vegetation

Restoration Category Vegetation

Restoration Type: Riparian Zone **Constraints:**

Acreage: 0.56

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

Description:

There is a narrow zone of trees and shrubs along Naylor's Run, and gullies in the stream bank are present. Replanting native riparian forest species along Naylor's Run is recommended here. This may include repair of slopes along the creek. This area is adjacent to the proposed wetland/meadow area (V66), which would improve storm water retention in this area.

Restoration Options:

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

Park: CC **Restoration Site ID:** V66 **Site Name:** Naylor's Run Meadow

Location: Behind Environmental Center on Naylor's Run

General Location: Baltimore-Marshall, west side

Disturbance/Condition: Mowed/No Riparian Zone

Restoration Category Vegetation

Restoration Type: Riparian Zone **Constraints:**

Acreage: 2.19

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

Description:

This area is somewhat secluded and could be developed into a mix of meadow and wetland habitat that could be of great benefit to the environmental center. This project would be more valuable if it is done in conjunction with the adjacent riparian planting. The area may be used by people from the adjacent residential neighborhood, so the design should include retention of some mowed area to accommodate these needs. Little or no use has been seen on several site visits, except for people walking along the path from Walnut Lane to footbridge across creek, and a few people on upper part of slope.

A mix of mowed fields, meadow and wetlands can allow multiple use of this area. Planting of native meadow species is recommended and mowing should only be done once or twice a year, beginning the year after the initial planting. This area is near the mowed field (V65) across from the stables, for which a similar mix of mowed field, meadow and wetland is recommended. Either or both of these projects would be valuable.

The creation of the wetland will benefit those using the environmental center, will act as water storage and filtration during storm events and will provide wildlife habitat. The wetland would encompass part of site, e.g., at the southeast end, where elevations are lowest. 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. Erecting fences and putting up signs would aid in protecting the area and informing people. After establishment of vegetation, introduction of fish or other organisms may be desirable.Replanting native herbs and wetland creation are suggessted here. Presently, this area is a low, mowed field bordered by narrow strip of floodplain trees including box elder, silver maple, and weeping willow. Japanese knotweed is also a problem in this site. A wetland would hold water from storm events which cascades down the hill behind the homes. Creating a wetland here would require that the park stop mowing, regrading, and replanting of wet herbaceous species.

Restoration Options:

ID	Action	Priority	Proportion
B	Replant Native Herbs	H	50%
C	Wetland Creation	H	30%

Park: CC **Restoration Site ID:** V67A **Site Name:** Bocci Court Woods

Location: Bocce Court Woods

General Location: Market-former Darby and Merion Road

Disturbance/Condition: Lack of understory/herbaceous layer

Restoration Category Vegetation

Restoration Type: Forested Upland **Constraints:**

Acreage: 17.55

Site Priority: H **Location Criteria:**

Description:

This is one of the largest contiguous tracks of woods in Cobbs Creek Park. This area patches of good woods, with mature and sapling oaks, hickories and other tree species. However, much of the understory is poorly developed or has low diversity of herbs and shrubs. There is also wetland seep with skunk cabbage in the eastern part of the woods. There are also some early successional patches with native herb species along old roads. Overall, this area is not as severely disturbed as smaller wooded areas. The recommendation is to protect the good woods, and fill in the lacking understory with native shrubs, herbs, and trees. Some areas around the mature woods, especially at the northern end, are open with many invasives. Control of invasives and replanting is recommended here.

Roads and trails through this area create access and erosion problems. Abandonment of cars and trash dumping are problems. While much of the area remains in good condition despite these disturbances, control of access would enhance the area and increase success of other restoration efforts.

The "Bocce" tributary runs through this area. Restoration of this tributary and along its riparian zone is a high priority. Other high priority restoration projects, including removal of the Millbourne Dam, are located along Cobbs Creek. The quality of existing habitats in the area and the group of recommended restoration projects make this a significant area.

Restoration Options:

ID	Action	Priority	Proportion
B	Protect/Monitor	H	100%
C	Replant Native Herbs	H	20%
A	Replant Native Shrubs	H	20%
D	Replant Native Trees	H	10%

Park: CC **Restoration Site ID:** V67 **Site Name:** Bocce Court Pond

Location: In woods 300 feet behind Bocce Courts

General Location: Market-former Darby and Merion Road

Disturbance/Condition: Filled/Drained Pond or Wetland

Restoration Category Vegetation

Restoration Type: Wetland **Constraints:** Poor access, ongoing disturbance

Acreage: 0.37

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

Description:

This is a small wet area with degraded fragmented forest surrounding it. Trash removal and the replanting of native herbs is suggested here. This area appears on the park map as a pond. The pond is seasonal, and during dry periods has wet soils but no standing water.. The area appears to be manmade. There are exotics on the slopes and sedges in the pond. Catalpa and sycamore are prevalent here, as well as silver maples.

Restoration Options:

ID	Action	Priority	Proportion
B	Replant Native Herbs	H	100%
A	Trash Removal	H	100%

Park: CC **Restoration Site ID:** V68A **Site Name:** Cobbs riparian, South of Bocce Woods

Location: Off of Karakung Golf Course

General Location: Market-former Darby and Merion Road

Disturbance/Condition: Invasive/Exotic Vegetation

Restoration Category Vegetation

Restoration Type: Riparian Zone **Constraints:** G

Acreage: 1.06

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

Description:

The left (north) bank of Cobbs Creek above the Millbourne dam (around the mouth of the "Bocce tributary") is open with dense growths of Japanese knotweed and other exotics. Control is recommended, which could be done using volunteer groups. Restoration of this area is important because of its proximity to high quality woods and other restoration sites.

Restoration Options:

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

Park: CC **Restoration Site ID:** V68 **Site Name:** Bocce Court Wetlands

Location: On creek 1,350 feet west of dam

General Location: Market-former Darby and Merion Road

Disturbance/Condition: Disturbed Forest

Restoration Category Vegetation

Restoration Type: Wetland **Constraints:**

Acreage: 3.36

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

Description:

The flood plain forest is highly disturbed, especially near the creek. It's understory is dominated by exotic species such as knotweed. Replanting of native wetland herbs to encourage biodiversity is recommended. Restoration of this site is important because of its proximity to high quality woods on the adjacent slope.

Restoration Options:

ID	Action	Priority	Proportion
A	Replant Native Herbs	H	100%

Park: CC **Restoration Site ID:** V69 **Site Name:** Bocce Court Slopes

Location: Directly behind bocce courts

General Location: Market-former Darby and Merion Road

Disturbance/Condition: Trash Dumping

Restoration Category Vegetation

Restoration Type: Forested Upland **Constraints:**

Acreage: 2.46

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

Description:

This area is a primary site for trash dumping, with large quantities accumulating at the top of the slope and falling down the slope. The trash problem is greatest behind the bocce facility, but dumping also occurs along an old road which flanks the slopes which drop down to the pond. Exotic plants occur in this highly disturbed area. Control of access and removal of trash is necessary in this area.

Restoration Options:

ID	Action	Priority	Proportion
A	Trash Removal	H	100%

Park: CC **Restoration Site ID:** V71A **Site Name:** 72nd St. and Woodbine Ave. Floodplain

Location: Indian Run, 72nd and Woodbine

General Location: Morris Park, Indian Run (West Br)

Disturbance/Condition: Invasive/Exotic Vegetation

Restoration Category Vegetation

Restoration Type: Riparian Zone **Constraints:**

Acreage: 0.89

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

Description:

This site is directly across from the storm sewer outlet STW 16. It is a highly disturbed flood plain adjacent to less disturbed woods and flood plain. The slope above the floodplain has had a dense stand of mile-a-minute. Control of mile-a-minute and other exotics and replanting of native shrubs is recommended at this site.

Restoration Options:

ID	Action	Priority	Proportion
B	Replant Native Shrubs	H	100%

Park: CC **Restoration Site ID:** V71 **Site Name:** Akebia patch

Location: Control Akebia and replant gaps in the forest

General Location: Morris Park, Indian Creek

Disturbance/Condition: Invasive/Exotic Vegetation

Restoration Category Vegetation

Restoration Type: Forested Upland **Constraints:**

Acreage: 4.93

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

Description:

Akebia covers about 4 acres. The Akebia is most dense on old fill above the East Branch of Indian Creek, but Akebia has spread to lower areas along the creek and floodplain. Akebia vines up trees and could cross the tree using overhanging branches. Although this is an exotic, it appears to only be found in this one patch of Cobbs Creek.we

Efforts to control Akebia at this site were started using volunteers, supplemented by herbicide application by park staff. A combination of cutting (especially stems growing up trees) and herbicide application appears most likely to succeed. Prevention of spread of Akebia to the west side of the creek or to the floodplain north of the site should be a priority.. Since Akebia is evergreen, control can be done in winter or early spring, when most other plants are dormant. The forest would benefit from a planting to help close the canopy gap, thus slowing down the growth of the Akebia. However, regrowth of remaining shrubs and regeneration of new plants has occurred without replanting.

Restoration Options:

ID	Action	Priority	Proportion
A	Invasive-Exotic Control	HV	80%
B	Replant Native Trees	L	100%

Park: CC **Restoration Site ID:** V72 **Site Name:** Sherwood Road Wetland

Location: North of Sherwood

General Location: Morris Park, Indian Creek

Disturbance/Condition: Filled/Drained Pond or Wetland

Restoration Category Vegetation

Restoration Type: Wetland **Constraints:**

Acreage: 0.47

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

Description:

The recommendation for this site is to restore the wetland west of the East Branch of Indian Creek. The wetland is in an old pond which has been almost completely filled with leaves and soil. The flood plain is mowed and not holding much storm water. In addition, the road is built up and creates steep slopes down to the site. There is potential of creating some storm water retention if the pond is deepened and possibly enlarged, and the flood plain is allowed to grow into wet meadow. There are a number of exotics on the edge including wisteria, Japanese honeysuckle and mile-a-minute. There is the possibility of volunteer support from Friends Central School, which is near the site.

Restoration Options:

ID	Action	Priority	Proportion
B	Invasive-Exotic Control	H	100%
A	Wetland Creation	HV	70%
D	Replant Native Shrubs	L	100%

Park: CC **Restoration Site ID:** V77 **Site Name:** Karakung Golf Course Wetland

Location: Hole One

General Location: Cardington to City Avenue, both sides

Disturbance/Condition: None/Minimal

Restoration Category Vegetation

Restoration Type: Wetland **Constraints:** G

Acreage: 0.05

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

Description:

This site contains a small wetland surrounded by mowed lawn. The existing wetlands could function more properly if the adjacent area were not mowed or were mowed less frequently.

Restoration Options:

ID	Action	Priority	Proportion
C	Release/Widen	H	100%
B	Replant Native Herbs	M	100%

Park: CC **Restoration Site ID:** V78 **Site Name:** Lansdowne and Cardington Exotics

Location: West side of Lansdowne Ave.

General Location: Cardington to City Avenue, both sides

Disturbance/Condition: Invasive/Exotic Vegetation

Restoration Category Vegetation

Restoration Type: Forested Upland **Constraints:**

Acreage: 2.77

Site Priority: H **Location Criteria:** Isolated

Description:

Mile-a-minute is prevalent in this area, especially at the edges of the mowed area. Removal of this exotic is recommended. Mile-a-minute is still relatively uncommon in the park and control so that control of its spread is desirable.

Restoration Options:

ID	Action	Priority	Proportion
A	Invasive-Exotic Control	H	100%

Park: CC **Restoration Site ID:** V79A **Site Name:** Morris Park slope woods

Location: East bank of Indian Creek south of Sherwood

General Location: Morris Park, Indian Creek

Disturbance/Condition: None/Minimal

Restoration Category Vegetation

Restoration Type: Slope **Constraints:**

Acreage: 0.92

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

Description:

These woods are of high quality, surrounded by slope and floodplain woods of intermediate disturbance. The quality of the woods should be recognized, so that the woods are preserved.

Restoration Options:

ID	Action	Priority	Proportion
A	Protect/Monitor	HP	100%

Park: CC **Restoration Site ID:** V79 **Site Name:** Morris Park, Indian Creek

Location: Indian Run

General Location: Morris Park, Indian Creek

Disturbance/Condition: Mowed/No Riparian Zone

Restoration Category Vegetation

Restoration Type: Riparian Zone **Constraints:**

Acreage: 0.09

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

Description:

There is a very narrow riparian zone immediately south of Sherwood Road. There are riparian woods along both sides of the creek. A trail run along the creek, and there is trampling and erosion of the streambank. The trails need to be stabilized and improved to reduce erosion.

Restoration Options:

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

Park: CC **Restoration Site ID:** V80 **Site Name:** Indian Creek mowed Riparian Zone

Location: North of Sherwood Street

General Location: Morris Park, Indian Creek

Disturbance/Condition: Disturbed Forest

Restoration Category Vegetation

Restoration Type: Riparian Zone **Constraints:**

Acreage: 0.44

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

Description:

The west bank of the East Branch of Indian Creek is partly open, with a narrow band of trees and much trampling, presumably from people using the adjacent picnic area. The area is largely mowed right up to the creek. A strip of land nearest the stream should be allowed to grow and plantings of native forest species would improve the riparian zone. The mowed area adjacent to the riparian zone is used for picnics and should be maintained.

Restoration Options:

ID	Action	Priority	Proportion
A	Release/Widen	H	100%
B	Replant Native Forest Species	HV	100%

Park: CC **Restoration Site ID:** V83 **Site Name:** Cobbs Creek Golf Course Slopes

Location: Cobbs Creek Golf Course, south facing slope

General Location: Cardington to City Avenue, both sides

Disturbance/Condition: Slope Erosion

Restoration Category Vegetation

Restoration Type: Slope **Constraints:**

Acreage: 5.66

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

Description:

The south-facing slope is highly disturbed, with an open tree canopy and many exotic plants. Control of invasive plants and replanting of native trees is recommended to restore this slope. Yard waste dumping is also an issue at this site. This is an opportunity for volunteer to remove yard waste and other debris. There are small wetlands along the creek at the base of the slope. The site is across the ravine from high quality woods, so enhancement of this site is significant.

Restoration Options:

ID	Action	Priority	Proportion
A	Replant Native Trees	H	50%
C	Trash Removal	HV	100%

Park: CC **Restoration Site ID:** V84 **Site Name:** Manoa Road Slopes

Location: North facing slopes, east bank of Cobbs Creek

General Location: Carroll Park

Disturbance/Condition: Slope Erosion

Restoration Category Vegetation

Restoration Type: Slope **Constraints:**

Acreage: 0.79

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

Description:

The slope lies at a right bend in Cobbs Creek below Old Manoa Road. The trail is worn into the hillside, and the slope has bare areas from people going up the trail (e.g., short-cutting to a trail to a playground at the top of the hill). Berms should be placed at the top of the slpe to help control erosion. Native shrub species will also aid in erosion control. Presently, the slope has large beech trees, Viburnum, witch hazel and ferns. Improvement of existing trails will deter people from creating rogue trails which exacerbates the erosion problem.

Restoration Options:

ID	Action	Priority	Proportion
C	Erosion Control	H	100%
A	Replant Native Shrubs	H	100%
B	Trail Improvement	H	100%

Park: CC **Restoration Site ID:** V85 **Site Name:** Carroll Park pond

Location: Old pond

General Location: Carroll Park

Disturbance/Condition: Filled/Drained Pond or Wetland

Restoration Category Stream/Vegetation

Restoration Type: Wetland **Constraints:**

Acreage: 0.62

Site Priority: H **Location Criteria:** Tied to storm water, watershed restoration

Description:

The former pond lies on a tributary which carries street runoff from the end of Carroll Road to Cobbs Creek. The tributary is deeply gullied between Carroll Road and the former pond, and from the base of the pond to the creek. The site is generally wet, with limited herbaceous cover, but has become progressively drier as the pond has filled in. Excavation of the pond to remove some soil will allow for wetland expansion. Native herbs should be planted to aid in supporting wetland vegetative diversity.

Restoration Options:

ID	Action	Priority	Proportion
A	Wetland Creation	H	40%

Park: CC **Restoration Site ID:** V86 **Site Name:** Wyndale Ave. Forest

Location: Cobbs Creek Golf Course (north facing slope)

General Location: Cardington to City Avenue, both sides

Disturbance/Condition: Invasive/Exotic Vegetation

Restoration Category Vegetation

Restoration Type: Forested Upland **Constraints:**

Acreage: 9.35

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

Description:

The forest on the south (north-facing) slope contains some of the least-disturbed forest in the park. The adjacent woods, especially to the east (between the best forest and the road) have increasing amount of exotic species. The southern end abuts the golf course and trash dumping is a problem in this area. The habitat in this high-quality woods could be improved by replanting native shrub species and removing trash from the area. A narrow buffer strip at the edge of the woods could provide additional habitat and reduce impacts from the golf course. The area should be monitored periodically to prevent further trash dumping problems.

Restoration Options:

ID	Action	Priority	Proportion
B	Replant Native Shrubs	H	50%
C	Trash Removal	H	100%

Park: CC **Restoration Site ID:** V88 **Site Name:** Bocce court Floodplain Left Bank

Location: West of dam east of creek

General Location: Market-former Darby and Merion Road

Disturbance/Condition: Dam

Restoration Category Vegetation

Restoration Type: Riparian Zone **Constraints:**

Acreage: 0.72

Site Priority: HV **Location Criteria:** Area with few other restoration opportunities

Description:

This site would benefit from removing Japanese knotweed along the banks. This is an activity which could be carried out by volunteers. Restoration in this area is important because of its proximity to the bocce facility woods and a number of restoration projects which are recommended in this area. Control of Japanese knotweed would reduce invasion of Japanese knotweed into the other restoration sites.

Restoration Options:

ID	Action	Priority	Proportion
A	Invasive-Exotic Control	HV	100%

Park: CC **Restoration Site ID:** V89 **Site Name:** Bocce Court Floodplain Right Bank

Location: North of Dam west of creek

General Location: Market-former Darby and Merion Road

Disturbance/Condition: Dam

Restoration Category Vegetation

Restoration Type: Riparian Zone **Constraints:**

Acreage: 1.77

Site Priority: HV **Location Criteria:** Isolated

Description:

This site would benefit from removing Japanese knotweed along the banks. This is an activity which could be carried out by volunteers. Restoration in this area is important because of its proximity to the bocce facility woods and a number of restoration projects which are recommended in this area. Control of Japanese knotweed would reduce invasion of Japanese knotweed into the other restoration sites.

Restoration Options:

ID	Action	Priority	Proportion
B	Invasive-Exotic Control	HV	100%

Park: CC **Restoration Site ID:** V90 **Site Name:** Carroll Park Floodplain

Location: North of City Line Avenue

General Location: Carroll Park

Disturbance/Condition: Erosion/Scour

Restoration Category Vegetation

Restoration Type: Riparian Zone **Constraints:**

Acreage: 2.02

Site Priority: HV **Location Criteria:** Isolated

Description:

This site is located in Carroll Park, North of City Line Avenue and the floodplain is dominated by Japanese knotweed. This exotic species needs to be removed by volunteers to prevent further invasion along the streambanks.

Restoration Options:

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

Park: CC **Restoration Site ID:** V91 **Site Name:** Sansom Street Wetlands

Location: Enters north of Sansom St, right bank Cobbs

General Location: Marshall-Market, both sides

Disturbance/Condition: Trash Dumping

Restoration Category Vegetation

Restoration Type: Wetland **Constraints:**

Acreage: 0.40

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

Description:

This seep/wet area is in need of restoration due to the dumping and the old railroad line right next to it. Ideally, this wetland should be expanded, but there is not a significant amount of area to create a functional wetland. The trash should be removed from the site and the area should be monitored to prevent further dumping.

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Restoration Options:

ID	Action	Priority	Proportion
A	Trash Removal	H	100%

Park: CC **Restoration Site ID:** V92 **Site Name:** Wetland at Hole #2

Location: Edge of Bocce court woods & Karakung golf course

General Location: Cardington to City Avenue, both sides

Disturbance/Condition: Golf Course Impacts

Restoration Category Stream/Vegetation

Restoration Type: Wetland **Constraints:**

Acreage: 0.52

Site Priority: H **Location Criteria:** Tied to storm water, watershed restoration

Description:

Possible berms, minor regrading, with planting.

An infiltration device or berms to control runoff from golf course should be built. A no mow zone should be created where the swales meet the fairway and native wetland herbs should be planted. The stream needs redirection or stabilization for the gully that is now in the road. Most of the flow at the headwaters actually comes from two low grassy swales within the fairway. A level-spreader or infiltration trench could also be built in this area to encourage infiltration and prevent further gullying. There is a sealed spring house in this area as well.

Restoration Options:

ID	Action	Priority	Proportion
D	Berms	H	100%
C	Replant Native Herbs	H	100%
B	Structural Improvement	H	100%

Park: CC **Restoration Site ID:** V93 **Site Name:** City Line Avenue Riparian Zone

Location: Indian Run riparian zone

General Location: Morris Park, Indian Run (West Br)

Disturbance/Condition: Invasive/Exotic Vegetation

Restoration Category Vegetation

Restoration Type: Riparian Zone **Constraints:**

Acreage: 1.74

Site Priority: HV **Location Criteria:** Isolated

Description:

This site would benefit from removing Japanese knotweed along the banks. This is an activity which could be carried out by volunteers.

Restoration Options:

ID	Action	Priority	Proportion
A	Invasive-Exotic Control	HV	100%

Park: CC **Restoration Site ID:** V94 **Site Name:** Karakung Wetland

Location: Downstream on Cobbs from confluence with Indian Cr

General Location: former Darby and Merion Road to Cardington

Disturbance/Condition: Golf Course Impacts

Restoration Category Stream/Vegetation

Restoration Type: Wetland **Constraints:**

Acreage: 0.76

Site Priority: H **Location Criteria:** Tied to storm water, watershed restoration

Description:

This site does not appear to have much stormwater input. However, it does get some runoff from the golf course and is an ideal place to create/enhance a wetland. The wetland lies between the golf course and Cobbs Creek, at the base of the hill. The wetland is rutted with vehicle tracks, and empties into deeply eroded gullies. Control of exotics and planting of native wetland species is recommended.

Restoration Options:

ID	Action	Priority	Proportion
A	Wetland Creation	H	100%

Park: CC **Restoration Site ID:** V96 **Site Name:** Angora Street Riparian Zone

Location: North of the Railroad Line

General Location: Cobbs Creek Parkway to Baltimore, east side

Disturbance/Condition: Mowed/No Riparian Zone

Restoration Category Vegetation

Restoration Type: Riparian Zone **Constraints:**

Acreage: 1.19

Site Priority: HV **Location Criteria:** Isolated

Description:

This site would benefit froom removing Japanese knotweed along the banks. This is an activity which could be carried out by volunteers.

Restoration Options:

ID	Action	Priority	Proportion
B	Invasive-Exotic Control	HV	100%

Park: CC **Restoration Site ID:** V98 **Site Name:** Hoffman Avenue Riparian Zone

Location: North of Whitby Ave., along right bank of Cobbs Ck

General Location: 65th-Cobbs Creek Parkway, west side

Disturbance/Condition: Invasive/Exotic Vegetation

Restoration Category Vegetation

Restoration Type: Riparian Zone **Constraints:**

Acreage: 2.11

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

Description:

This site would benefit froom removing Japanese knotweed along the banks. This is an activity which could be carried out by volunteers.

Restoration Options:

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

Park: CC **Restoration Site ID:** V99 **Site Name:** Recreation Field Riparian Zone

Location: Left bank of Cobbs Creek south of Whitby Ave.

General Location: Cobbs Creek Parkway to Baltimore, east side

Disturbance/Condition: Invasive/Exotic Vegetation

Restoration Category Vegetation

Restoration Type: Riparian Zone **Constraints:** O

Acreage: 2.20

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

Description:

The riparian zone on the left bank of Cobbs is mostly Japanese knotweed and Japanese hops. The invasive/exotics should be removed.

Restoration Options:

ID	Action	Priority	Proportion
A	Invasive-Exotic Control	HV	100%

Park: CC **Restoration Site ID:** V100 **Site Name:** Woodland-Church invasives (No mapped polygon)

Location: Cobbs Creek Woodland-Church

General Location: Woodland Ave-Church, both sides

Disturbance/Condition: Invasive/Exotic Vegetation

Restoration Category Vegetation

Restoration Type: Riparian Zone **Constraints:** D

Acreage:

Site Priority: HV **Location Criteria:** Area with few other restoration opportunities

Description:

Polygons were not derfined on the restoration map for this recommendation, since it is applicable to most of the stream banks in this section. The major invasive/exotic species are Japanese Knotweed and Japanese hops. Control can be done by volunteers (e.g., cutting or pulling plants), supplemented by herbicide application by trained personnel.

Restoration Options:

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

Park: CC **Restoration Site ID:** V101 **Site Name:** Church-65th Invasives (No mapped polygon)

Location: Cobbs Creek Church-65th St.

General Location: Church-65th Street, both sides

Disturbance/Condition: Invasive/Exotic Vegetation

Restoration Category Vegetation

Restoration Type: Riparian Zone **Constraints:**

Acreage:

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

Description:

This is a general finding applicable to both banks of Cobbs Creek in this section of the park. Polygons were not derfined on the restoration map for this recommendation, since it is applicable to most of the stream banks in this section. The major invasive/exotic species are Japanese Knotweed and Japanese hops. Control can be done by volunteers (e.g., cutting or pulling plants), supplemented by herbicide application by trained personnel.

Restoration Options:

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

Park: CC **Restoration Site ID:** V102 **Site Name:** Invasive/Exotic Riparian Zones (No mapped polyg

Location: Cobbs Creek, Cobbs Creek Parkway to Baltimore

General Location: Cobbs Creek Parkway to Baltimore, west side

Disturbance/Condition: Invasive/Exotic Vegetation

Restoration Category Vegetation

Restoration Type: Riparian Zone **Constraints:** D

Acreage:

Site Priority: HV **Location Criteria:** Area with few other restoration opportunities

Description:

This is a general finding on the right bank of Cobbs Creek in this section of the park. Polygons were not derfined on the restoration map for this recommendation, since it is applicable to most of the stream banks in this section. The major invasive/exotic species are Japanese Knotweed and Japanese hops. Control can be done by volunteers (e.g., cutting or pulling plants), supplemented by herbicide application by trained personnel.

Restoration Options:

ID	Action	Priority	Proportion
A	Invasive-Exotic Control	HV	100%
C	Replant Native Herbs	M	100%

Park: CC **Restoration Site ID:** V104 **Site Name:** Cobbs riparian, sw side Bocce Woods

Location: Karakung Golf Course

General Location: former Darby and Merion Road to Cardington

Disturbance/Condition: Invasive/Exotic Vegetation

Restoration Category Vegetation

Restoration Type: Riparian Zone **Constraints:** G

Acreage: 1.48

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

Description:

The riparian buffer could be widened in this area through a managed mowing schedule. This area is located close to other restoration sites and removing Japanese knotweed along the banks would enhance these projects.

Restoration Options:

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

Park: CC **Restoration Site ID:** V105 **Site Name:** Wyndale High Quality Woods

Location: 77th and Wyndale Sts.

General Location: Cardington to City Avenue, both sides

Disturbance/Condition: None/Minimal

Restoration Category Vegetation

Restoration Type: Forested Upland **Constraints:**

Acreage: 4.46

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

Description:

This is a high quality area which is considered to be one of the nicest stands of woods in Cobbs Creek Park. Identifying this as high quality woods and protecting this area against invasion by exotic vegetation and human disturbance is recommended. A survey to identify rare native flora and fauna should be performed to ensure protection of this contiguous parcel of woods, as it could serve as habitat for various species which are not found in disturbed sites. Exotic vegetation is beginning to invade the area from surrounding disturbed sites. This area should be maintained by routine exotic removal on the fringes and trash removal by volunteers. Planting native herbs at the edges will act as a buffer against storm water flow, will protect woods from erosion, and will provide habitat for some animals.

Restoration Options:

ID	Action	Priority	Proportion
B	Protect/Monitor	HP	100%
D	Replant Native Herbs	H	10%
C	Survey for Rare Flora and Fauna	H	100%
E	Trash Removal	HV	5%

Park: CC **Restoration Site ID:** V106 **Site Name:** Karakung Riparian Zone (Trib 12)

Location: Karakung Golf Course

General Location: Cardington to City Avenue, both sides

Disturbance/Condition: Mowed/No Riparian Zone

Restoration Category Vegetation

Restoration Type: Riparian Zone **Constraints:** G

Acreage: 4.79

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

Description:

As is common on most maintained lands, the riparian zone is mowed to the edge of the stream, leaving virtually no vegetation to act as a buffer against heavy storms and flooding of the stream. A wooded or meadow riparian zone should be developed. A managed mowing schedule of two times a year would allow for a natural buffer and would reduce costs of mowing.

The polygon is mapped to about 150' width. Release will be less, depending on golf course needs, (probably 25' on each side at most). The associated tributary is affected by a blocked storm water inlet on the street at the head, which causes storm water to flow into an eroding gully. This problem should be addressed by the Philadelphia Water Department and or Department of Streets.

Restoration Options:

ID	Action	Priority	Proportion
A	Release/Widen	H	30%
B	Replant Native Forest Species	M	30%

Park: CC **Restoration Site ID:** V107 **Site Name:** Fish Reintroduction (No mapped polygon)

Location:

General Location: Cobbs Creek Park-All areas

Disturbance/Condition:

Restoration Category Fauna

Restoration Type: Park Wide **Constraints:**

Acreage: 1.00

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

Description:

Introduce several fish species which are widespread in the city and region but were not found in Cobbs Creek. The tesselated darter, spotfin or satinfin shiner are primary candidates for introduction.

Restoration Options:

ID	Action	Priority	Proportion
A	Fish Reintroduction	H	100%

Park: CC **Restoration Site ID:** V108 **Site Name:** Plant Reintroduction (No mapped Polygon)

Location:

General Location: Cobbs Creek Park-All areas

Disturbance/Condition: No Vegetative Diversity

Restoration Category Vegetation

Restoration Type: Park Wide **Constraints:**

Acreage: 1.00

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

Description:

This is a general recommendation to reintroduce those species which are presently rare in this area, but once thrived as native herbs, shrubs, etc.

No species for reintroduction have yet been identified. Candidate species would be identified through comparison of historical and current conditions. These reintroductions would be done in appropriate habitats as part of priority replanting recommended in other projectse. Special attention should be given to maintaining these species where introduced.

Restoration Options:

ID	Action	Priority	Proportion
A	Floral Reintroduction	H	100%

Park: CC **Restoration Site ID:** V109 **Site Name:** Church Lane Wetland

Location: North of Church Lane, west side Cobbs Creek

General Location: 65th-Cobbs Creek Parkway, west side

Disturbance/Condition: None/Minimal

Restoration Category Vegetation

Restoration Type: Wetland **Constraints:**

Acreage: 0.16

Site Priority: H **Location Criteria:**

Description:

This is a small wetland dominated by cattails and mixed grasses, rushes, and sedges, surrounded by a stand of green ash and crabapple trees. This area is presently very small. The wetland could be enlarged on the north and northeast side. Expanding the wetland would include removing several surrounding trees, excavating to remove some soil, depositing of soil properly and replanting the area with appropriate native wetland species (see planting list). Fencing to protect new plantings from human disturbance should be placed around the restoration. Informative signs would also add to the success of the enlarged wetland.

This area could be improved by protecting surrounding areas from exotic vegetation such as lesser celandine and garlic mustard. This vegetation could be removed by volunteer groups.

Restoration Options:

ID	Action	Priority	Proportion
A	Protect/Monitor	HP	100%
C	Wetland Creation	H	20%
B	Invasive-Exotic Control	HV	100%

Park: CC **Restoration Site ID:** V110 **Site Name:** Cobbs Creek: Control Access

Location: Parkwide, esp Morris Park, Bocce area, Whitby St.

General Location: Cobbs Creek Park-All areas

Disturbance/Condition: Vehicle Damage

Restoration Category Vegetation/Trails

Restoration Type: Park Wide **Constraints:**

Acreage:

Site Priority: H **Location Criteria:**

Description:

Control of vechicle access, including all-terrain-vehicles (ATV's) and motorcycles, needs to be implemeneted throughout the park, especially in Morris Park, in the bocce facility woods, and the area south of Baltimore Avenue.

Restoration Options:

ID	Action	Priority	Proportion
B	Structural Improvement	H	100%
A	Gully Repair	M	100%

Park: CC **Restoration Site ID:** V111 **Site Name:** Haverford Road Riparian Zones

Location: N of Haverford Road along Indian Ck (no polygon)

General Location: Morris Park, Indian Creek

Disturbance/Condition: Mowed/No Riparian Zone

Restoration Category Vegetation

Restoration Type: Riparian Zone **Constraints:**

Acreage:

Site Priority: H **Location Criteria:**

Description:

Mowing is done virtually to the creek bank, and gullying of the bank is occurring in several places. The riparian zones on both sides of the East Branch of Indian Creek should be widened to at least 35 feet. The riparian buffer could be allowed to revert to woods or could be maintained as a meadow edge by implementing a mowing schedule, e.g., twice a year.

Restoration Options:

ID	Action	Priority	Proportion
A	Release/Widen	H	100%
C	Gully Repair	L	100%
B	Replant Native Forest Species	L	100%

Park: CC **Restoration Site ID:** V200 **Site Name:** Cobbs Creek Park

Location: Entire Park

General Location: Cobbs Creek Park-All areas

Disturbance/Condition:

Restoration Category Vegetation

Restoration Type: Park Wide **Constraints:**

Acreage: 1.00

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

Description:

Although deer do not appear to be causing a major disturbance in Cobbs 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%