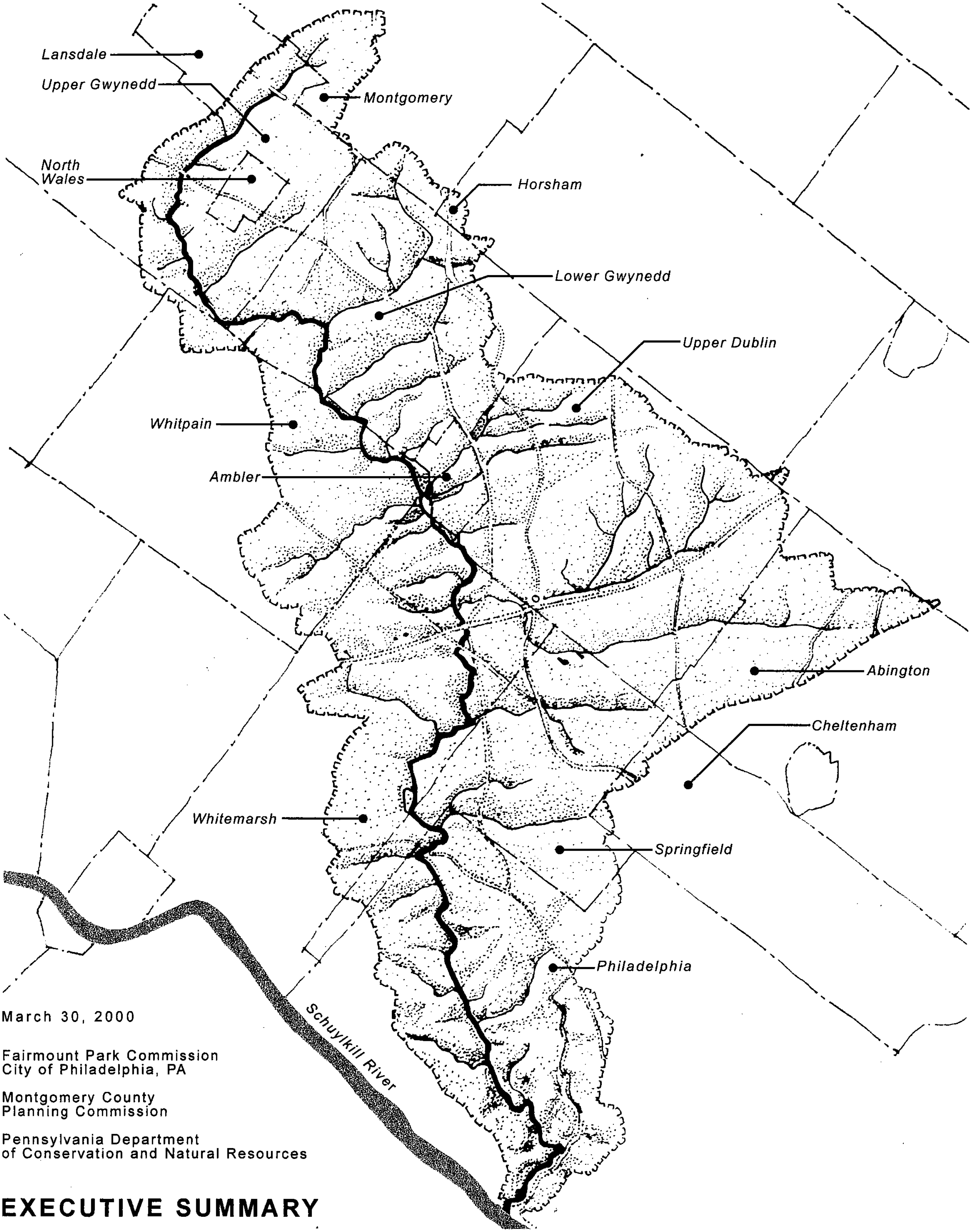

March 30, 2000

Fairmount Park Commission
City of Philadelphia, PA

Montgomery County
Planning Commission

Pennsylvania Department
of Conservation and Natural Resources

EXECUTIVE SUMMARY

WISSAHICKON CREEK RIVER CONSERVATION PLAN

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EXECUTIVE SUMMARY

MARCH 30, 2000

The Fairmount Park Commission, Philadelphia, PA
- Stephanie Craighead, Deputy Director for Planning, Coordinator

Montgomery County Planning Commission, Norristown, PA
- John Wood, Chief of Open Space Planning

The Pennsylvania Department of Conservation and Natural Resources
- Terry Hough, Pennsylvania Rivers Conservation Coordinator

The Delta Group • Environmental Planners and Landscape Architects
C. Miller, PE • PAQ Inc • S. Hammell • S. E. David • Temple University Landscape Architecture and Horticulture

Executive Summary Report

On July 22, 1999, a draft Project Summary Report was completed and distributed to all 14 municipalities in the Wissahickon Watershed for review and comment. The full final River Conservation Plan Report was completed in December 1999 and the final Executive Summary was completed in March 2000. The full report was then delivered or mailed to all the municipalities with a letter requesting a support statement. Several letters of support have been received and will be transmitted to the DCNR to strengthen our application.

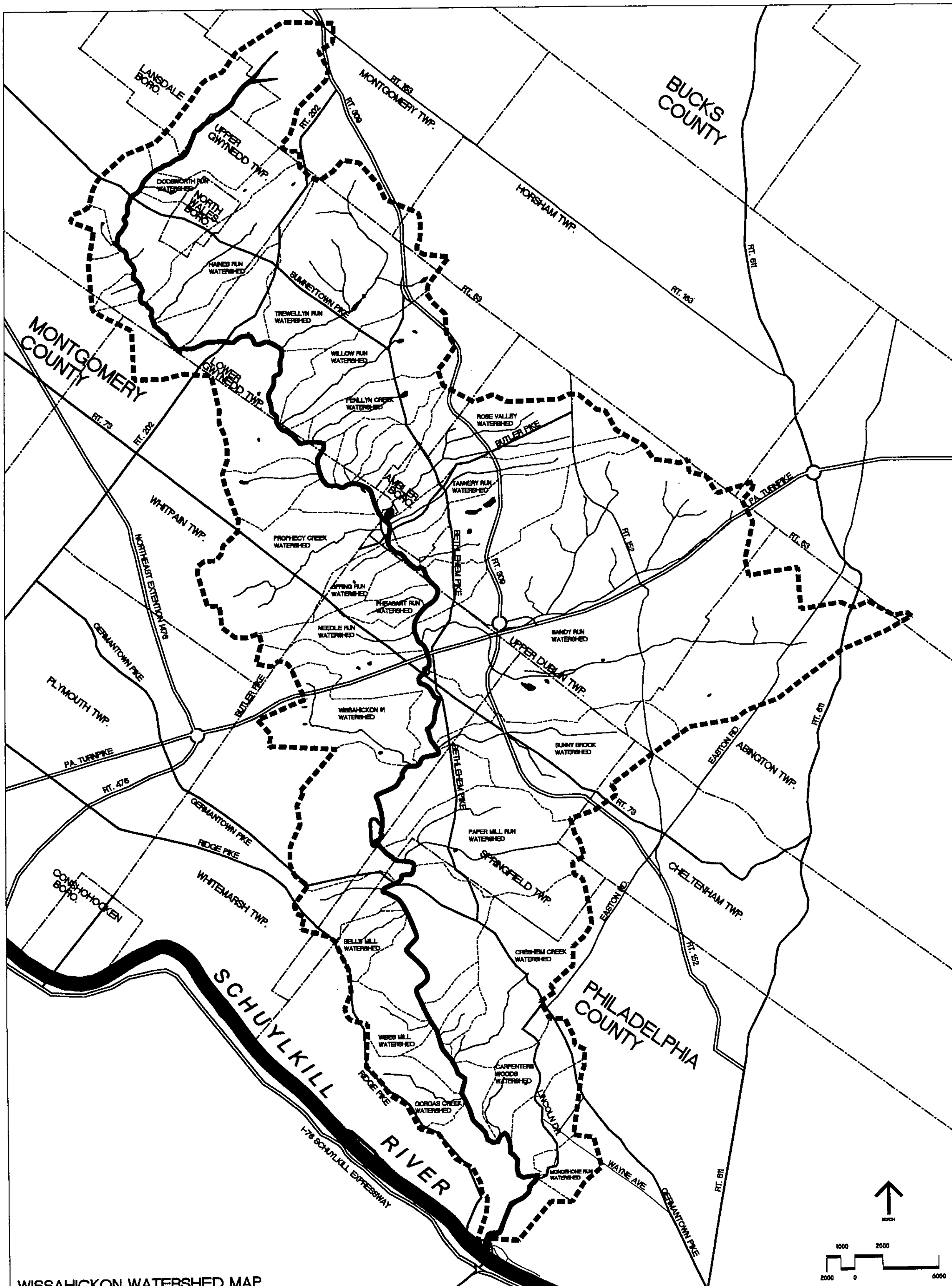
The final Executive Summary will be made available to the Wissahickon Partnership and other interested individuals or groups.

For information concerning those documents, contact The Fairmount Park Commission, at 215-685-0040. The address is P.O. Box 21601, Philadelphia, PA 19131.

The Executive Summary has been prepared to provide a brief outline of the two-year Wissahickon Creek River Conservation Plan effort. We have included portions of the final Plan report which explain the goals, process, scope, and conclusions / recommendations developed to structure the implementation of this plan. The Final Plan Report has been summarized in order to give an understanding of the contents and objectives of the Plan.

The following Table of Contents for the Final Plan Report has been included for information. The Executive Summary follows the same outline.

PROJECT REPORT OUTLINE



WISSAHICKON WATERSHED MAP

WISSAHICKON CREEK · RIVER CONSERVATION PLAN

FAIRMOUNT PARK COMMISSION, PHILADELPHIA, PA · MONTGOMERY COUNTY PLANNING COMMISSION · WISSAHICKON VALLEY WATERSHED ASSOCIATION · FRIENDS OF THE WISSAHICKON · WISSAHICKON RESTORATION VOLUNTEERS
PENNSYLVANIA DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
The Delta Group · C. Miller, PE · Steven Hammell · PAQ, Inc · S. Edgar David · Temple University Department of Landscape Architecture and Horticulture

I. INTRODUCTION

A. The Wissahickon Creek Conservation Plan Goals

The River Conservation Plan program is a statewide planning initiative developed and funded by the Pennsylvania Department of Conservation and Natural Resources. A grant from the William Penn Foundation provided equal support for the Conservation Plan.

The Montgomery County Planning Commission shares the project sponsorship with the Fairmount Park Commission which provided overall project coordination.

The goals of the Conservation Plan are as follows:

- Identify unique natural and cultural resources and the existing environmental problems which degrade and disrupt the natural stability of the stream corridors and watershed land.
- Recommend prototypical preservation and restoration solutions including education, water quality initiatives, restoration and management techniques.
- Develop a prioritized list, costs and location maps of recommended projects for funding by state and federal programs and local organizations at the subwatershed and overall watershed scale.
- Recommend the adoption of stronger, more performance-based ordinances and regulations throughout the watershed.
- Recommend alternative appropriate management or organizational structures to assure a coordinated, ongoing action-oriented restoration effort.
- Improve public awareness of watershed stewardship issues and elicit community support.

B. The Wissahickon Watershed

The Wissahickon Creek, which originates in a parking lot for a commercial development in Montgomery Township, flows southeasterly through a 21 mile-long corridor, then tumbles into the Schuylkill River near the end of Lincoln Drive. Four distinct geological zones, each with uniquely different landform, soils, vegetation and bedrock characteristics make up this 64 square mile basin. Thirty-one sub-watersheds occupy portions of the ten Townships, three Boroughs and the City of Philadelphia, which share the watershed.

The Wissahickon watershed faces ever-increasing challenges to the re-establishment of a healthy, beautiful and productive environment for human and wildlife habitation. These conditions are the result of excessive development, causing severe erosion, water pollution, soil compaction and sedimentation. Invasive plants, reduction of habitat and overpopulation of wildlife species are also major contributors.

Now predominantly "built-out" and developed as residential, institutional, commercial, transportation or recreational land uses, the municipalities in the watershed face the realization that to repair the damage inflicted by human activity over many decades will require establishing ongoing, energetic educational programs, physical restoration, planning and management. It will also require a strong sense of teamwork by adjacent municipalities which share the watershed.

Because most of the watershed is now in single family residential ownership, it will be necessary to inspire the participation of the watershed residents in the efforts to re-establish vegetated riparian buffers and the removal of constricting, damaging walls along the sub-watershed stream corridors. Serious incentives must be developed to elicit support for these programs.

The overall intent of this planning effort is to provide a guide for establishing a comprehensive program, rather than attempting to produce definitive design or engineering recommendations for site-specific problems. The completion and approval of this conservation plan will officially permit the application for federal, state and local grants specifically for watershed projects.

C. Sponsoring / Participating Organizations

The Wissahickon watershed has valuable human resources, as well as unique natural and historical attributes. Within the City of Philadelphia, the Fairmount Park Commission is custodian of the 1400 acre Wissahickon Valley Park, which is a major regional recreational attraction for nature lovers, equestrians, hikers, runners and bikers. The park staff includes administrative, technical and professional expertise. The Friends of the Wissahickon and the Wissahickon Restoration Volunteers are private organizations that are very active in the restoration and reforestation of the Fairmount Park portion of the watershed.

In the Montgomery County portion of the watershed, the Wissahickon Valley Watershed Association has assembled considerable land bordering the main Wissahickon Creek corridor, and retains ownership and management responsibility on 285 acres and several miles of trails.

For all four of the Wissahickon related organizations mentioned above, public educational programs are an important part of their present mission.

The Montgomery County Planning Commission and the Fairmount Park Commission, co-sponsors for this planning project, have a long involvement in open space planning in the watershed.

Funding for this study has been provided by the Department of Conservation and Natural Resources and the William Penn Foundation.

D. The Planning Team

The planning team for the Wissahickon Watershed Conservation Plan is led by:

The Delta Group, Environmental Planning and Design;

Project Director -	John F. Collins, FASLA
Project Manager -	Tom Schraudenbach, RLA
Project Assistant -	Joseph M. McDonnell

Sub-consultants:

Charlie Miller, P.E. -	Environmental Engineer
S. Edgar David RLA -	Landscape Architect and Environmental Planner; Associate Professor of Landscape Architecture
Steve Hammell -	Environmental Planner
Patricia Ann Quigley -	Ecologist/Wetland Biologist

Temple University Department of Landscape Architecture and Horticulture student interns were members of the team as project assistants, between 1997 and 1998.

Kate Prendergast -	Project Assistant
Joseph M. McDonnell -	Project Assistant

All the team members have lived in or worked in the Wissahickon Watershed.

F. Problems / Opportunities

1. Problems

At public meetings, the planning team is often asked to describe the general environmental health of the Wissahickon Watershed. To the casual viewer, the creek looks reasonably good. A closer look, however, reveals that there are serious "health" problems, which if not treated, will lead to more serious ecological breakdown and irreparable damage to the health of the entire watershed.

All the major building blocks of the natural landscape: geology, soils, plants, water and landform are under siege in the Wissahickon basin. The inhabitants of the watershed, the people and wildlife, are also contributing to ecological imbalance with nature.

a. The continuous, unrelenting erosion and undercutting of stream banks is caused by excessive rate and volume of stormwater runoff. This problem is accelerated by the vast amounts of impervious roof, road and parking surfaces, the results of years of suburban sprawl development. Most of the watershed was developed prior to implementation of stormwater regulations, now requiring more difficult retrofit solutions.

b. Disease, a warming climate, insect infestation and harmful invasive plant species are attacking the native forests of the watershed. The woodlands of the area can no longer reproduce because of soil compaction, aggressive invasive plants, wildlife predation and the lack of viable seed sources. The American love affair with the lush green lawn is also a contributor to the excess runoff, lack of forest regeneration and water quality problems. Over-browsing by deer, other mammals and insects has almost completely destroyed the understory and herbaceous layer in the forested portion of the park. The reproduction of hardwood seedlings is virtually non-existent. Additional research and testing of alternative wildlife and vegetation management techniques should be a high priority.

c. Water pollution, both point and non-point, systematically poison the waters of the subwatershed streams and main Wissahickon Creek. Runoff from roads and parking carries hot water, deicing salts, heavy metals and oils into the stream system. The 12 sewage treatment plants all discharge treated effluent into the creek, degrading the aquatic habitat considerably. The decline in natural base flow in the streams, also caused by the excessive rate of runoff, has created a situation whereby the effluent discharged by treatment plants makes up most of the water flowing in the creek.

d. Human over-use of the trails and forests of the Fairmount Park portion of the Wissahickon has created severe compaction and excess runoff conditions. Conflicts between incompatible user groups, for example, hikers and mountain bikers, have degraded the quality of recreation in this great natural landscape.

e. Existing stormwater ordinances and development regulations do not adequately protect or require restoration of the floodplain. The focus on 100 year storm events while ignoring the more damaging 2 or 5 year storms, is one of the real drawbacks of the existing municipal ordinances.

f. Destruction or loss of the riparian buffers, the wooded or heavily vegetated zone on both sides of a stream, is also a serious problem. The healthy buffer holds the soil/streambank in place and provides filtering of polluted runoff while providing wildlife habitat and movement corridors.

2. Opportunities

This planning effort offers several unique opportunities for watershed restoration:

a. *An Action Plan* - The outcome is targeted to begin a ten year comprehensive program to restore the Wissahickon Watershed to its full potential.

b. *Outside Funding* - Both State and Federal assistance is anticipated to fund these efforts upon completion and registry of the plan.

c. *Teamwork* - This is the first planning program that has included participation of all the municipalities involved. Indications to date are that there is a high degree of willingness to join in efforts to accomplish these objectives. The formation of the Wissahickon Partnership is evidence of the strong local municipal and corporate interest and concern.

d. *Sub-Watershed Approach* - As recommended by the Center for Watershed Protection in Silver Springs, Maryland, we have chosen to develop detailed analysis and recommendations at the sub-watershed scale. Three representative sub-watersheds have been chosen to facilitate the process of identifying problems and opportunities and potential projects for implementation. They are: A. The Headwaters of the Wissahickon (high density neighborhood, large scale impervious surfaces) B. The Trewellyn Creek (rural, relatively open, low density) C. Cresheim Creek (high density, urban neighborhoods and trail linkage potential). If plans for 3 sub-watersheds were developed and implemented each year, the remaining 28 would take approximately 9 years.

It is appropriate that we address the sub-watersheds as they are the most susceptible to continued environmental degradation. The main creek is, as has been noted, primarily in public ownership, therefore is somewhat more protected. The unprotected sub-watersheds continue to generate excessive runoff, which causes significant damage to both the sub-watershed creeks and to the main creek corridor below.

It is hoped that someday, signs of a restored watershed environment will be the presence of heavily vegetated streambanks, native trout, abundant amphibians, reptiles, crawfish, healthy young hardwood forests, return of the American chestnut, extensive meadows, reforested land, clean, poison and silt-free water, increased perennial stream base-flow, neighborhoods with numerous rainbarrels and the absence of trash and vandalism. These conditions will be fostered by an educated, involved local community. These goals can be realized if the development of an energetic, positive and well-coordinated restoration and management program is launched and maintained over the next decade.

3. Definitions of Best Management Practice Terms:

The following short definitions are offered to aid in understanding these concepts.

- A *BMP* is a technique developed to reduce environmental degradation, to restore a natural stream, pond or wetland emphasizing the use of biological solutions rather than structural ones.

- *Stormwater Recharge* is the term for percolation of storm water into the soil and into the subsurface to provide water storage capacity for increasing base flow of streams and use by humans.

- *Erosion* is the process of removing soil particles from streambanks, farm fields and other "erosion prone" soils. Water or wind can both be the "carriers". Loss of agricultural topsoil and streambanks are very serious national problems.

- *Siltation* is the process of depositing soil material, which is carried downstream by water and is generally the very fine soil particles called silt. Silt blocks culverts, streams, fills in marshes and slow moving river/stream corridors.

- *Riparian Buffer* is a strip of land on both sides of a stream or river. It is beneficial if this strip is heavily vegetated, as it will provide protection of the stream from erosion and bank undercutting. Generally, all or part of the buffer area is in the flood plain.

- *Bioengineering* is a term for using parts of living plant stems or branches, as bundles (fascines), stakes or cuttings which are planted in a streambank to take root and reinforce the bank. Plants such as black willow, red stem dogwood, elderberry and a few other native species are all wetland plants, which form roots very easily.

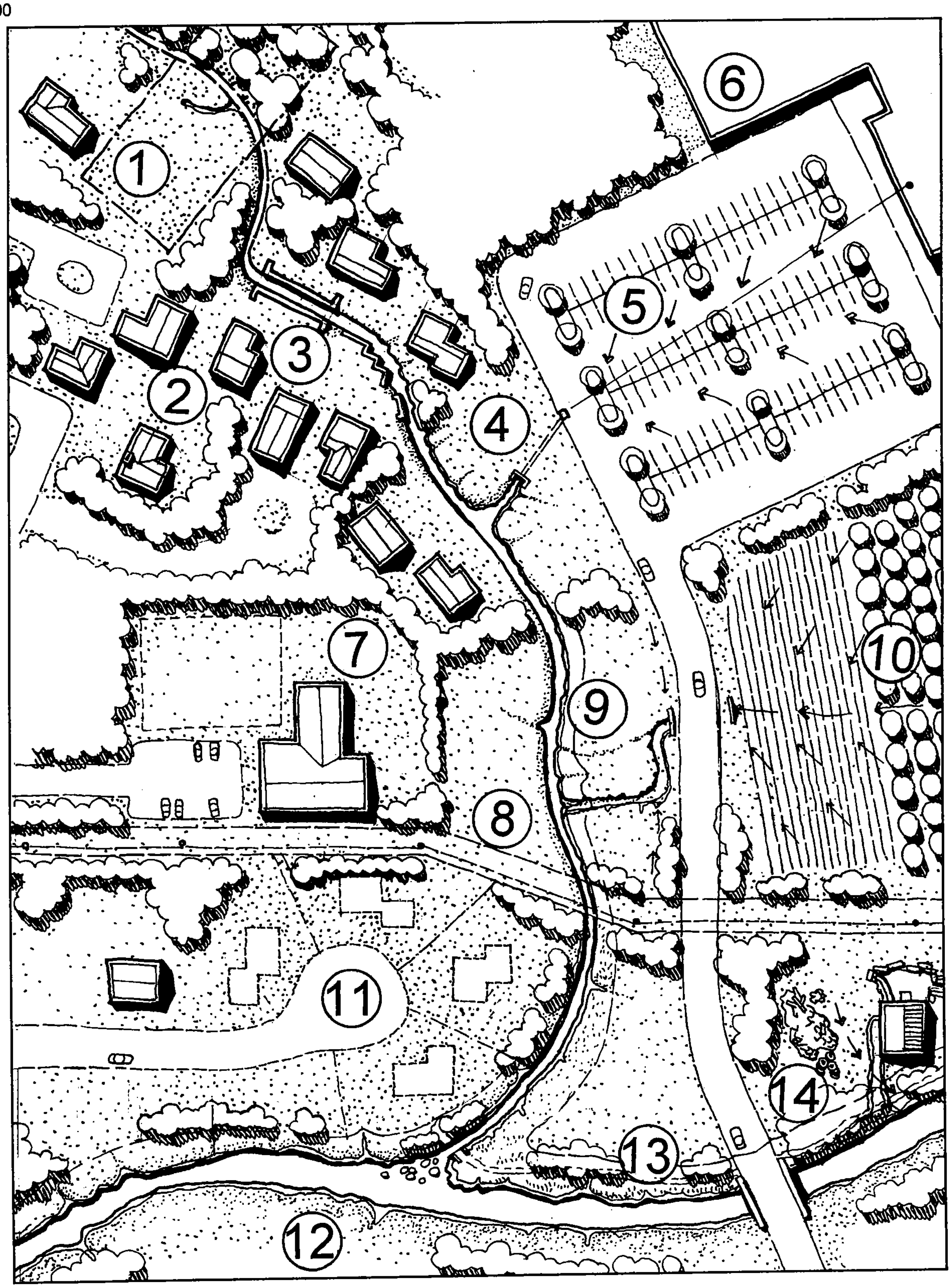
- *Bio-retention* is a technique of holding stormwater runoff in a basin or storage container so that it is able to percolate into the soil, cleansed by passing through an area planted with plants especially adapted to removing pollutants.

- *Impervious Surfaces* are harmful in that they prevent stormwater from penetrating into the ground. "Impervious" means not porous. Using pervious or porous paving is a relatively new idea, allowing water to penetrate, reducing the amount and rate of runoff.

- *Reach* is an identifiable, relatively straight section of a stream or river.

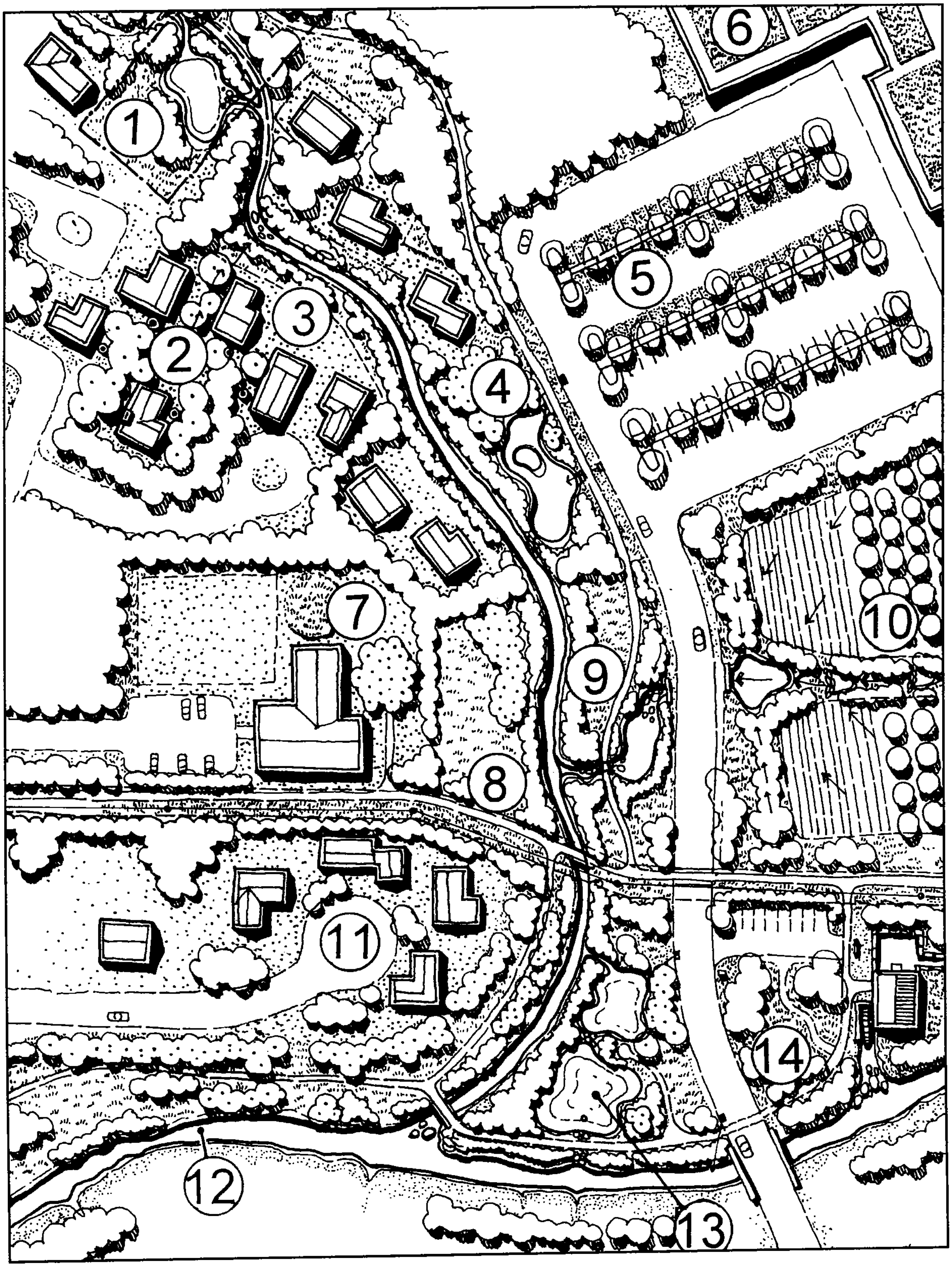
4. Typical Problems / Opportunities Plan Diagrams

The plan diagram on the following pages identify 14 problems or opportunities in a fictitious subwatershed area. The next two pages show plan diagrams of the same locale, with the appropriate Best Management Practices (BMPs) in place. It is hoped that these graphic descriptions will aid the reader in understanding the new language of BMPs, bio-engineering, bio-retention, stormwater recharge, erosion, siltation, riparian buffers and impervious surfaces.



BEFORE
Subwatershed Problems and Opportunities Identified

1. Unprotected Natural Spring
2. Intense Development - High Volume Runoff
3. Built Channel Increases Damage
4. Discharge from Pipe Increases Erosion
5. Extensive Impervious Paving
6. Large Roofed Area
7. Excessive Lawn Area
8. Existing Powerline Trail Opportunity
9. Culvert Increases Velocity of Runoff
10. Agriculture Causes Serious Pollution
11. Planned Subdivision will Prevent Buffer
12. Main Creek Channel Receives Damage
13. Public Open Space Unused
14. Historic Site in Poor Condition



AFTER
Acquisition, Restoration, Stormwater Management, Education & Watershed Management Projects

1. Off-line Spring - Fed Wetland on Acquired Site
2. Upland"Canopy" Landscape Improvements
3. Restore Streambank to "Natural" Condition
4. Detention Wetland in Restored Buffer
5. Bioretention Retro Landscape Improvements
6. Vegetated Roof Cover
7. On-site Education Projects at School
8. Trail and Meadow Development
9. In-line Riparian Buffer Wetland
10. Vegetated Swale and Check Dams
11. Resource - Based Cluster Retains Buffer
12. Main Creek Buffer Improved
13. Educational / Wildlife Habitat Wetland
14. Restore Historic Site

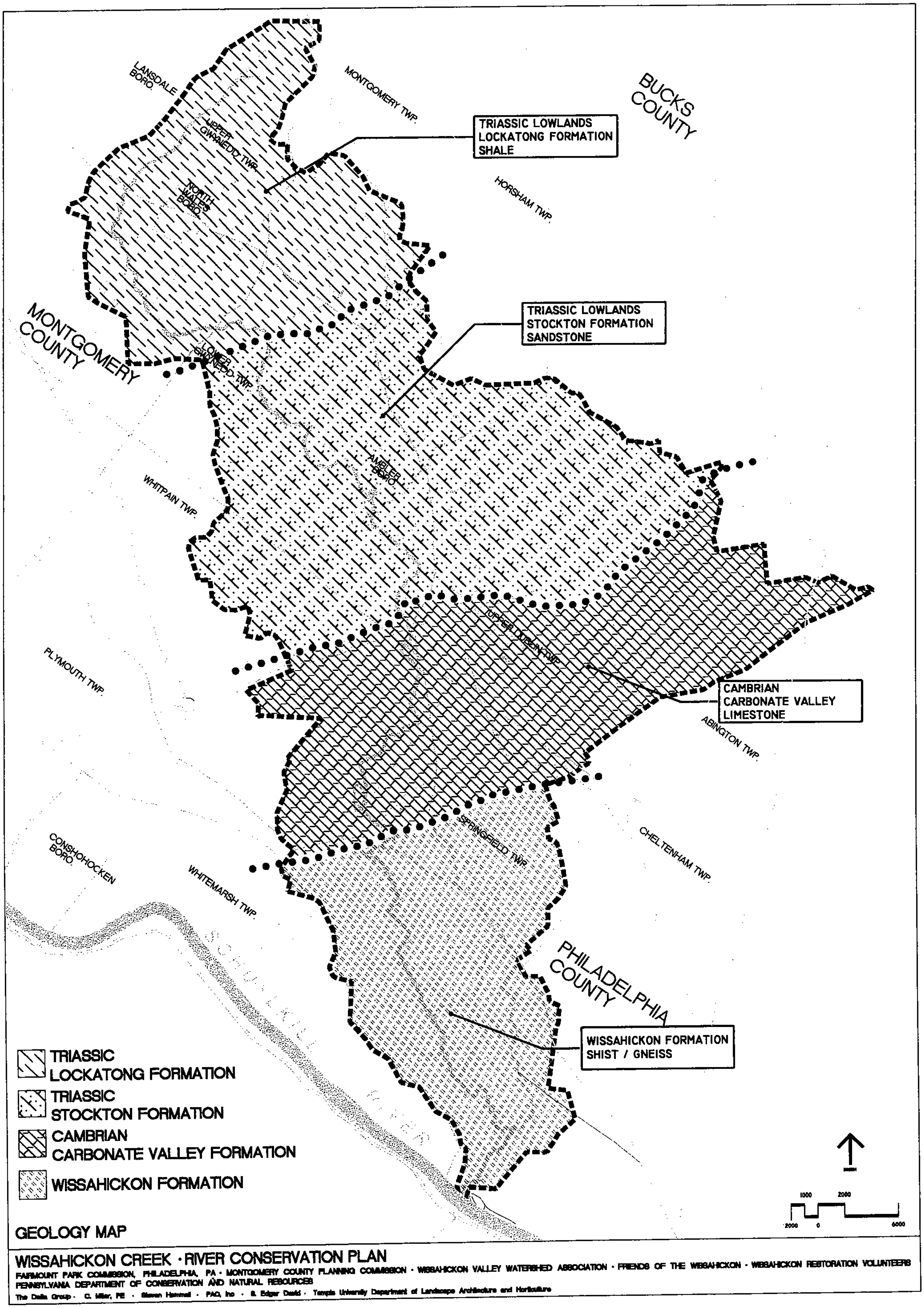
G. Community Involvement

13 of the 14 municipalities have been interviewed to determine their perception of resources, problems, opportunities, unique local open spaces, history and existing ordinances/regulations, open space and comprehensive plans if available.

A Steering Committee was formed with representatives from all municipalities, the Fairmount Park Commission, the Montgomery County Planning Commission, the Friends of the Wissahickon, the Wissahickon Valley Watershed Association and the Wissahickon Restoration Volunteers, D.E.P., D.C.N.R., the Philadelphia Water Department and the Philadelphia Planning Commission.

Public watershed-wide workshop meetings were held on four occasions to discuss issues, findings and recommendations. These meetings were held at Lower Gwynedd, Upper Dublin and Whitemarsh Townships, the Wissahickon Watershed Association and the Temple University Ambler Campus. In addition to formal workshops and steering committee meetings, several presentations were made to interested groups such as the Friends of the Wissahickon in Chestnut Hill and the Wissahickon Partners group meeting in Philadelphia.

DAY	MONTH	YEAR	MEETING TYPE	LOCATION
27th	August	1997	DEP Meeting	DEP Offices
13th	January	1998	Steering Committee	Ambler Campus
5th	March	1998	First Public	Upper Dublin Township
20th	October	1998	Steering Committee	Wissahickon Valley Watershed Association
5th	January	1999	Friends of Wissahickon	Springside School
12th	January	1999	Second Public	Lower Gwynedd Township
27th	April	1999	Steering Committee	Wissahickon Valley Watershed Association
12th	May	1999	Third Public	Whitemarsh Township
15th	June	1999	DEP / Partnership	Philadelphia Free Library
22nd	July	1999	Public Hearing	Wissahickon Valley Watershed Association


LANSDALE BORO.
MONTGOMERY TWP.
BUCKS COUNTY
UPPER GWYNEDD TWP.
TRIASSIC LOWLANDS
LOCKATONG FORMATION
SHALE
NORTH WALES BORO.
HORSHAM TWP.
MONTGOMERY COUNTY
TRIASSIC LOWLANDS
STOCKTON FORMATION
SANDSTONE
LOWER GWYNEDD TWP.
AMBLER BORO.
WHITPAIN TWP.
UPPER DUBLIN TWP.
PLYMOUTH TWP.
CAMBRIAN
CARBONATE VALLEY
LIMESTONE
ABINGTON TWP.
SPRINGFIELD TWP.
CHELTENHAM TWP.
CONSHOHOCKEN BORO.
WHITEMARSH TWP.
PHILADELPHIA COUNTY
WISSAHICKON FORMATION
SHIST / GNEISS
TRIASSIC
LOCKATONG FORMATION
TRIASSIC
STOCKTON FORMATION
CAMBRIAN
CARBONATE VALLEY FORMATION
WISSAHICKON FORMATION
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WISSAHICKON CREEK · RIVER CONSERVATION PLAN

II. ANALYSIS OF NATURAL AND CULTURAL RESOURCES OF THE WISSAHICKON CREEK WATERSHED

5. Ordinances

The development of most of the Wissahickon Creek took place without benefit of stormwater management controls. This has left the municipalities with the dilemma of identifying problems and potential remedies on private properties as well as undeveloped land.

The existing municipal ordinances vary in their level of detail and degree of protection for the water courses and floodplain areas. Most provide controls for 25, 50 and 100 year storm frequencies, but ignore the 1 through 5 year storms, which are the source of most of the severe damage.

Generally, existing ordinances do not promote Best Management Practices such as, bioengineering, porous paving, roof "meadows" or stream bank and riparian buffer restoration. Prescribing the use of native plants for canopy, understory and herbaceous layers, using species found in natural plant associations could be very beneficial. Permitting the development of appropriately graded areas that encourage temporary ponding of rainwater, (rain gardens), rather than always requiring "positive" drainage, is another technique that would increase recharge.

Limiting the amount of turf grass, on excessive slopes for instance, and where the proposed use of the property does not require lawn as a surface material, could be beneficial. Combining reforestation and meadow landscape for large, unprogramed spaces can improve the health of the environment, and eventually reduce maintenance costs. Planting of existing detention basins should also be part of the retroscape effort.

These and other issues relating to ordinances are discussed in further detail, and are found in Section V G. Ordinances.

One of the major recommendations of this report identifies the potential for a watershed-wide ordinance review process which can benefit each individual municipality and their unique conditions, as well as address larger scale issues that could improve the whole Wissahickon Watershed. This is to be found in the Action Plan.

6. Summary

Perhaps human activities, both past and present, have exerted and continue to exert the most profound influence on vegetation, erosion, wildlife and water quality of the Wissahickon Creek watershed. Extensive land clearing, both historic and modern-day, has greatly reduced and fragmented the once-continuous cover of forest. Today, forest covers sections of creek valleys, scattered upland patches, and ridges such as those at Fort Washington State Park that were too steep and rocky to farm and are now under benign ownership. Management efforts within the watershed should generally attempt to connect these fragments of forest to one another and expand forest cover overall. In both upland and wetland settings, forests provide a variety of important functions including improvement of air and water quality, a cooling effect, increased privacy and provision of wildlife habitat.

The useful information to be derived from a review of landform, geology and soils factors in the Wissahickon Watershed is that serious conditions causing excessive runoff problems exist in both the lowland and upland piedmont zones, in other words, throughout the entire Watershed.

The lowland triassic area includes 2 major soil types, the Lockatong and the Stockton soils. In the northernmost Lockatong, there is very shallow depth to impervious red shale bedrock and the presence of periodic impervious clay "lenses" called fragipan, both prevent rainfall from percolating into the soil. The heavy clay soils which overlay the shale and subsoil are productive for agriculture but very prone to virtual physical destruction from earth moving equipment and landscape activities, especially during wet conditions. Compaction of these soils eliminates the pore spaces that are necessary to accommodate air and water penetration, into the soil.

The two upland areas, including the Carbonate Valley and the Wissahickon Park in Philadelphia, present different issues. The limestone valley has deep, high quality well drained soils over limestone bedrock. While the potential for recharging stormwater exists, there is local resistance to infiltration techniques because of the potential for increasing the development of sinkholes, common in water soluble limestone areas. This indicates the need for flexibility in preparing ordinances, to accommodate unique localized conditions.

In the Philadelphia area of the park, the Manor-Glenelg soils are also deep, well drained, high quality soils. The topography in this area is extremely steep, which when combined with serious compaction and tree canopy loss in the park and a high % of impervious surfaces in built-out parts of the watershed, an extremely high percentage of most rainfall rapidly runs off rather than penetrates the soil.

The conclusion is that managing and restoring the forest landscapes of the Wissahickon Watershed are among the most important challenges for the 14 municipalities that will become the pro-active stewards of this unique resource.

A detailed analysis of Water Quality issues is being developed by the National Institute for Environmental Renewal. It is anticipated that this report will provide guidance in dealing with this important issue.

Solutions to the serious problems of excessive volume and rate of stormwater runoff will require a new mindset for civil engineers, landscape architects, architects, landscape / plumbing contractors and the public, to avoid the traditional over use of inlets and buried stormwater piping to remove runoff from the built landscape. Keeping stormwater on the surface and using grading techniques and planting design to encourage recharge is a much more logical approach.

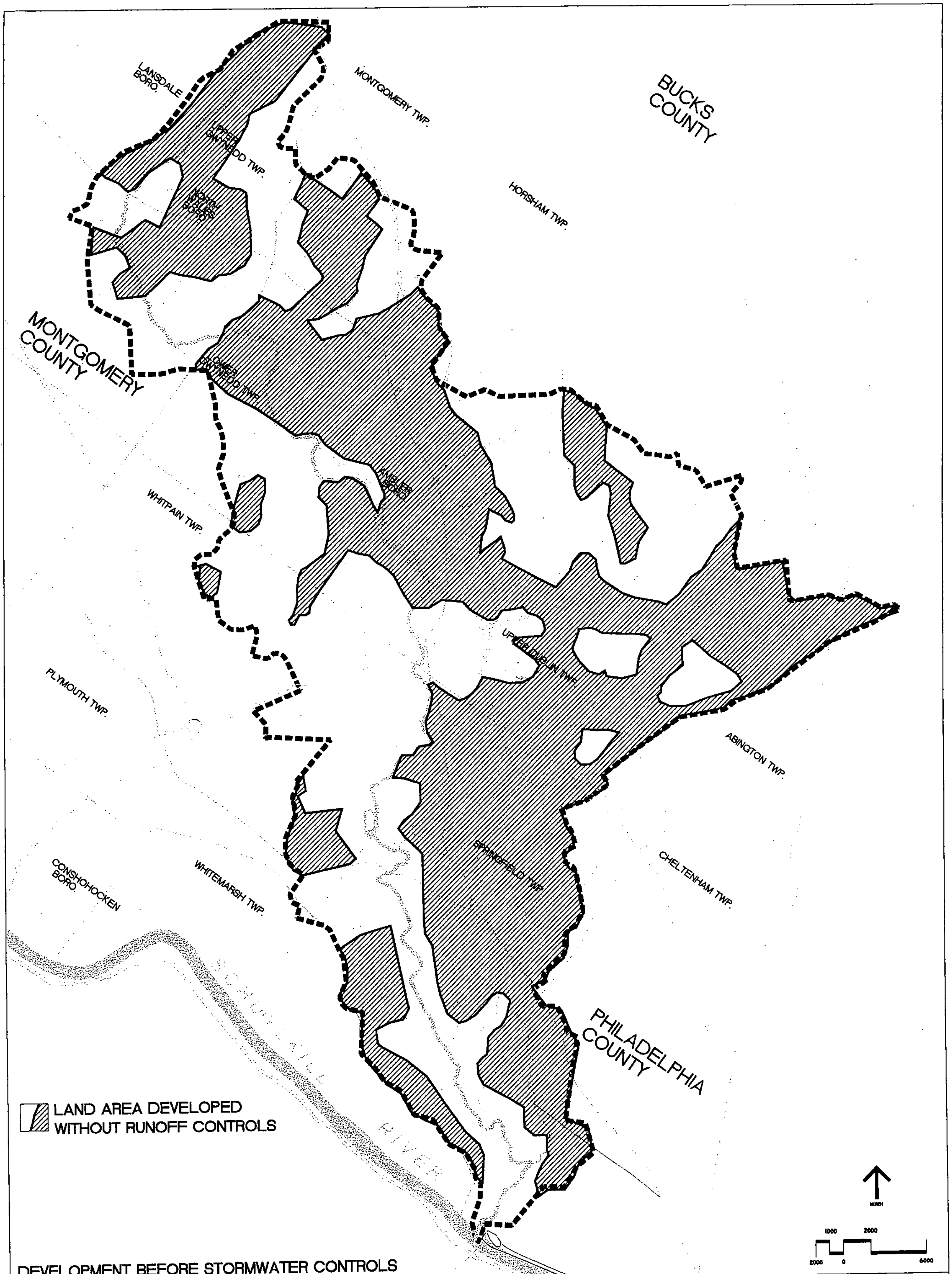
Roof downspouts, inlets in parking lots, roadways and lawn areas are normally tied together to collect almost all stormwater from the site and to pipe it to natural drainage courses as quickly as possible where it is discharged. This approach robs the site of necessary stormwater for infiltration, instead turning this water, a priceless resource, into an unintended environmental "weapon" against downstream communities.

Stormwater management basins, while well intentioned, often cause more environmental damage than benefits. They are also generally unsightly, and almost valueless as habitat. Improving the grading design to avoid the earthen "bath-tub" look, planting wildflowers, tall grasses, trees and shrubs which slow and filter stormwater can improve their visual appearance and functional value.

Depending more for runoff management on reforestation and creative grading design on development sites, rather that on basins alone, should become a more accepted part of the site planning and design process.

The Map on the next page shows the approximate amount of land developed in the Wissahickon Watershed prior to enactment of stormwater regulations.

This is by far the most telling graphic in this report. It reinforces the conclusion that to repair the damage and heal the wounds of the watershed, finding a methodology to involve private participation in this effort is the most difficult problem all the municipalities' face.



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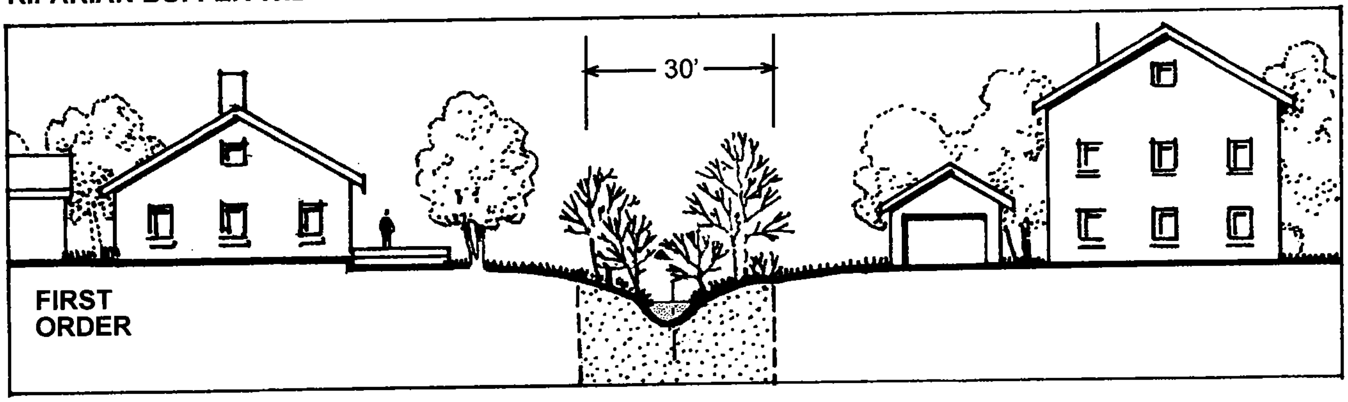
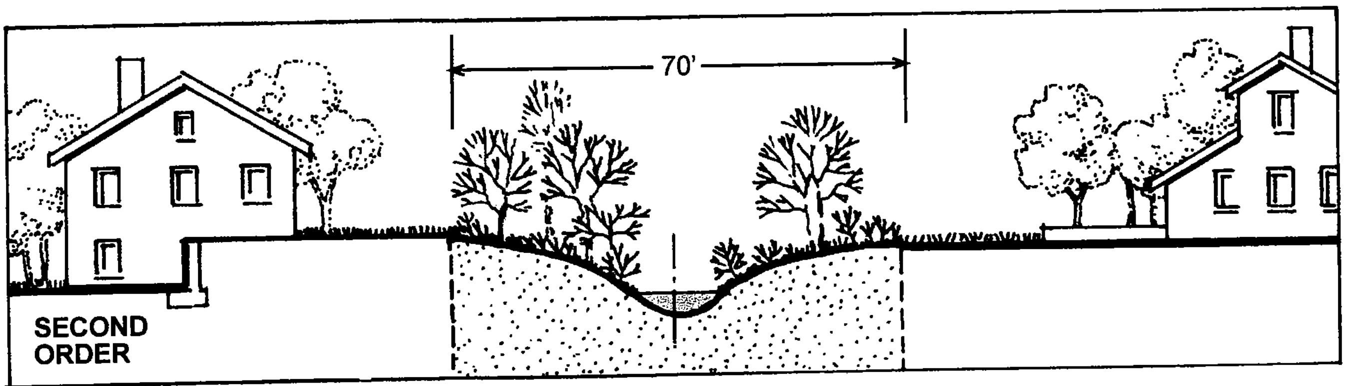
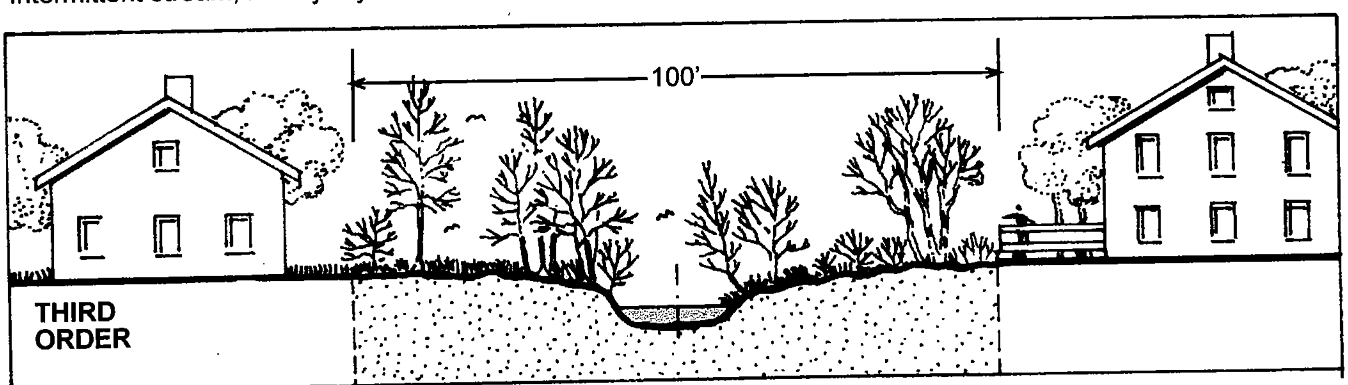
MINIMUM WIDTH RECOMMENDATIONS FOR NEW AND APPROPRIATE EXISTING DEVELOPMENT RIPARIAN BUFFER WIDTHS BASED ON STREAM ORDER



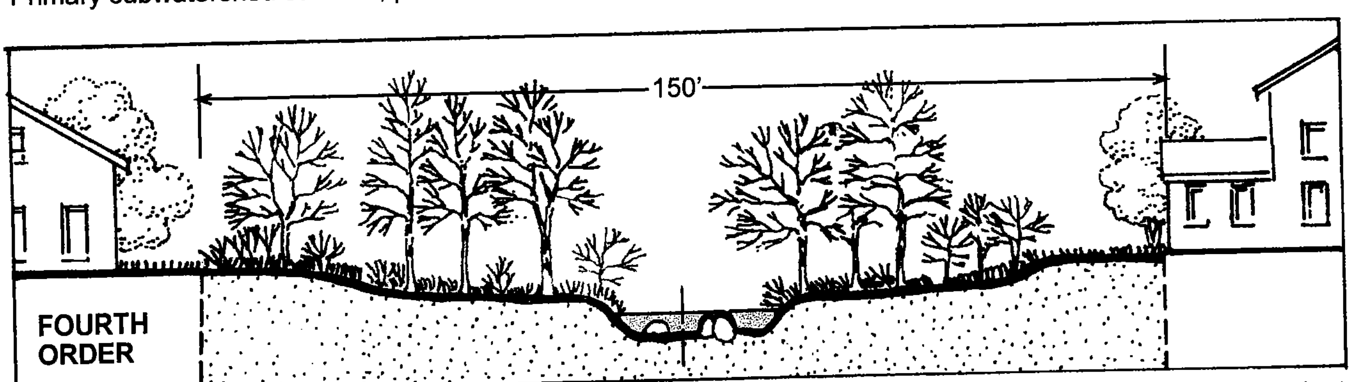
Ephemeral creek or swale. Dry except during / after rainfall, less than 5' wide.



Intermittent stream, mostly dry in summer, less than 15' wide, most in private lands.



Primary subwatershed streams, perennial flow, most hydro-active of watershed.



Perennial flow, water storage for large storms, sustained flow from third order tributaries, sewage treatment plants and quarry.

III. RESTORATION GOALS / STRATEGIES

General Watershed Wide Strategies

Restoration of the Wissahickon Watershed can be best viewed as integrating the built environment with the natural systems, open space and ecology of the Watershed to create the most sustainable landscape possible. Restoration involves activities that help mitigate the harmful activities associated with development and human impact. Understanding the ecological and functional characteristics of the Eastern Deciduous Forest is important in achieving successful restoration. Active, physical restoration must be an ongoing process throughout the watershed with the objective of reestablishing appropriate native landscapes that are designed to restore and enhance the ecological functions, diversity and richness of our forests and to improve water quality throughout the watershed. The built or man-made landscape should minimize impacts on those natural resources that are vital to our physical and mental health.

The success of a watershed wide restoration / enhancement effort is dependent on communities working together to achieve a greater common goal. Private landowners as well as municipalities, corporations and institutions are all equal and essential shareholders that must be engaged in order to be successful. A philosophy of restoration / enhancement must be the foundation of achieving a sustainable landscape that will slowly emerge from the step by step process of repairing and healing a severely damaged ecosystem.

The following is and outline of restoration / enhancement strategies that should be incorporated throughout the watershed. (See full River Conservation Plan for detail descriptions)

A. Riparian and Woodland / Wildlife Corridor Preservation / Restoration / Enhancement

- *Riparian Corridors*
  A minimum forested riparian corridor is recommended, for the four stream orders, sized to relate to the magnitude of the stream, to buffer streams and associated wetlands, to enhance migration of flora and fauna and to encourage biological species diversity. All communities should work toward restoring and protecting riparian corridors along the streams and swales.

  Uninterrupted corridors of woodlands with well-stratified layers of native vegetation are needed to facilitate species migration and genetic diversity. Creating new greenways and enhancing existing corridors are essential to long term stability of the Wissahickon.

B. Streambank Restoration / Bio-Engineering

A significant portion of the Wissahickon's first and second order tributary streams have been severely degraded as a result of land use changes, particularly the conversion of forest to impermeable cover. The cross-sectional areas of these streams are in constant adjustment to accommodate increased flows that result in severe erosion and sediment loading throughout the watershed and beyond. Regrading of eroded streambanks and establishment of native streambank vegetation through applications of bio-engineering will greatly enhance the bank stability and visual and aesthetic characteristics of the watershed.

C. Wetland Creation

Over the last 300 years, the conversion of the Wissahickon Watershed to its present land use and cover has resulted in the loss of many naturally occurring wetlands. These wetlands historically performed many vital hydrological functions throughout the watershed. The creation of new man-made wetlands will be a valuable means of mitigating impacts associated with stormwater and restoring valuable wildlife habitat. Wetlands will help reduce nutrient and sediment loading and reestablish needed base flow to streams. The creation of wetland habitat should be integrated with the creation of BMP's for managing stormwater.

D. Invasive Species Management

Many opportunistic (invasive) species are well entrenched throughout the Wissahickon Valley and several new species are beginning to emerge. These aggressive plants are particularly prevalent on disturbed sites and threaten the stability and biological diversity of native flora. If allowed to continue unchecked, these invaders can rapidly migrate into healthy ecosystems. The management and eradication of exotic invasive species must be closely tied to a reforestation/planting program.

E. Bio-diversity Enhancement

Restoration of the watershed must include increasing the diversity and frequency of native species. Documentation of species occurrence from past studies indicates much greater species diversity and occurrence than is present in the watershed today. An extensive program to reintroduce and establish diversity of native species is recommended.

F. Private Land Restoration

Large portions of the open space within the Wissahickon Watershed are in private ownership, particularly residential, industrial and corporate holdings. The majority of these landscapes are managed using traditional practices that could be revised to significantly upgrade the ecological integrity of the watershed. The management practices of these areas could include reforestation and meadow establishment to improve the watershed landscape quality.

G. Hydrologic Management / Stormwater Management

The integration of best management practices (BMPs) into new development as well as redevelopment of existing projects can help restore the hydrologic balance of the watershed. In recent years a wide variety of BMPs have been introduced and proved to provide valuable functions

Many of these measures can readily be introduced into previously developed areas. In fact, since most BMPs incorporate the native vegetation as a functional component, they can also become a means of improving the appearance and livability of urban communities.

BMPs are used most advantageously when they treat runoff near its source, such as the edge of paved areas. Generally, speaking they tend to be small-scale devices that are implemented on privately owned land. The effective use of BMPs requires the widespread adoption of these measures in site design. Therefore, the challenge will be to create incentives for the voluntary construction of BMPs by the residents, businesses, corporations and institutions in the watershed.

H. Restoration / Education / Legislation

Education at all levels will be an important component to establishing a knowledgeable and caring population in order to create a sustainable watershed. Beginning with the youngest classes, school curricula need to be linked to foster an understanding of the natural landscape on which they depend for life. Students should learn how they impact their environment and how they can affect change in positive ways. Local schools throughout the Wissahickon Watershed should adopt their school grounds and local stream corridors and play and active role with an added hands-on dimension to the restoration and care of these landscapes.

In large part, the future quality of the watershed will be shaped by the land use decisions and regulations of the municipalities that compose the Wissahickon Watershed. The collaboration of the municipalities, working together to develop strong environmental standards, will play an important role in determining the ecological quality of the watershed. Legislation to protect natural areas and create new ones as part of a normal process will greatly enhance the future watershed quality.

I. Stream Monitoring

- Developing an effective stream monitoring program that integrates volunteer monitoring activities with qualified technical analysis will be an important component of a restoration plan.

IV. ORGANIZATIONS INVOLVED IN RESTORATION AND BEST MANAGEMENT PRACTICES

Landscape preservation, restoration / enhancement and management projects that promote a more sustainable landscape have been ongoing throughout portions of the watershed by several organizations and institutions. Although these projects and activities are often small in context to the larger watershed, they represent a significant commitment toward achieving a healthier and more sustainable watershed system. These projects also represent a significant pool of demonstration issues in landscape restoration/enhancement and management and will become models and educational tools for implementation on an even larger scale throughout the Wissahickon Watershed. The following institutions and organizations have been instrumental in promoting a restoration ethic in the Wissahickon Watershed and will play a vital role in moving the Watershed toward a more sustainable future.
(See full River Conservation Plan for Details)

A. Not-for-Profit Organizations

1. Friends of the Wissahickon
2. Wissahickon Restoration Volunteers
3. Morris Arboretum
4. Wissahickon Valley Watershed Association

B. Educational Institutions

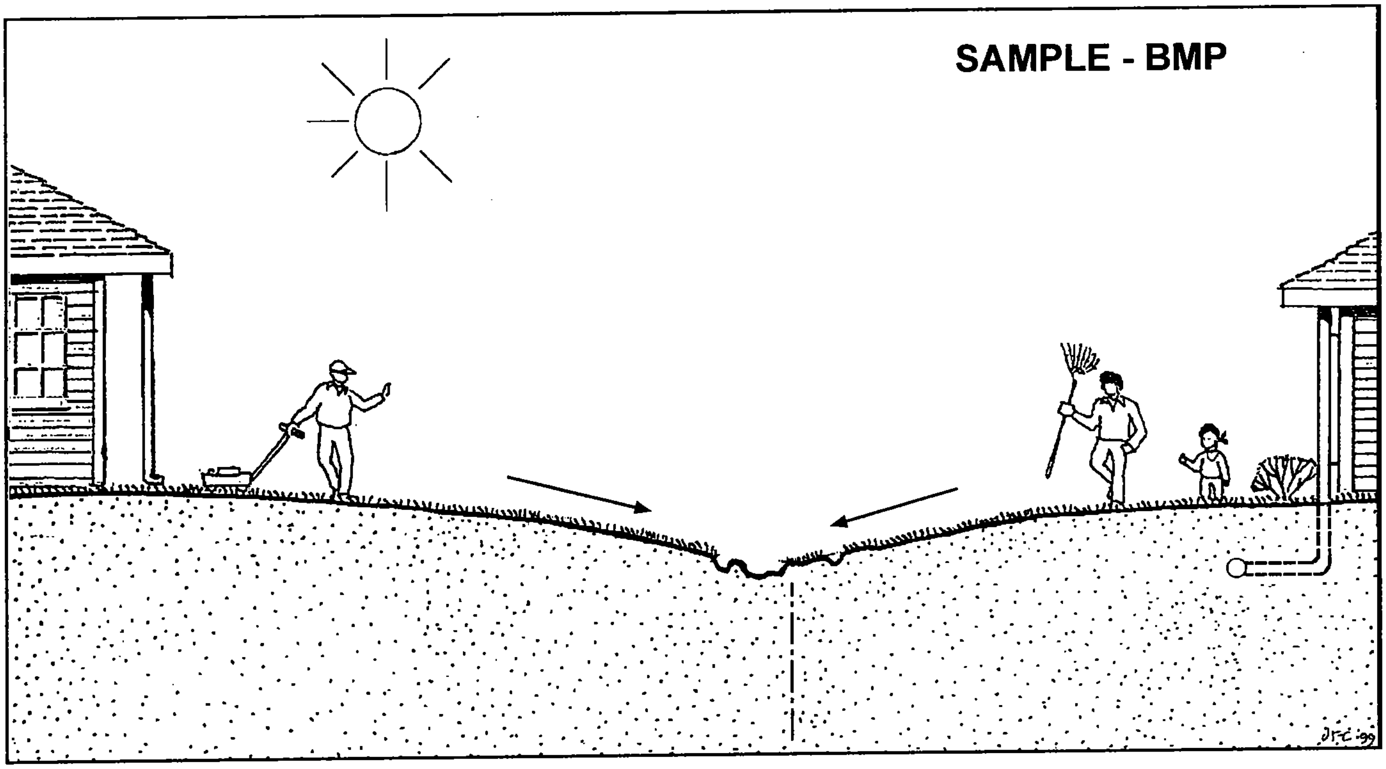
1. Temple University Ambler - Department of Landscape Architecture and Horticulture
2. Robins Park Environmental Education Center
3. Delaware Valley College
4. WiSP Institutions

C. Cities / Townships / Boroughs

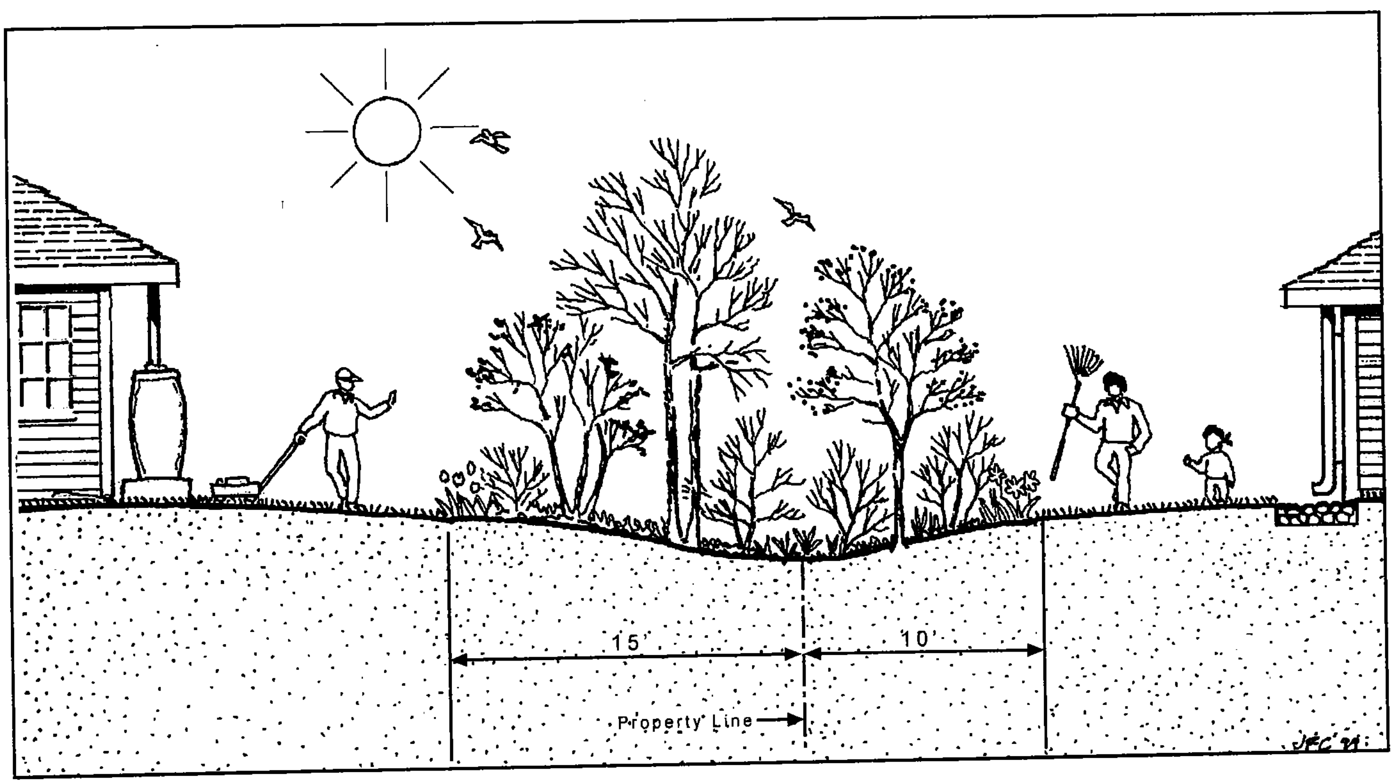
1. City of Philadelphia Fairmount Park Commission
2. Office of Watersheds, Philadelphia Water Department
3. Shade Tree Commissions

D. Businesses and Corporations

1. McNeil Consumer Products
2. McNeil Pharmaceutical
3. Rohm and Haas Company



BEFORE: DRAINAGE SWALE IN RESIDENTIAL DISTRICT
Unproductive, no privacy, rapid runoff, erosion, downspout connection to drain system.



AFTER: VEGETATED DRAINAGE SWALE
Rainbarrel and planting reduce runoff impact, provide privacy, wildlife habitat, and improved water quality filter. Disconnected downspout, outfall into rock energy dissipator

V. RESTORATION IMPLEMENTATION TOOLS

In order to implement the restoration strategies outlined in Chapter III: Restoration Goals and Strategies, a series of restoration implementations tools must be developed. Tools discussed cover a range of activities, including the acquisition of key open space; hands-on physical changes of the landscape with an emphasis on the use of best management practices; developing appropriate ordinance programs and finding incentives that will encourage interest and participation by individuals, organizations, businesses and municipalities.

A. Open Space Acquisition

1. There are often very good reasons to acquire land. Among the most important reasons are to create linkages, to protect important resources or to provide recreational uses and access. There are several ways that open space land can be acquired *Easement, Fee Simple Purchase, Donation, Grant, and Cluster Development*. (See full River Conservation Plan for Details)

B. Landscape Modification / Restoration

One of the most straightforward and beneficial implementation tools for improving the quality of the watershed environment is through the restoration of native landscapes. These include meadow development, forest creation / reforestation, and wetland creation.

C. Bio-engineering Nursery

In order to install these bioengineering restoration devices, considerable cutting material must be available which is generally very difficult to buy or collect. Purchase of stock plants, from which cuttings are taken, can be made from commercial nurseries.

D. Invasive Plant Management / Testing

One of the most difficult problems involved in the management of urban " natural" landscapes is controlling or eliminating exotic invasive plant species. It is recommended that a number of test plots be established and several control measures and techniques be applied and evaluated for knotweed and other major problem species such as Norway maple, ailanthus, honeysuckle, multiflora rose and porcelain berry.

E. Best Management Practices (BMP's)

The effective use of BMPs begins with the preservation of existing features of the landscape that perform vital functions. In particular, natural depressions and vegetated waterways provide opportunities for rainfall to infiltrate, filter runoff, and transition flow into the receiving streams. Where possible, these should be preserved and integrated into site plans. Frequently, the best place to site a BMP, such as a rain-garden, will be in these low-lying areas.

Designing with BMPs is always less intrusive than conventional approaches using centralized dry detention ponds. Furthermore, BMPs can be combined to create systems or "treatment trains" that replace many of the hydrologic functions lost during the development process. No site is too densely developed that BMPs cannot be found that will improve the character of runoff.

F. Structural Project Implementation

1. <u>Public Works Projects</u>

Administered by the responsible municipality (or shared if there is multiple municipal involvement). Publicly owned sub-watershed projects can be either modifications to existing development or related to new work.

The larger, more complex projects involving major excavation, grading, construction and bio-engineering effort will require the participation of appropriate landscape architect, civil engineer and wildlife biologist consultant experts. The process would include survey, preliminary design, contract documents and competitive bidding by approved contractors as required for most public work.

2. **Private Facilities**

Improvements to existing privately owned centralized facilities, such as detention basin changes in outlet configurations and the addition of native woody and herbaceous plantings, are examples of the types of modifications that should be made to improve water quality and reduce down stream erosion. Often these earthen "bath tubs" are devoid of visual or wildlife habitat value, which can be greatly improved by the application of design principals and native plant knowledge.

G. Ordinances

One of the most important recommendations made in this plan is to implement strong ordinances for watershed-wide stormwater management controls.

While the perception exists that the watershed municipalities are "built out", there continues to be considerable large and small-scale construction / development underway throughout the watershed.

Establishing performance-based regulations on buffers, setbacks, restorative measures, reforestation, habitat protection, stormwater infiltration and on-going management requirements.
(See full River Conservation Plan for Details)

H. Components of Watershed Ordinances

Many ordinances have been enacted in recent years that incorporate provisions for stream preservation, water quality improvement, and baseflow augmentation. The emphasis of these ordinances varies, depending upon the hydrologic setting and upon the perceived needs of the communities.

The process of developing effective ordinances will require coordination among all the municipalities in the Watershed. Furthermore, land development and subdivision ordinances should be modified to encourage low-impact design features, including narrower streets, smaller road setbacks, development clustering, etc.

New or revised ordinances in the Wissahickon Watershed should be responsive to the fact that development is already far advanced. Therefore, it is important to encourage preservation of the remaining assets and also to introduce remedial measures. The following is a generalized outline and checklist for ordinance development. (See full River Conservation Plan for Details)

I. Education Program

The development of an environmental educational program, which focuses on all ages, is probably the most important element in achieving the goal of a restored, healthy watershed.

Some of the elements of this program should be, *Environmental Education Video*, a "Restoration and Management Handbook", *School Ground Forestry and Meadow Projects, Water Quality Monitoring Program,* Tributary Stream Adoption Program. (See full River Conservation Plan for Details)

J. Sustainable Funding Mechanisms and Incentives

The realization of the goals of the Wissahickon Creek River Conservation Plan will require the willing involvement of the residents of the watershed. First and foremost, the public must be taught to understand and appreciate the benefits of stream preservation and restoration. They must embrace a new vision as to how their neighborhoods can be integrated with the unique properties of the ephemeral creeks and perennial streams in their back yards.

VI. SUBWATERSHED PLANNING

As recommended by the Center for Watershed Protection in Silver Springs, Maryland, we have chosen to develop detailed analysis and recommendations at the sub-watershed scale. Three representative sub-watersheds have been chosen to facilitate the process of identifying problems and opportunities and potential projects for implementation. They are: **A. The Headwaters of the Wissahickon (**high density neighborhood, large scale impervious surfaces) **B. The Trewellyn Creek** (rural, relatively open, low density) **C. Cresheim Creek** (high density, urban neighborhoods and trail linkage potential). If plans for 3 sub-watersheds were developed and implemented each year, the remaining 28 would take approximately 9 years.

In addition to recommending the subwatershed approach, the Center for Watershed Protection also makes a strong case for avoiding emphasis on technological planning tools, while emphasizing strong community participation, the need for a permanent management structure and strong comprehensive regulatory ordinances.

In order to keep the Executive Summary brief, we have included only one of these subwatersheds in this document. The Cresheim Creek and Trewellyn Creek subwatersheds can be found in the Full Final Report.

The once heavily forested piedmont landscape of the Wissahickon Creek watershed has been fragmented over the centuries by successive waves of development. Roadways, commercial and industrial sites, town centers and residential areas have replaced the creeksheds, forests, wetlands, wildlife habitats and ponds in the watershed, leaving behind many isolated and disconnected fragments of the natural landscape. With the vision of reconnecting these remnant patches, many communities are developing lineal 'greenways' along riparian, railroad and utility corridors.

The three subwatersheds selected for a detailed study are described as to their general characteristics and recommendations for various stormwater management (S); restoration of water quality (R); and public education (E) projects. Potential acquisition sites are also identified (A). Management recommendations are identified as (M). The plan on the previous page shows the location of the three subwatersheds selected for detail study.

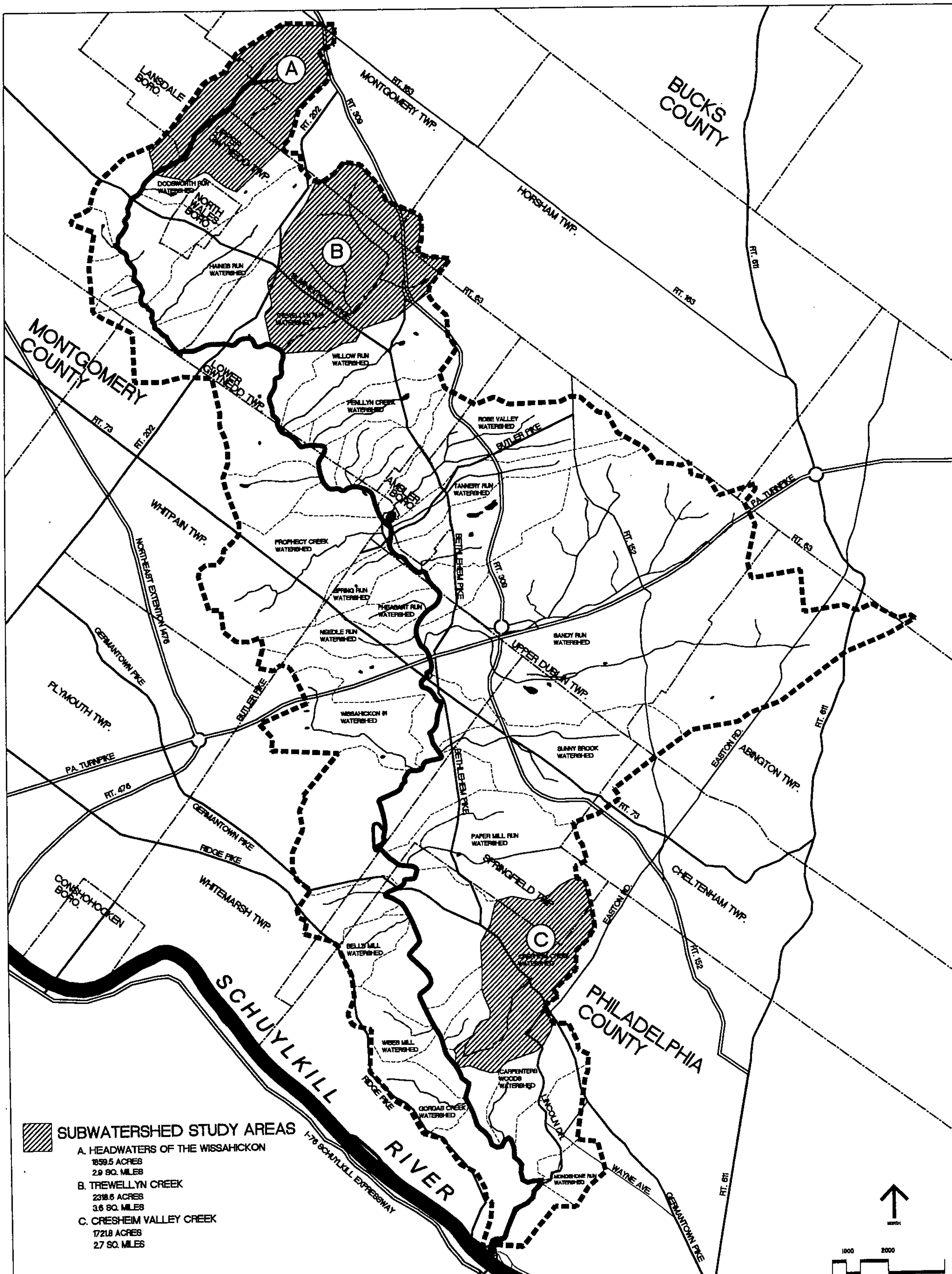
Budget Estimates:

The proposed project sites have not been surveyed to document existing site details including acreage, property lines, topography, vegetation, utilities and structures. Therefore no detailed design or engineering has been possible as yet.

The budget figures provided in this report are based on a very preliminary review of the project type, size, location and complexity and on approximate current unit prices for materials and labor.

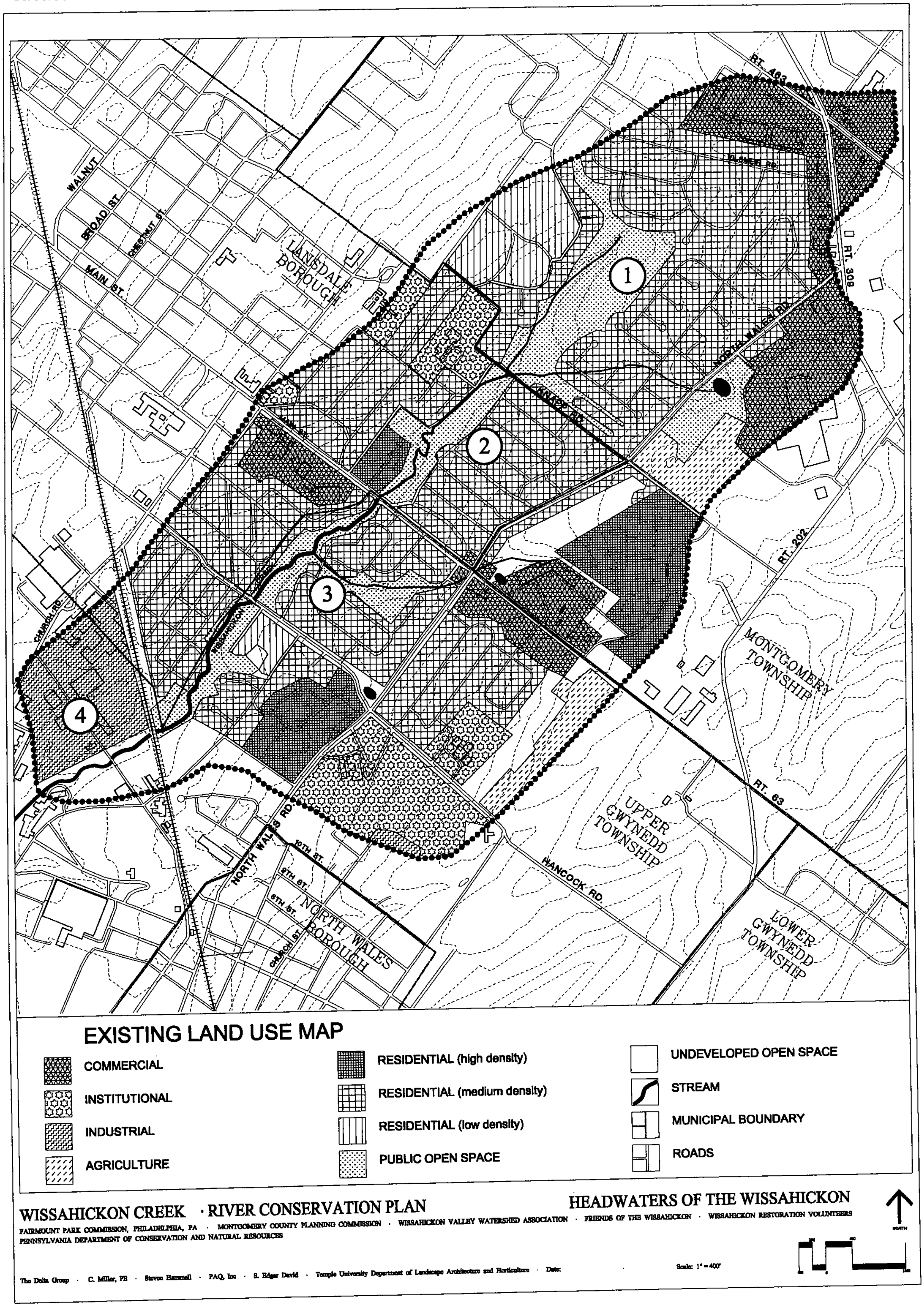
It is assumed that most of the larger projects will be constructed or implemented by professional contractors who will be selected after a competitive bidding process.

Municipal staff may also be utilized to complete some of the projects, while others may be accomplished by volunteer groups. The cost will vary greatly depending on which of these three groups are involved in implementing the work.



SUBWATERSHED STUDY AREA MAP

WISSAHICKON CREEK · RIVER CONSERVATION PLAN
FAIRMOUNT PARK COMMISSION, PHILADELPHIA, PA · MONTGOMERY COUNTY PLANNING COMMISSION · WISSAHICKON VALLEY WATERSHED ASSOCIATION · FRIENDS OF THE WISSAHICKON · WISSAHICKON RESTORATION VOLUNTEERS
PENNSYLVANIA DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
The Delta Group · C. Miller, PE · Steven Hammel · PAQ, Inc · S. Edgar David · Temple University Department of Landscape Architecture and Horticulture


RT. 463
WILMER RD.
RT. 309
NORTH WALES RD.
LANSDALE BOROUGH
WALNUT
BROAD ST.
CHESTNUT ST.
MAIN ST.
CHURCH RD.
RT. 202
RT. 63
MONTGOMERY TOWNSHIP
UPPER GWYNEDD TOWNSHIP
LOWER GWYNEDD TOWNSHIP
NORTH WALES BOROUGH
HANCOCK RD.
10TH ST.
9TH ST.
6TH ST.
CHURCH ST.
1
2
3
4
EXISTING LAND USE MAP
COMMERCIAL
INSTITUTIONAL
INDUSTRIAL
AGRICULTURE
RESIDENTIAL (high density)
RESIDENTIAL (medium density)
RESIDENTIAL (low density)
PUBLIC OPEN SPACE
UNDEVELOPED OPEN SPACE
STREAM
MUNICIPAL BOUNDARY
ROADS
WISSAHICKON CREEK · RIVER CONSERVATION PLAN
HEADWATERS OF THE WISSAHICKON
FAIRMOUNT PARK COMMISSION, PHILADELPHIA, PA · MONTGOMERY COUNTY PLANNING COMMISSION · WISSAHICKON VALLEY WATERSHED ASSOCIATION · FRIENDS OF THE WISSAHICKON · WISSAHICKON RESTORATION VOLUNTEERS
PENNSYLVANIA DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
The Delta Group · C. Miller, PE · Steven Hammell · PAQ, Inc · S. Edgar David · Temple University Department of Landscape Architecture and Horticulture · Date:
Scale: 1" = 400'

A. Headwaters of the Wissahickon

Located in the red clay soils / red shale bedrock Triassic Basin, this 2.9 square-mile subwatershed includes portions of Montgomery and Upper Gwynedd Townships and Lansdale Borough. The Headwaters has a high percentage of impervious surfaces (parking lots, roads and roof area). It also includes a mix of high-density residential and commercial development. There are five schools and a considerable amount of active development underway within the watershed, primarily along the Welsh Road corridor. PECO Energy rights-of-way traverse the southern portion of the subwatershed. Most of the Wissahickon Creek corridor is in public ownership, except for the northern most drainage course which is in private residential ownership and the southernmost corridor which is owned by PECO.

Of the three subwatersheds investigated, the Headwaters is the most threatened by loss of essential hydrologic functions.

1. Assessment

Most of this subwatershed is underlain by shale of the Brunswick Formation. The natural tendency of this terrain to produce rapid runoff has been aggravated by development of the watershed. It is now common for the main channel of the Creek to go completely dry during the height of the summer. On the other hand, residents describe the overbank flooding events as becoming increasingly frequent. Furthermore, flooding events both rise and recede very rapidly.

Approximately 30 percent of the subwatershed lies within the borough of Lansdale. There are no runoff controls within this area, and storm sewers outfall directly into the Creek. With the exception of commercial districts at Montgomery Mall, Five Points Plaza, and Sandy Brooke Mall, most areas in suburban Montgomery and Upper Gwynedd Townships are also without effective runoff controls.

The principal outcome has been a large increase in the magnitude and frequency of overbank flooding. As a result the Creek is widening and deepening. In most reaches the Creek has eroded to bedrock. Typically, stream banks are barren, nearly vertical slopes that have been eroded from floodplain clay soil. Undermining of stream banks is widespread.

The Creek is evolving from a meandering stream into a straight channel with flood-dominated features, such as *chute bars*. The principal process is erosion and transport of fine sediment out of the subwatershed. Consequently, sedimentation, a common problem in many other subwatersheds, is not important here. However, these conditions in the Headwaters subwatershed are undoubtedly contributing to sedimentation problems further downstream in the Wissahickon Creek.

Down cutting of the stream has diminished the effectiveness of the floodplain, even where the floodplain has been preserved. The new, deeper channel tends to accelerate the flow during storm events. Instead of being dispersed onto the floodplain, stormwater is concentrated in the deepened channels where it further erodes and destabilizes the banks. Gullies tend to form at the confluence of tributaries as they downcut to reach the Creek bed elevations.

These effects are recent. Long-time residents can recall when the Creek and its tributaries had gentler, vegetated banks. Many residents with homes adjacent to the Creek do not understand how the Creek is changing, and believe that the present steep banks are a natural or desirable feature. As a result, a pattern of stream encroachment has developed in which residents seek to stabilize the Creek by filling the floodplain and constructing environmentally damaging walls.

Most of the natural tributaries have been replaced by storm sewers. At present only two secondary tributaries have been preserved for a length of more than 200 yards.

2. Proposed Projects for Headwaters Subwatershed

The following map on page VI-13 and list of proposed projects have been developed in response to the analysis of the conditions on-site, discussion with the municipalities involved and comments received at public workshops.

The reconstruction of a storm water wetland pond complex in Lansdale Borough between Route 63 (Main Street) and Knapp Road in the existing park could reduce downstream erosion/sedimentation problems considerably, while establishing an important recreational and wildlife habitat for public enjoyment and education. The existing conditions of the dam ruins and pond are in an unmanageable condition and are somewhat hazardous.

Developing demonstration "retroscape" parking lot and roofscape stormwater recharge and detention projects in each subwatershed would provide the opportunity to monitor the effectiveness and cost of these more innovative projects.

High density neighborhood "retrofit" stormwater storage programs should be developed whereby rain barrels and canopy trees could be made available at low or no cost to homeowners who would agree to install the rain barrels and to plant the trees on their private property.

Establishing or restoring private property and public open space riparian buffers, reconstructing stream banks and establishing trails on PECO Energy rights of way are other examples of physical improvements that are recommended.

Educational projects could include involvement of students and faculty in reforestation/meadow and bioengineering projects, both in the stream corridors and on school grounds.

Acquisition of two parcels or leases negotiated with PECO Energy are recommended as well.

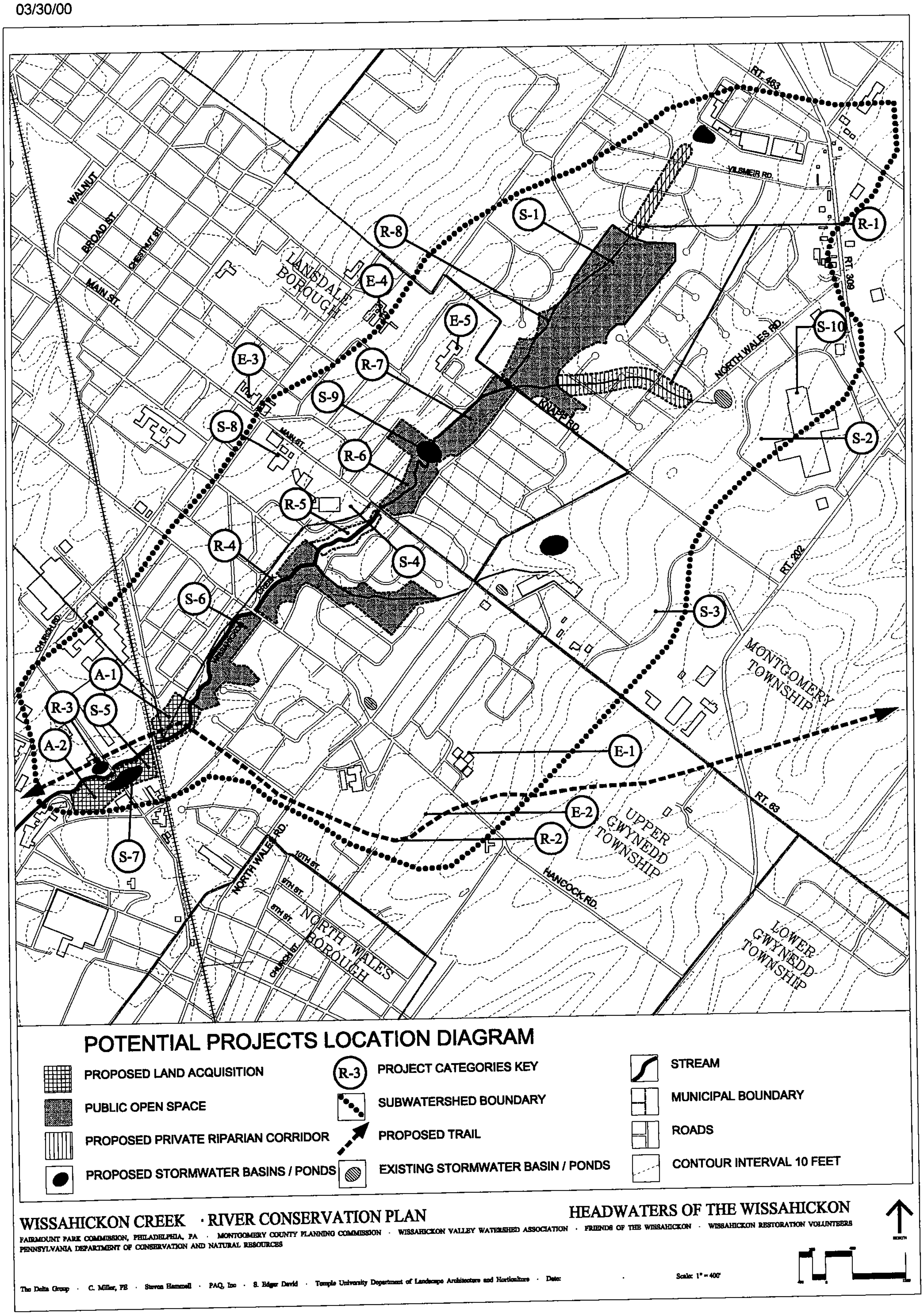
These projects lists were reviewed with Upper Gwynedd and Montgomery Township representatives and the elected officials to establish prioritization.

HEADWATERS OF THE WISSAHICKON
PROJECT IDENTIFICATION LIST

#	MUNIC	TYPE	SIZE	COST	REMARKS
STORMWATER MANAGEMENT / BMP'S					
S-1	MT.	Regrade Floodplain	600 LF	$110,000	
S-2	MT.	Retrofit Parking	32,500 SF	$63,600	
S-3	MT.	High Density Retrofit		$10,000	50 Rainbarrels, 50 Trees
S-4	LB.	Retrofit Parking	32,500 SF	$63,600	
S-5	UG.	Floodplain Regrading	600 LF	$110,000	
S-6	UG.	Outfall		$10 - 15,000	
S-7	UG.	Floodplain Pond	160,000 SF	$400,000	
S-8	LB.	Retrofit Parking	32,500 SF	$63,600	100 Cars
S-9	LB.	Dam / Pond Reconstruction	80,000 SF	$480,000	SWM / Wildlife / Recreation Use
S-10	MT.	Roofscape Demonstration	10,000SF	$80,000	
RESTORATION OF WATER & HABITAT QUALITY					
R-1	MT.	Private Buffer	3,400 LF	$132,600	
R-2	UG.	Power Line Trail	11,500 LF	$287,500	
R-3	UG.	Pond Construction	60,000 SF	$360,000	
R-4	UG.	Restore Stream Buffer	1,100 LF	$99,000	
R-5	UG.	Restore Stream Buffer	1,000 LF	$90,000	
R-6	LB.	Restore Stream Buffer	1,000 LF	$75,000	
R-7	LB.	Regrade Channel	1,400 LF	$112,000	
R-8	LB.	Restore Stream Buffer	2,800 LF	$112,000	
PUBLIC EDUCATION					
E-1	UG.	Education Project		$10,000	Pennbrook School
E-2	UG.	Education Project		$10,000	Pennbrook Middle School
E-3	LB.	Education Project		$10,000	St. Stanislaus Elementary School
E-4	LB.	Education Project		$10,000	Lansdale Catholic High School
E-5	LB.	Education Project		$10,000	Knapp Elementary School
MANAGEMENT TOOLS / ORGANIZATION					
WM-1,2,3	LB.	Develop New Ordinances, Project Manager, Nursery		$20,000	
WM-1,2,3	MT.	Develop New Ordinances, Project Manager, Nursery		$20,000	
WM-1,2,3	UG.	Develop New Ordinances, Project Manager, Nursery		$20,000	
ACQUISITION					
A-1	UG.	Acquisition Site	42,000 SF±	$240,000	PECO R.O.W. (Easement)
A-2	UG.	Acquisition Site	42,000 SF±	$240,000	

LB = Lansdale Borough
MT = Montgomery Township
UG = Upper Gwynedd Township

The Map on the following page, indicates the location, category and number of the projects recommended for implementation. They are also listed on this page with budget estimates for each project.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VILSMEIR RD.
RT. 309
NORTH WALES RD.
KNAPP RD.
RT. 202
MONTGOMERY TOWNSHIP
RT. 63
UPPER GWYNEDD TOWNSHIP
HANCOCK RD.
LOWER GWYNEDD TOWNSHIP
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CHURCH RD.
NORTH WALES RD.
10TH ST.
9TH ST.
8TH ST.
CHURCH ST.
S-1
R-1
R-8
E-4
E-5
S-10
E-3
R-7
S-9
S-2
S-8
R-6
R-5
S-4
R-4
S-6
S-3
A-1
R-3
S-5
A-2
E-1
E-2
R-2
S-7
POTENTIAL PROJECTS LOCATION DIAGRAM
PROPOSED LAND ACQUISITION
PUBLIC OPEN SPACE
PROPOSED PRIVATE RIPARIAN CORRIDOR
PROPOSED STORMWATER BASINS / PONDS
R-3
PROJECT CATEGORIES KEY
SUBWATERSHED BOUNDARY
PROPOSED TRAIL
EXISTING STORMWATER BASIN / PONDS
STREAM
MUNICIPAL BOUNDARY
ROADS
CONTOUR INTERVAL 10 FEET
WISSAHICKON CREEK · RIVER CONSERVATION PLAN
HEADWATERS OF THE WISSAHICKON
FAIRMOUNT PARK COMMISSION, PHILADELPHIA, PA · MONTGOMERY COUNTY PLANNING COMMISSION · WISSAHICKON VALLEY WATERSHED ASSOCIATION · FRIENDS OF THE WISSAHICKON · WISSAHICKON RESTORATION VOLUNTEERS
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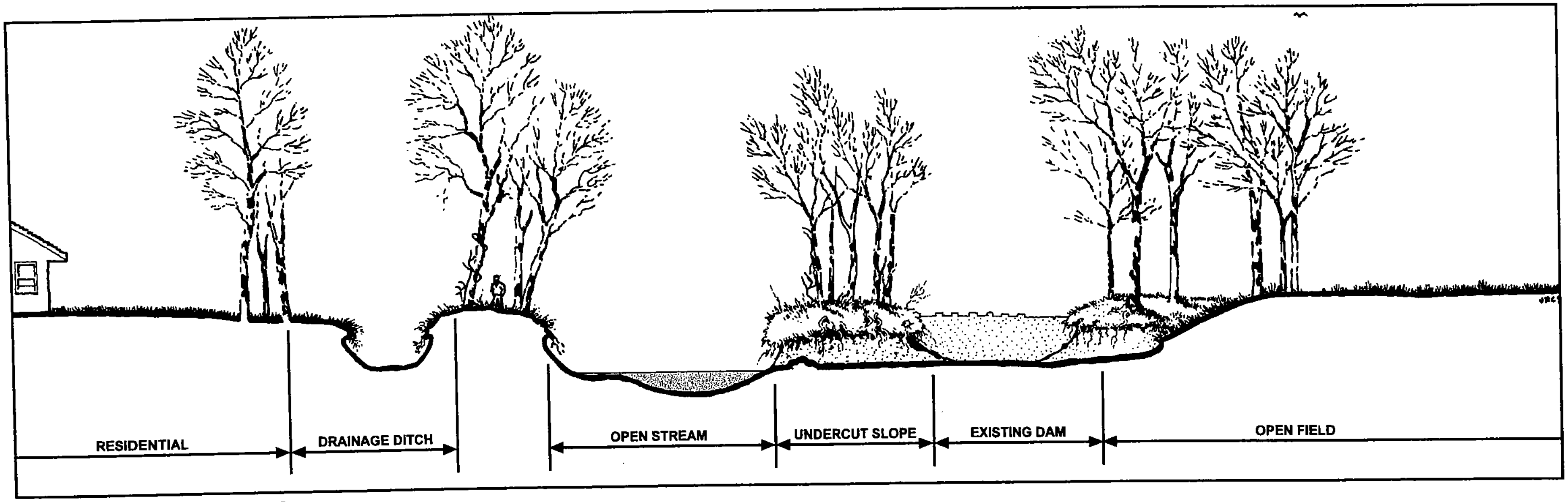
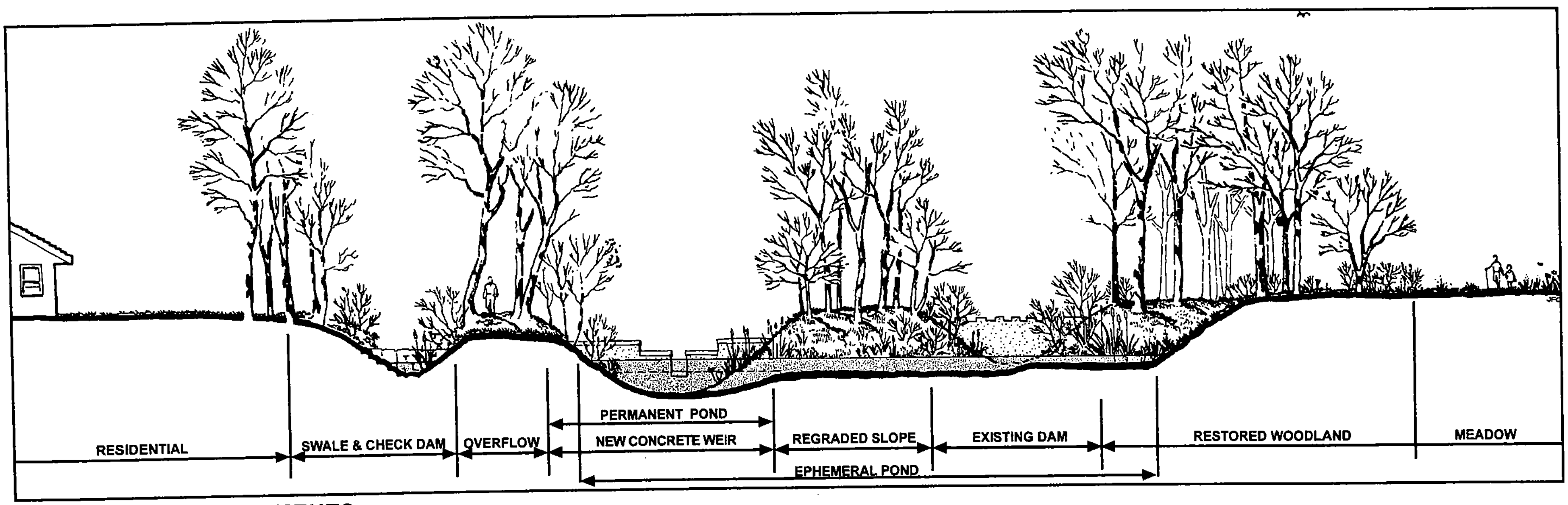


EXISTING CONDITIONS
PROJECT SITE SECTION
HEADWATERS OF THE WISSAHICKON
Severe erosion, dilapidated dam structure and a deep, dangerous drainage ditch are the basic problem with this area.



PROPOSED IMPROVEMENTS
STORMWATER MANAGEMENT BMP'S
HEADWATERS OF THE WISSAHICKON
A new concrete dam to contain runoff, check dams in the drainage ditch, regrading the banks and planting with native species are shown in this section.

VI. WISSAHICKON-WIDE MANAGEMENT ALTERNATIVES

The need for designating coordination responsibility for the Wissahickon Watershed restoration-related activities must be one of the first steps in the implementation process.

Maintaining existing municipality independence while promoting teamwork between the fourteen in the watershed will also be important. Creating another new layer of regulatory or bureaucratic authority should be avoided.

Retaining the active involvement of the numerous subwatershed groups and the three major watershed support groups, the Wissahickon Valley Watershed Association, the Friends of the Wissahickon and the Wissahickon Restoration Volunteers, is also of great importance.

The tasks that the coordinating agency/organization/person might assume include the following:

1. Planning and Coordination

The realization of the goals of the River Conservation Plan will require strong coordination among the many stakeholders in the watershed. In particular, the following tasks are critical to success:

- Coordination between local municipalities, state and county agencies, including ordinance revisions to support the planning goals.
- Assistance in preparing funding applications, construction / implementation contracts, grant proposals, etc.
- Long-range watershed planning liaison.
- Prioritization of restoration and remediation projects.
- Administration of restoration contracts, inspections, review of invoices.
- Public education and outreach to community and schools.
- Coordination of applied research activities on wildlife, water quality improvement, plant disease/insect control and invasive plant management.

Fortunately a watershed coalition is already forming. Known as the Wissahickon Watershed Partnership (Partnership), its members include government agencies, non-profit groups, volunteer organizations, landowners, industries, and concerned citizens. Over 30 local, state and regional organizations and all municipalities within the watershed are represented. The Partnership was formed in 1997 because of a strong interest in the creek, and a need to coordinate many on-going and proposed studies. Since its formation the scope of the organization has widened to embrace all aspects of stream management, including water quality and open-space preservation, recreational development, stream bank and floodplain restoration, habitat restoration, and flood control. The Partnership continues to benefit from the active support of the Pennsylvania Department of Environmental Protection (PADEP) Watershed Coordinator.

2. Policy Implementation

Implementation of the Partnership's recommendations will depend upon the participation of its member organizations. There are numerous groups in the watershed that have the experience and expertise to implement critical programs. The Partnership can further empower these groups by:

- Coordinating activities among the municipalities within the watershed.
- Functioning as a recognized authority for policy-making within the watershed.
- Ensuring a reliable level of funding for on-going programs.
- Subsidizing new staff members who will be dedicated full- or half-time to the Wissahickon Creek watershed.
- Building relationships and alliances that are better equipped to take on long-term or difficult projects.

Some specific recommendations include:

a. Establish a new position for Restoration Project Coordinator. This professional could be conveniently added to the four full-time staff of the Wissahickon Valley Watershed Association.

b. Fund a half-time position at a regional Watershed Technical Center, to be hosted at the Academy of Natural Sciences. The role of this person would be to: 1) collect and disseminate monitoring data and other technical information about the watershed, 2) develop guidelines and educational programs, 3) coordinate on-going monitoring efforts.

c. Fund a field consultant for the Montgomery County Conservation District (MCCD). This person's role would be to meet with developers and municipal engineers during site plan development, inspect construction, and monitor conditions in the watershed.

d. Municipalities would be encouraged to incorporate review by the MCCD in site plan approval.

If existing organizations are not able or willing to shoulder the increased responsibilities for watershed management, then it may become necessary to establish a new central watershed planning office with a full time director and staff with restoration and educational credentials.

The cost of salaries for watershed professionals would be shared among the participating municipalities.

The Wissahickon Valley Watershed Association would seem to be the most logical organization to provide day to day coordination of watershed implementation policies. This established organization is currently acquiring and managing an effective stream corridor open space system. They are also well respected by organizations and municipalities within the watershed and are already involved in fund-raising, planning and public education activities.

VIII. ACTION PLAN

It is most important that the Wissahickon Creek River Conservation Plan conclude with observations, recommendations and implementation strategies for the entire watershed, so that all areas and municipal entities have equal opportunity to participate in implementation programs and be eligible for funding. With this goal in mind, a series of documents have been prepared which address the overall watershed. These include the following:

- *Conclusions And Recommendations*

  The following list describes ten "Conclusions and Recommendations" concerning watershed wide issues, based on the findings of the Planning process. These general conclusions are followed by recommendations for each problem / conclusion implementation strategies in:

- *Project Category - Examples*

  Derived from the individual prototype subwatershed studies, these categories of project implementation programs have been developed to apply to the overall watershed, and to cover a broad range of physical and management approaches.

- *Project Descriptions*

  This chart lists a series of general implementation projects that would be applicable to any municipality in the watershed, and which a municipality could utilize as a first round implementation program whether or not a more detailed subwatershed study had been done within that municipality. This would enable each municipality to seek implementation grant monies immediately, and to make significant progress in restoration efforts.

  Three municipalities or private organizations have requested projects that are not in the subwatersheds that were given detailed attention. They are North Wales, Friends of Hillcrest Pond and Philadelphia (Fairmount Park).

  <u>North Wales</u> - Restoration of a wetland / pond in the northwest part of the Borough. ($50,000)

  <u>Friends of Hillcrest Pond</u> – Cisco Park, Paper Mill Run
  Restoration of streambank and pond ($200,000)

  <u>Fairmount Park</u> – Several sites identified by the Academy of Natural Sciences requiring restoration (no budget available).

- *Municipality Project Assignment Chart (Page VIII-7)*

  The final chart keys implementation projects with estimated costs to each participating municipality in the Wissahickon watershed. The Project Descriptions chart on Page VIII-5, describes the demonstration projects that would be included on the list for all watershed municipalities.

- *Action Plan Preliminary Outline*

  A list of steps that should be included in the development of an action-based detailed Work Plan, to accomplish the goals of this effort.

CONCLUSIONS / PROBLEMS	RECOMMENDATIONS
1. Most land in the Wissahickon watershed was developed prior to storm water management regulations.	Requires concentration on remedial restoration / water quality projects. Ordinances must also be revised to deal with retro-restoration throughout the entire watershed.
2. Most land in the Wissahickon watershed is in private ownership, primarily residential.	Develop projects to restore riparian buffers in residential / institutional / corporate and open space areas.
3. Main Wissahickon Creek corridor is mostly in public ownership.	Complete "Green Ribbon" park along entire creek. Direct main focus on restoring subwatersheds.
4. Subwatersheds are the appropriate scale to deal with physical planning and restoration efforts.	Select three subwatersheds per year for next 9 years as part of on-going planning program for restoration
5. Education must be a high priority for all age groups.	Develop classroom and outdoor programs for each school. Sponsor creek stewardship workshops and demonstration projects.
6. There is strong need for both long range, broadly based watershed-wide policy leadership and day-to-day project implementation / management responsibility.	Establish Wissahickon Watershed Partnership as the comprehensive policy / coordinating group and the Wissahickon Valley Watershed Association responsible for project management / implementation, and local Montgomery County municipal coordinator.
7. Incentives are needed to encourage private property project owners.	Grants, awards programs, hands-on workshops, a how-to handbook, subsidized plant sales and tax relief incentives should be developed.
8. Existing ordinances are not sufficient. They don't deal with retro-restoration or appropriate storm frequency.	Develop a watershed wide ordinance revision / update program, which permits adoption of relevant controls and guidelines tailored to the needs of each municipality.
9. Project funding will require combined Federal, State and local resources. In-kind local match can include volunteer labor as well as municipal staff, equipment and labor cost.	Develop aggressive grant application program. Establish volunteer team or committee for each subwatershed.
10. There is a need for native plant and bioengineering material for restoration efforts. These materials are not available from most nurseries.	Establish a watershed native plant and bioengineering materials nursery. (Could be several sites.)

PROJECT DESCRIPTIONS

Overall Wissahickon Watershed Projects. (W)

For each municipality in the watershed, the following implementation projects are recommended to be included in the list developed for fund raising efforts.

Demonstration Projects

Stormwater Management	WS-1	Parking Lot Stormwater Bio-Infiltration.	$26,000
	WS-2	Neighborhood Rainbarrels Program.	$12,000
Restoration	WR-1	Riparian Buffer Restoration Maintenance (150 L.F.)	$16,000
	WR-2	Reforestation and (1acre) Invasives Control	$14,000
Education	WE-1	Education Projects (Elem. School)	$10,000
	WE-2	Education Projects (High School)	$10,000
	WE-3	Education Projects (Junior High School)	$10,000
Project Coordination & Management	WM-1	Ordinance Redrafting	* $5,000
	WM-2	Watershed Project Manager	* $5,000
	WM-3	Bioengineering Nursery	* $10,000
		Minimum recommended annual implementation grant / contribution total for each municipality	$118,000

* The municipalities may wish to make a contribution to ordinance revisions, the new management person's salary, and the nursery project. In municipalities involved in first year Subwatershed planning (Headwaters, Trewellyn and Cresheim) the Municipality Project Assignment Chart has been adjusted to reflect site specific projects.

Subwatershed Projects

The project identification lists for the three subwatersheds include a comprehensive approach to stormwater, restoration, educational, management and acquisition which can be accomplished over several years. The Municipality Project Assignment Chart indicates an attempt to establish a first, second and third order of priority, which could be implemented within the first year of active project management, perhaps starting in the year 2000. Subsequent priorities should be established by the Wissahickon Watershed Partners in cooperation with the municipalities.

The projects are grouped under letter designations as follows:

S - Stormwater Management Projects BMP's (including bio-infiltration, streambank repair, parking lot renovation to reduce runoff, roofscape, planting stormwater basins, filter strips and culvert improvements).

R - Restoration of Water and Habitat Quality (privately and publicly owned riparian buffer planting, trail development, reforestation, meadow development).

E - Education Projects (school grounds forest and meadow projects, creek stewardship, coursework and workshop outlines).

M - Management Projects (share salary of watershed project manager, ordinance review / redrafting, cost of bioengineering materials nursery).

A - Acquisition Projects (purchase, easement, cluster or gift of property with priority on main stream of the Wissahickon and major subwatershed tributaries, emphasize opportunities for multiple use, i.e.: trails, nature study and fishing activities as well as environmental benefits).

WISSAHICKON CREEK - RIVER CONSERVATION PLAN
PROJECT CATEGORY - EXAMPLES

"S" - Stormwater Management / BMP's

- Enhancements to existing dry basins.
- Hydraulic modifications to pond systems (control small storm runoff).
- Outfall modifications to mitigate impacts.
- Threatened tributaries - require restoration of buffers, floodplain regrading, controls at sewer outfalls, etc.
- Urban retrofit - large scale (parking lots) / small scale (residential BMP's).

"R" - Restoration / Water Quality / Habitat

- Reforestation - riparian buffers / upland infiltration program.
- Invasive species management.
- Wetland creation / enhancement.
- Floodplain protection.
- Residential landscaping opportunities.
- Restoration as education.

"E" - Public Education

- Demonstration handbook / video.
- Design guidelines.
- Private property BMP's handbook.
- Schools: on-site woodland / meadow demonstration.
- Schools: environmental education outreach.

"M" - Management Tools

- Ordinance review / modifications.
  - Stormwater management incorporating BMP's.
  - Redevelopment requirements.
  - Riparian corridor preservation.
  - Landscape treatment
- Organizations.
- Planning and design guidelines.
- Develop Native Plant / Bioengineering Nursery.

"A" - Acquisition

- Conservation / preservation - habitat, buffers, open space.
- Public access / trails / linkages.
- Purchase / easement options.

"SP" - SPECIAL PROJECTS (Generally watershed wide)

- Establish Advisory Management Organization for entire watershed.
- Research re: invasives, wildlife, reforestation, etc.
- Water quality testing / monitoring.
- Teaching - meadow / forest development on school property.
- Volunteer involvement in restoration.
- Develop restoration and management team (permanent).
- Clean-up days.
- Trail Planning / design.
- Establish watershed management agency.
- On-going sub-watershed studies, 3 per year for 9 years.
- Invasive Plant Eradication.

Location H = Headwaters, T = Trewellyn, C = Cresheim
Type S = Stormwater Mgt., R = Restoration, E = Education, M = Management, A= Acquisition
Number W = Watershed-wide, not site specific
TS-1
♦ Additional projects identified in other studies

DRAFT
MUNICIPALITY PROJECT ASSIGNMENT CHART
PHASE 1

MUNICIPALITY	S	R	E	M	A	
Montgomery (MT)	TS-2 TS-1 HS-1 $156,000	TR-2 HR-1 HR-3 $466,900		WM-1 WM-2 WM-3 $20,000		$643,000
Lansdale (LB)	HS-10 HS-4 $143,600	HR-7 HR-8 $224,000	HE-3 HE-4 HE-5 $30,000	WM-1 WM-2 WM-3 $20,000		$417,500
North Wales (NW)	WS-1 WS-2 $38,000	R-1 R-2 $50,000	E-1 E-2 E-3 $30,000	WM-1 WM-2 WM-3 $20,000		$138,000
Upper Gwynedd (UG)	HS-1 HS-6 HS-7 $495,000	HR-2 HR-4 HR-5 $476,500	HE-1 HE-2 $20,000	WM-1 WM-2 WM-3 $20,000	HA-1 $240,000	$1,251,500
Lower Gwynedd (LG)	TS-3 TS-6 TS-7 $346,000	TR-3 TR-8 TR-9 $310,000	TE-1 TE-2 TE-3 $30,000	TM-1 WM-2 WM-3 $20,000	TA-2 $691,000	$1,397,000
Horsham (HT)	TS-4 WS-2 $75,600	WR-1 WR-2 $30,000		WM-1 WM-2 WM-3 $20,000		$125,600
Whitpain (WT)	WS-1 WS-2 $38,000	WR-1 WR-2 $30,000	WE-1 WE-2 WE-3 $30,000	WM-1 WM-2 WM-3 $20,000		$118,000
Upper Dublin (UD) ♦	WS-1 WS-2 $38,000	WR-1 WR-2 $30,000	WE-1 WE-2 WE-3 $30,000	WM-1 WM-2 WM-3 $20,000		$118,000
Ambler (AB)	WS-1 WS-2 $38,000	WR-1 WR-2 $30,000	WE-1 WE-2 WE-3 $30,000	WM-1 WM-2 WM-3 $20,000		$118,000
Whitemarsh (WM)	WS-1 WS-2 $38,000	WR-1 WR-2 $30,000	WE-1 WE-2 WE-3 $30,000	WM-1 WM-2 WM-3 $20,000		$118,000
Springfield (SP) ♦	CS-1 $700,000	PR-1 CR-4 CR-1 $1,040,000	CE-9 $10,000	WM-1 WM-2 WM-3 $20,000	CA-1 $172,000	$1,942,000
Abington (AT) ♦	* WS-1 WS-2 $38,000	* WR-1 WR-2 $30,000	WE-1 WE-2 WE-3 $30,000	WM-1 WM-2 WM-3 $20,000		$118,000
Cheltenham (CT)	WS-1 WS-2 $38,000	WR-1 WR-2 $30,000	WE-1 WE-2 WE-3 $30,000	WM-1 WM-2 WM-3 $20,000		$118,000
Philadelphia (PC) ♦	CS-2 CS-4 CS-9 $115,459	CR-6 CR-8 CR-10 $627,638	CE-1 CE-2 CE-3 $30,000	WM-1 WM-2 WM-3 $20,000	CA-2 $120,000	$863,000
SUB TOTAL						$7,485,600
RESEARCH, PLANNING, EDUCATION, RESTORATION HANDBOOK						$200,000
CONTINGENCY 10%						$768,560
TOTAL						$8,454,160

Action Plan Preliminary Outline

The following outline assumes the recommendations be adopted that the Wissahickon Partnership and the Wissahickon Valley Watershed Association assume ongoing responsibility for establishing policy, coordination, priorities, fund raising, planning and project implementation for the entire basin. As all municipalities are members of the Partnership, all have a voice in these issues. The WVWA role is to provide day to day overview of restoration efforts, in close contact with all municipalities.

A committee of Partnership member WVWA, Montgomery County Planning Commission and Fairmount Park Commission should be established to develop a realistic, fair and action-oriented program for continuing the process that this Plan has started.

Some of the elements of this program may include the following ten steps:

1. Complete the River Conservation Plan, send to DCNR for approval and registry, which will permit application for funding from State and Federal programs. Select year 2 subwatersheds for planning.

2. Develop Detailed Action Plan Program, A committee as described above, should prepare a detailed work / Action Plan to guide the process.

3. Add a Fulltime Restoration Project Manager, to the WVWA staff who will coordinate project grant applications, municipal joint ventures, design, bidding and contract administration. On-site inspections would also be this persons responsibilities.

4. Select Phase 1 Projects and Submit Grant Applications,

5. Implement Bio-Engineering Nursery, prepare plans for year 2, involve all municipalities to assist.

6. Begin Ordinance Update Process, Attempt to include all municipalities in developing a watershed-wide set of ordinances.

7. Develop a Watershed Restoration Handbook, to guide the projects, describe the techniques, materials and equipment required.

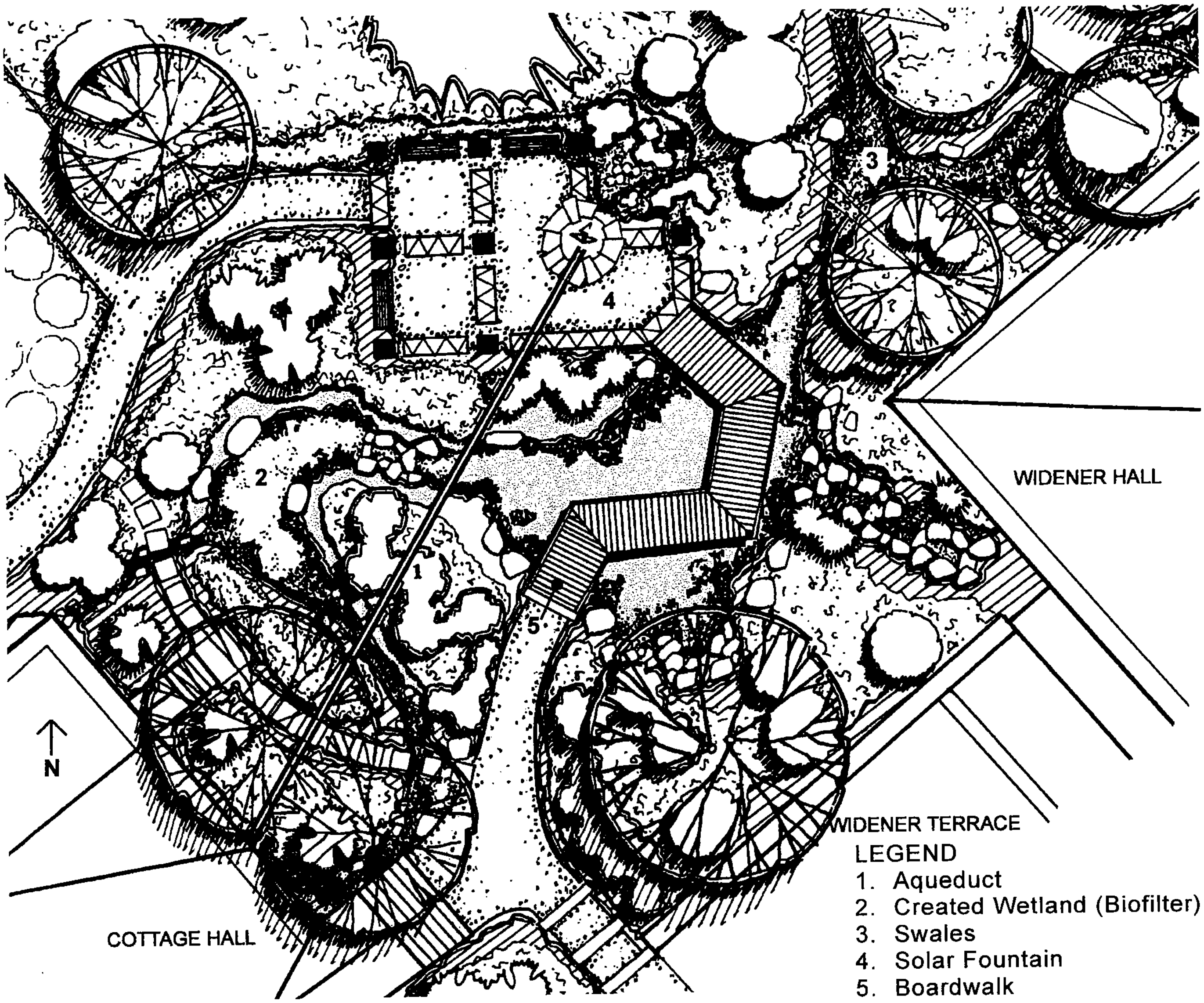
8. Begin Educational Projects, throughout the watershed. Involve students in hands on projects. Coordinate Volunteer involvement.

9. Continue to Hold Public Workshops, to develop support for the process. Establish committee for each Subwatershed.

10. Complete Phase I Projects, apply for year 2 funds at the appropriate time.

11. Complete year 2 subwatershed plans. (3)

The schedule for this Action Plan will depend on many factors. The major ingredients for a successful program will be teamwork and a sense of urgency. If this action Plan is not begun in the very near future it may be very difficult to rekindle the enthusiasm and momentum that has been developed over the past two years.



SUSTAINABLE WETLAND GARDEN

Temple University Department of Landscape Architecture and Horticulture Spring 1999

IX. CONCLUSION

The work incorporated in this report is the result of a strong team effort involving the 14 municipalities of the Wissahickon Watershed, The Fairmount Park Commission, Montgomery County Planning Commission and the Pennsylvania Department of Conservation and Natural Resources, Department of Environmental Protection, Friends of the Wissahickon, Wissahickon Valley Watershed Association and The Wissahickon Restoration Volunteers and the professional consultant team. The forming of the Wissahickon Partnership during the duration of this effort was very fortuitous, and should continue to provide a clear, unified voice for the watershed community.

The Delta Group and their Sub-consultants wish to thank all involved for their hospitality, interest, input and advice in developing the plan, during a time when numerous other studies and planning efforts were also underway in the Watershed, each requiring involvement of the municipalities and organizations listed above. It has been a privilege to be involved in this important effort.

A good deal of criticism of many of our most cherished landscape traditions can be found in this report. We hope that the text and illustrations are successful in making a case for the somewhat unusual concepts, and the recommendations that have been made.

These long held values include the extensive lush green lawn, large paved areas, filling and clearing "brush" in the floodplain and residential plantings that require irrigation have always been symbolic of a quality, high class community. Rare plants from Asia and Europe have also become signs of a prestigious landscape, while often they require intensive chemical maintenance that native plants can live without.

The concept of "Beauty" should extend to the native landscape, the subtle colors of a warm season grass or wildflower meadow, the mature upland forest in winter or summer and the fall color of a wetland corridor all have their special visual quality. The interests of the outdoor athlete, avid gardener, or plant collector can co-exist with an ecological approach to upland and riparian landscape management. Some of the solutions include sizing lawn areas to fit the intended uses, using garden products that are not toxic and purchasing native plants that will not "escape" and become invasive.

A recently built innovative wetland garden on the Temple Ambler Campus is a valuable example of how creative handling of roof and site stormwater runoff can be incorporated into a residential-scale landscape. Bio-filtration, groundwater recharge, wildlife habitat and visual enjoyment are all accomplished in this unique project which is open to the public. A plan drawing is shown on the facing page, IX-2.

A formal native plant display garden is also open to visitors. It demonstrates the versatility of our native flora.

We hope that this conservation plan will be the first step in developing an energetic, cooperative program to restore the Watershed to a state of improved health so that the future visual, economic and environmental quality will lead to greater enjoyment and well-being for the Wissahickon Watershed communities, and for the many that visit this unique resource.

I. INTRODUCTION

VALLEY GREEEN INN ON FORBIDDEN DRIVE FAIRMOUNT PARK, PHILADELPHIA

I. INTRODUCTION

A. The Wissahickon Creek Conservation Plan Goals

The River Conservation Plan program is a statewide planning initiative developed and funded by the Pennsylvania Department of Conservation and Natural Resources. A grant from the William Penn Foundation provided equal support for the Conservation Plan.

The Montgomery County Planning Commission shares the project sponsorship with the Fairmount Park Commission which provided overall project coordination.

The goals of the Conservation Plan are as follows:

- Identify unique natural and cultural resources and the existing environmental problems which degrade and disrupt the natural stability of the stream corridors and watershed land.
- Recommend prototypical preservation and restoration solutions including education, water quality initiatives, restoration and management techniques.
- Develop a prioritized list, costs and location maps of recommended projects for funding by state and federal programs and local organizations at the subwatershed and overall watershed scale.
- Recommend the adoption of stronger, more performance-based ordinances and regulations throughout the watershed.
- Recommend alternative appropriate management or organizational structures to assure a coordinated, ongoing action-oriented restoration effort.
- Improve public awareness of watershed stewardship issues and elicit community support.

B. The Wissahickon Watershed

The Wissahickon Creek, which originates in a parking lot for a commercial development in Montgomery Township, flows southeasterly through a 21 mile-long corridor, then tumbles into the Schuylkill River near the end of Lincoln Drive. Four distinct geological zones, each with uniquely different landform, soils, vegetation and bedrock characteristics make up this 64 square mile basin. Thirty-one sub-watersheds occupy portions of the ten Townships, three Boroughs and the City of Philadelphia, which share the watershed.

The Wissahickon watershed faces ever-increasing challenges to the re-establishment of a healthy, beautiful and productive environment for human and wildlife habitation. These conditions are the result of excessive development, causing severe erosion, water pollution, soil compaction and sedimentation. Invasive plants, reduction of habitat and overpopulation of wildlife species are also major contributors.

Now predominantly "built-out" and developed as residential, institutional, commercial, transportation or recreational land uses, the municipalities in the watershed face the realization that to repair the damage inflicted by human activity over many decades will require establishing ongoing, energetic educational programs, physical restoration, planning and management. It will also require a strong sense of teamwork by adjacent municipalities which share the watershed.

Because most of the watershed is now in single family residential ownership, it will be necessary to inspire the participation of the watershed residents in the efforts to re-establish vegetated riparian buffers and the removal of constricting, damaging walls along the sub-watershed stream corridors. Serious incentives must be developed to elicit support for these programs.

The overall intent of this planning effort is to provide a guide for establishing a comprehensive program, rather than attempting to produce definitive design or engineering recommendations for site-specific problems. The completion and approval of this conservation plan will officially permit the application for federal, state and local grants specifically for watershed projects.

C. Sponsoring / Participating Organizations

The Wissahickon watershed has valuable human resources, as well as unique natural and historical attributes. Within the City of Philadelphia, the Fairmount Park Commission is custodian of the 1400 acre Wissahickon Valley Park, which is a major regional recreational attraction for nature lovers, equestrians, hikers, runners and bikers. The park staff includes administrative, technical and professional expertise. The Friends of the Wissahickon and the Wissahickon Restoration Volunteers are private organizations that are very active in the restoration and reforestation of the Fairmount Park portion of the watershed.

In the Montgomery County portion of the watershed, the Wissahickon Valley Watershed Association has assembled considerable land bordering the main Wissahickon Creek corridor, and retains ownership and management responsibility on 285 acres and several miles of trails.

For all four of the Wissahickon related organizations mentioned above, public educational programs are an important part of their present mission.

The Montgomery County Planning Commission and the Fairmount Park Commission, co-sponsors for this planning project, have a long involvement in open space planning in the watershed.

Funding for this study has been provided by the Department of Conservation and Natural Resources and the William Penn Foundation.

D. The Planning Team

The planning team for the Wissahickon Watershed Conservation Plan is led by:

The Delta Group, Environmental Planning and Design;

Project Director -	John F. Collins, FASLA
Project Manager -	Tom Schraudenbach, RLA
Project Assistant -	Joseph M. McDonnell

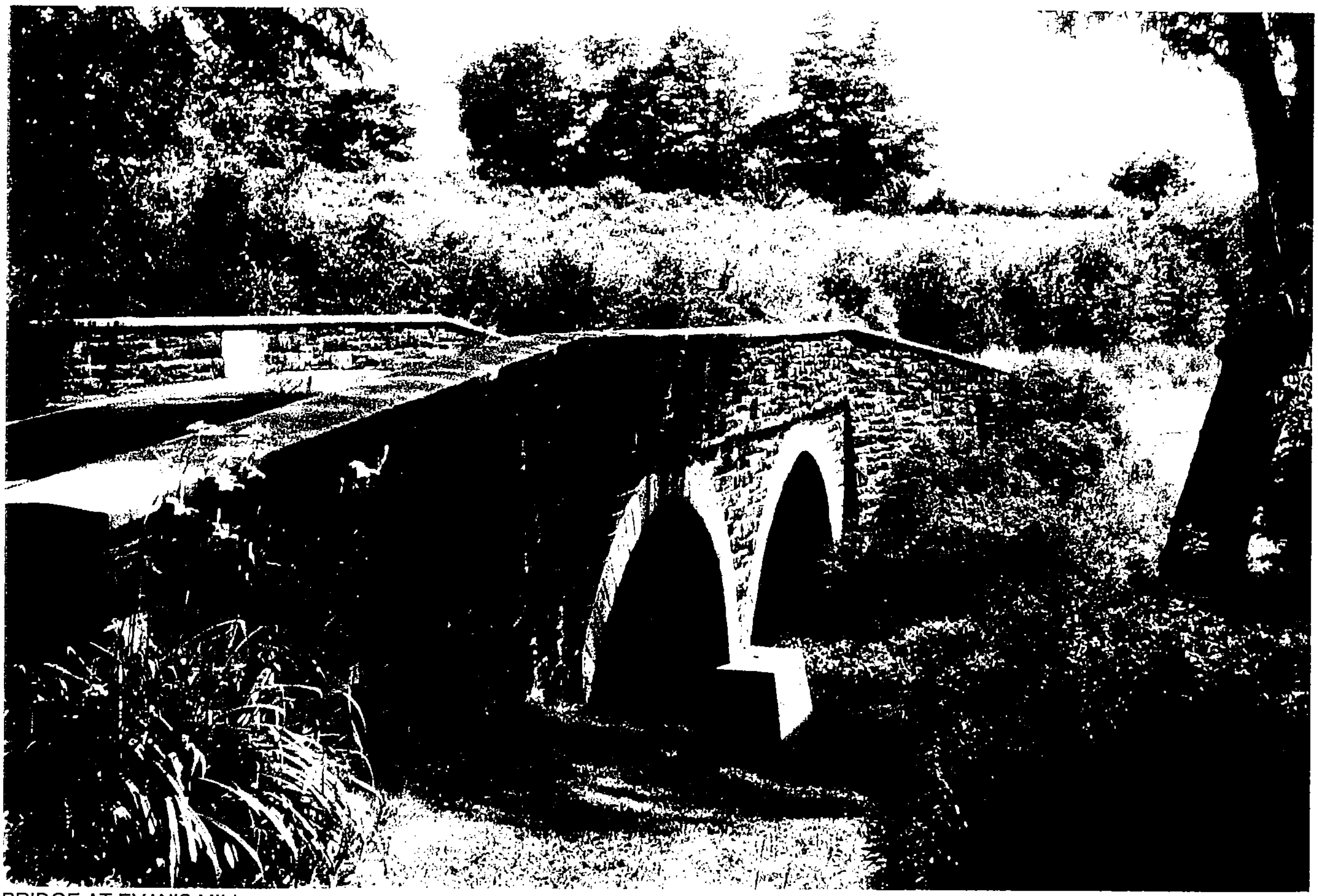
Sub-consultants:

Charlie Miller, P.E. -	Environmental Engineer
S. Edgar David RLA -	Landscape Architect and Environmental Planner; Associate Professor of Landscape Architecture
Steve Hammell -	Environmental Planner
Patricia Ann Quigley -	Ecologist/Wetland Biologist

Temple University Department of Landscape Architecture and Horticulture student interns were members of the team as project assistants, between 1997 and 1998.

Kate Prendergast -	Project Assistant
Joseph M. McDonnell -	Project Assistant

All the team members have lived in or worked in the Wissahickon Watershed.



BRIDGE AT EVAN'S MILL UPPER GWYNEDD TOWNSHIP

E. Municipalities Description

The fourteen municipalities in the watershed are a unique group of forward-looking municipalities with a wealth of natural and cultural resources. A brief description follows, starting in the northwestern corner of the watershed where the creek begins.

1. Montgomery Township

The Wissahickon Creek originates in Montgomery Township in the parking lot of the Montgomeryville Mall Shopping Center.

Flooding is not considered a problem as the township is well above all adjacent watershed land. Domestic water is served by the north Wales Water Company.

Open space and protected areas include the Montgomery Natural Area, Applewood Park and a proposed trail to connect open space within the Wissahickon and Neshaminy Creek Watersheds.

Current development plans include a strip mall and supermarket. There is also a proposal to develop the Knapp Farm, known as the Knapp Farm Village Plan.

The Township has an Environmental Advisory Committee, a Shade Tree Commission and a Park Board.

2. Lansdale Borough

Lansdale Borough, a 2.5 square mile compact village, served by SEPTA rail, is located at the western edge of the Wissahickon Watershed, just south of the headwaters. Due to its urban character it has a very large percentage of impervious cover.

There are no tributaries at this upper point and no flooding problems for the same reason. The borough is served by its own municipal water system.

There continues to be pressure from high-density development proponents both on new open space sites and on infill properties in the older neighborhoods.

Intensive Commercial development is continuing on the eastern approach to Lansdale along Route 63 in Upper Gwynedd.

The primary open space, Memorial Park on Main Street (Route 63), has a handsome, mature oak grove and a well developed athletic field.

The construction of wood and masonry walls along the banks of the Wissahickon Creek in residential areas has become almost a tradition in Lansdale. This practice has created an increase in erosion, sedimentation and destruction of the natural self-protective vegetation. These areas should be restored, to a more environmentally stable condition, with appropriate incentives for cooperative residents.

3. North Wales Borough

North Wales Borough, a highly attractive, small-scale village, is completely surrounded by Upper Gwynedd Township, and is located southeast of Lansdale Borough. North Wales was founded in 1704 and incorporated in 1869. The Borough is 1 mile by .6 mile. The normal strip commercial approaches to the center of the Village found in many communities has been largely avoided, due to Upper Gwynedd Township ordinances which provide considerable protection from sprawl of this type.

The intersection of North Wales Road and Sumneytown Pike, diagonally bisected by the SEPTA Lansdale / Doylestown tracks influenced the pattern of the borough street geometry. The railroad was built in 1857, linking North Wales to Philadelphia. A large Upper Gwynedd park is situated adjacent to the borough on the southwest, while within North Wales Borough Weingartner Park is a very beautiful centrally located public open space.

There are no major storm water / flooding problems with the exception of an unmanageable stormwater basin at the northern end of the borough at 9th street, which receives runoff from Upper Gwynedd. This is an example of how Municipalities must work together across property lines to solve problems in the Watershed. The community is very interested in restoring this area as a functioning wetland habitat.

A major recent streetscape improvement program has been implemented on Main Street. The Borough intends to continue this program to complete the entire Main Street area.

The Borough of North Wales has a Historical Commission and a Shade Tree Commission, which help to maintain the very high quality public environment in which the community takes great pride.

4. **Upper Gwynedd Township**

Gwynedd was settled in 1698 by mostly Welsh Quaker immigrants. By the time of the Revolution about half the population was German. The Township was predominantly farmland until the mid-1800's when the railroad made the area more accessible to Philadelphia. The original Gwynedd Township was divided into Upper and Lower Gwynedd in 1891.

Upper Gwynedd Township is located in the eastern part of the North Penn area, about 25 miles from central Philadelphia. It is accessible to the region over a road network, which includes Routes 202 and 309. The trend of sub-urbanization is evident in Upper Gwynedd especially with growth in its industry and population. This growth stems from the regional influences of the Philadelphia metropolitan area as well as from surrounding southeastern Pennsylvania counties. Physical features must be considered in guiding the growth of Upper Gwynedd, which is still largely undeveloped. About two-thirds of the Township lies in the major drainage basin of the Wissahickon Creek. Upper Gwynedd is mainly a residential community, but has a strong industrial and commercial economic base. Major industries and businesses include Merck, Precision Tube, Deltron, Rich Foods, Colorcon, Teleflex, Jefferson-Smirfit Corporation, Container Corporation, Safeguard and Lehigh Valley Dairies. Also there are numerous small industrial businesses and the Weiss strip shopping center, a Genuardi's shopping center and other small retail businesses. The Township has developed a very successful park / playground / Township Building Complex, and is actively involved in open space acquisition.

5. **Lower Gwynedd Township**

Lower Gwynedd Township is almost all within the Wissahickon watershed. The northeast corner is the only area beyond the watershed boundaries. Trewellyn Creek, Willow Run, and Pennlyn Creek are the tributaries.

Flooding is not a major issue in residential areas, however in Pennlyn Woods and Cedar Brook Country Club flooding occurs but without damaging results. Public water is supplied by the Ambler Water Authority.

Major Open Space / protected areas include the Pennlyn Woods, The Natural Lands Trust site, the Wissahickon Valley Watershed Association land and the Driscoll properties.

The most recent large-scale commercial development is a shopping center on the Jackson Parcel.

The township has an open space plan and stormwater management ordinance in addition to zoning and subdivision ordinances. A park and recreation Board oversees the parks and open space program.

Rohm and Haas Company, McNeil Consumer Products and Moore Products are some of the major corporations within the Township. Considerable employee interest in environmental programs to improve habitat quality on their properties is very encouraging.

6. **Horsham Township**

The amount of land that Horsham Township has in the Wissahickon watershed is only a few acres, however they are almost completely covered by impervious parking lots and the roof areas of shopping centers. This complex is located at the northeastern quadrant of the Routes 309 and 63 intersection.

The 19.2 square mile Township has 5 golf courses, the Willow Grove Naval Air Station and Graeme State Park. The Pennypack Creek, which originates in Maple Glen, flows northeasterly into Hatboro Borough, east of the Township Line.

South of the original Horsham Village on the eastern edge of the township, the Prudential Business Campus has become an important employment center of regional significance.

Like Montgomery Township, an agricultural district still exists, although it is under strong developmental pressure.

7. **Whitpain Township**

The Wissahickon Creek crosses the extreme northeastern corner of Whitpain Township where Lower Gwynedd, Ambler Borough, Upper Dublin and Whitemarsh Township join.

The Prophecy Creek and Willow Run are the tributaries that traverse the Township.

Major protected open space includes the Armound Trout tract, Cedar Brook Country Club, Meadowland Country Club and Wings Field. The Future of Wings Field is of concern to the Township.

Historic sites include Dowsfield Estate, Mather Mill and the Blue Bell Inn. The character of Morris Road west of Butler Pike, where it follows the Wissahickon Creek through a beautiful woodland, is a most impressive scenic drive.

Major residential development has taken place on the former Normandy Farm site. The Montgomery County Community College is one of the large institutions in the Township.

The Township has a Shade Tree Commission, a proactive Water Quality Act and a completed open space plan.

The township is served by the Ambler Water Company and by ground water wells.

8. **Upper Dublin Township**

Upper Dublin, one of the largest municipalities in the study area, is also about 90% within the boundaries of the Wissahickon watershed. Rose Valley Creek, Tannery Run, Rapp Run, Pine Run, Little Pine Run and Sandy Run are all sub watersheds of the Wissahickon Creek that traverse Upper Dublin Township.

Flooding has been a problem at the historical Dannenberg Estate, the Turnpike interchange at Fort Washington and the Dresher Triangle.

Major open spaces or protected areas include Mundock Commons, Robbins Park, Manufacturer Country Club, Lu Lu Country Club and the Temple University Ambler Campus.

Historical sites include the Colgate Building, the Schumacher Farm, now on the Temple Ambler Campus, and the Dannenberg property.

The township is substantially built-out, with almost all agricultural land developed in residential subdivisions.

There are a Shade Tree Commission and an Environmental Commission in the Township. A new comprehensive plan is underway.

9. **Ambler Borough**

The borough is situated on the Wissahickon Creek on the southern boundary. This relationship is beneficial to a strong "gateway" entrance into the borough via Butler Pike. The direct transition from a wooded, stream corridor environment to the downtown area prevents most of the typical strip commercial zone so common in suburbia.

Ambler has developed a series of channelized stream corridors, facilitating the rapid exit of storm water. This keeps the borough "dry" while increasing downstream flooding, erosion and turbidity. As a highly urbanized community, runoff from streets, parking lots and roofs is discharged directly into the Wissahickon Creek

The Borough is 99.9% developed, according to the Borough manager. The intent is to acquire more open space, within the .01% remaining undeveloped.

Knight Park is the primary Borough Park. Attempts to implement nature trails near homes have been met with resident resistance, fearing burglar access.

Historic sites include the Joseph Ambler Inn and the Mary Ambler house.

The PLANT AMBLER program, a volunteer streetscape improvement group, has made a strong contribution to the downtown environment.

10. **Whitemarsh Township**

Whitemarsh Township was the scene of major involvement in the American Revolution that included the fortified encampment of Washington's forces on the ridge of Militia Hill, General Lafayette's involvement and the March to Valley Forge.

The tributaries of the Wissahickon include Spring Run, Pheasant Run, Needle Run, Sandy Run and Sunny Brook Creek. Flooding is an important issue for residential and commercial development, along Sandy Run, Bethlehem pike near Route 73 and West Valley Green Road. Flooding takes place on the Philadelphia Cricket Club, Whitemarsh Valley County Club and the Morris Arboretum without serious problems.

The largest public open space is the 891-acre Fort Washington State Park. Miles Park and Cedar Grove Park are heavily used Township parks. Several golf courses, cemeteries, and Green Ribbon Preserve trails provide additional open land. The Dixon Estate is an important, highly scenic privately-owned, but publicly enjoyed landscape, which adjoins several other noteworthy sites.

There is strong pressure to develop the little remaining open land, which the township must deal with constantly.

A very high deer population exists, especially on the former Andorra Nursery land. During one recent year over 200 were killed by automobiles.

11. **Springfield Township**

Springfield Township has the most complex shape in the entire watershed. A "pan handle" extension of 3.5 miles, just five hundred yards wide, extends from the Stenton Avenue township boundary south almost to the Schuylkill River. This narrow strip is bounded on the west by Whitemarsh Township and on the east by Philadelphia. The Wissahickon traverses Springfield Township at Chestnut Hill College.

Sandy Run, Sunny Brook Creek, Oreland Mill Run, Enfield Run and Paper Mill Run are the tributaries that drain the Township.

Flooding is considered a major problem in several residential areas. A portion of The Paper Mill Run has been developed as a restoration demonstration project for a length of 900 feet through the Morris Arboretum property. Cleaning culverts is considered is considered an enormous problem for the township, as silt and sand deposited by runoff is a constant problem.

Open space, public and private, include Cisco Park, Mermaid Park, Oreland Quarry, The Morris Arboretum and three Country Clubs.

One unique feature of the stormwater regulations requires provision of stormwater management for all new impervious projects over 200 square feet in area.

The Bethlehem Pike corridor contains many historical sites within the township.

12. **Abington Township**

This 16 square mile township is bordered by Philadelphia, Cheltenham, Upper Dublin, and Upper and Lower Moreland Townships. Abington Township is one of the most historically and visually important municipalities in the watershed. During the American Revolutionary War, the battle of Edge Hill took place in the northeastern corner of the Sandy Run subwatershed. The former Brackin and Thomas properties and the ten-acre forest sanctuary on Edge Hill are important historical sites.

Water quality in the Wissahickon Creek is degraded by typical pollutants found in highly urbanized areas. A very serious storm water flooding condition led to two fatalities in September 1996. Severe channelization of drainage corridors throughout the urbanized Sandy Run subwatershed has contributed to the flooding problems. A River Conservation Plan for the Sandy Run has been completed. Recommendations for remedial work on the creek are being evaluated. The Abington township wastewater treatment plant discharges into the Pennypack Watershed.

The Township has an active Shade Tree Commission and Environmental Council. The Old York Road Historical Society is also an important contributor to the cultural life of the community. A trail system was recommended by a recently completed Open Space Plan. Phase I has been funded and awaits approval by the Township.

13. **Cheltenham Township**

Only a very small portion of western Cheltenham Township falls within the watershed, one of the highest points of the drainage basin, therefore no flooding or severe erosion or other water-related problems exist here.

The Township has exceptionally high-quality neighborhoods, many with a rural, woodsy atmosphere.

Quarrying has been an active enterprise for many years. The Marcolina Quarry has produced Mica Gneiss Schist (Chestnut Hill Stone) for countless projects. The Manero Limestone Quarry on Willow Grove Avenue produces limestone. These are both slightly east of the Wissahickon Watershed boundary.

A large-scale leaf-composting program provides mulch, soil amendment and wood chips for the township residents.

14. **Philadelphia**

The major tributary sub-watersheds within the city of Philadelphia are Bells Mill, Wises Mill, Gorgas Creek, Monoshone Run, Carperters Woods, Cresheim Creek and Chestnut Hill.

The Philadelphia Wissahickon Watershed is the recipient of the runoff, erosion and pollution problems generated by the thirteen upstream neighboring municipalities. Severe damage is on-going, because the unique natural landscape in the Fairmount Park portion of the watershed includes very steep topography combined with an intensive storm water piping system serving the high density neighborhoods surrounding the park. Philadelphia also has a deep interest in maintaining or improving water quality, as water is withdrawn from the Schuylkill River only a few hundred yards from the mouth of the Wissahickon.

The watershed area is extremely rich in historical / cultural resources. There is not the space or intent to examine them in detail in this report.

Major issues concern conflicting recreational uses of the park, wildlife, forest regeneration problems and restoration efforts. The Wissahickon Valley Watershed Association, The Friends of the Wissahickon and Wissahickon Restoration Volunteers provide high quality community support.

GERMANTOWN AVENUE IN CHESTNUT HILL

F. Problems / Opportunities

1. Problems

At public meetings, the planning team is often asked to describe the general environmental health of the Wissahickon Watershed. To the casual viewer, the creek looks reasonably good. A closer look, however, reveals that there are serious "health" problems, which if not treated, will lead to more serious ecological breakdown and irreparable damage to the health of the entire watershed.

All the major building blocks of the natural landscape: geology, soils, plants, water and landform are under siege in the Wissahickon basin. The inhabitants of the watershed, the people and wildlife, are also contributing to ecological imbalance with nature.

a. The continuous, unrelenting erosion and undercutting of stream banks is caused by excessive rate and volume of stormwater runoff. This problem is accelerated by the vast amounts of impervious roof, road and parking surfaces, the results of years of suburban sprawl development. Most of the watershed was developed prior to implementation of stormwater regulations, now requiring more difficult retrofit solutions.

b. Disease, a warming climate, insect infestation and harmful invasive plant species are attacking the native forests of the watershed. The woodlands of the area can no longer reproduce because of soil compaction, aggressive invasive plants, wildlife predation and the lack of viable seed sources. The American love affair with the lush green lawn is also a contributor to the excess runoff, lack of forest regeneration and water quality problems. Over-browsing by deer, other mammals and insects has almost completely destroyed the understory and herbaceous layer in the forested portion of the park. The reproduction of hardwood seedlings is virtually non-existent. Additional research and testing of alternative wildlife and vegetation management techniques should be a high priority.

c. Water pollution, both point and non-point, systematically poison the waters of the subwatershed streams and main Wissahickon Creek. Runoff from roads and parking carries hot water, deicing salts, heavy metals and oils into the stream system. The 12 sewage treatment plants all discharge treated effluent into the creek, degrading the aquatic habitat considerably. The decline in natural base flow in the streams, also caused by the excessive rate of runoff, has created a situation whereby the effluent discharged by treatment plants makes up most of the water flowing in the creek.

d. Human over-use of the trails and forests of the Fairmount Park portion of the Wissahickon has created severe compaction and excess runoff conditions. Conflicts between incompatible user groups, for example, hikers and mountain bikers, have degraded the quality of recreation in this great natural landscape.

e. Existing stormwater ordinances and development regulations do not adequately protect or require restoration of the floodplain. The focus on 100 year storm events while ignoring the more damaging 2 or 5 year storms, is one of the real drawbacks of the existing municipal ordinances.

f. Destruction or loss of the riparian buffers, the wooded or heavily vegetated zone on both sides of a stream, is also a serious problem. The healthy buffer holds the soil/streambank in place and provides filtering of polluted runoff while providing wildlife habitat and movement corridors.

2. Opportunities

This planning effort offers several unique opportunities for watershed restoration:

a. *An Action Plan* - The outcome is targeted to begin a ten year comprehensive program to restore the Wissahickon Watershed to its full potential.

b. *Outside Funding* - Both State and Federal assistance is anticipated to fund these efforts upon completion and registry of the plan.

c. *Teamwork* - This is the first planning program that has included participation of all the municipalities involved. Indications to date are that there is a high degree of willingness to join in efforts to accomplish these objectives. The formation of the Wissahickon Partnership is evidence of the strong local municipal and corporate interest and concern.

d. *Sub-Watershed Approach* - As recommended by the Center for Watershed Protection in Silver Springs, Maryland, we have chosen to develop detailed analysis and recommendations at the sub-watershed scale. Three representative sub-watersheds have been chosen to facilitate the process of identifying problems and opportunities and potential projects for implementation. They are: A. The Headwaters of the Wissahickon (high density neighborhood, large scale impervious surfaces) B. The Trewellyn Creek (rural, relatively open, low density) C. Cresheim Creek (high density, urban neighborhoods and trail linkage potential). If plans for 3 sub-watersheds were developed and implemented each year, the remaining 28 would take approximately 9 years.

It is appropriate that we address the sub-watersheds as they are the most susceptible to continued environmental degradation. The main creek is, as has been noted, primarily in public ownership, therefore is somewhat more protected. The unprotected sub-watersheds continue to generate excessive runoff, which causes significant damage to both the sub-watershed creeks and to the main creek corridor below.

It is hoped that someday, signs of a restored watershed environment will be the presence of heavily vegetated streambanks, native trout, abundant amphibians, reptiles, crawfish, healthy young hardwood forests, return of the American chestnut, extensive meadows, reforested land, clean, poison and silt-free water, increased perennial stream base-flow, neighborhoods with numerous rainbarrels and the absence of trash and vandalism. These conditions will be fostered by an educated, involved local community. These goals can be realized if the development of an energetic, positive and well-coordinated restoration and management program is launched and maintained over the next decade.

VOLUNTEERS REFOREST A PORTION OF THE ROHM AND HAAS CAMPUS LOWER GWYNEDD TOWNSHIP

WILDFLOWER MEADOW AND YOUNG FOREST ON THE SAME SITE TWO YEARS LATER LOWER GWYNEDD TOWNSHIP

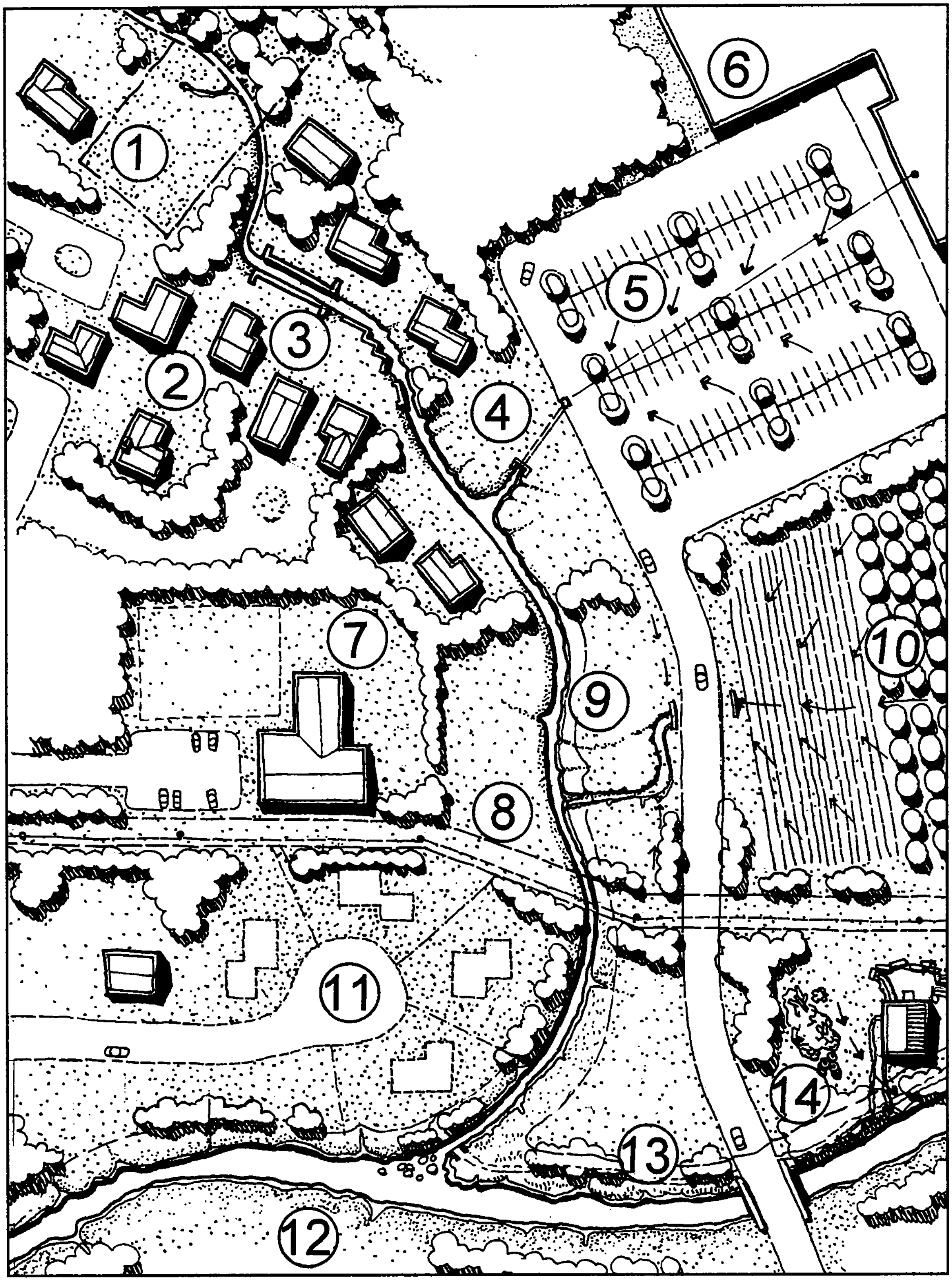
3. **Definitions of Best Management Practice Terms:**

The following short definitions are offered to aid in understanding these concepts.

- A *BMP* is a technique developed to reduce environmental degradation, to restore a natural stream, pond or wetland emphasizing the use of biological solutions rather than structural ones.
- *Stormwater Recharge* is the term for percolation of storm water into the soil and into the subsurface to provide water storage capacity for increasing base flow of streams and use by humans.
- *Erosion* is the process of removing soil particles from streambanks, farm fields and other "erosion prone" soils. Water or wind can both be the "carriers". Loss of agricultural topsoil and streambanks are very serious national problems.
- *Siltation* is the process of depositing soil material, which is carried downstream by water and is generally the very fine soil particles called silt. Silt blocks culverts, streams, fills in marshes and slow moving river/stream corridors.
- *Riparian Buffer* is a strip of land on both sides of a stream or river. It is beneficial if this strip is heavily vegetated, as it will provide protection of the stream from erosion and bank undercutting. Generally, all or part of the buffer area is in the flood plain.
- *Bio-engineering* is a term for using parts of living plant stems or branches, as bundles (fascines), stakes or cuttings which are planted in a streambank to take root and reinforce the bank. Plants such as black willow, red stem dogwood, elderberry and a few other native species are all wetland plants, which form roots very easily.
- *Bio-retention* is a technique of holding stormwater runoff in a basin or storage container so that it is able to percolate into the soil, cleansed by passing through an area planted with plants especially adapted to removing pollutants.
- *Impervious Surfaces* are harmful in that they prevent stormwater from penetrating into the ground. "Impervious" means not porous. Using pervious or porous paving is a relatively new idea, allowing water to penetrate, reducing the amount and rate of runoff.
- *Reach* is an identifiable, relatively straight section of a stream or river.

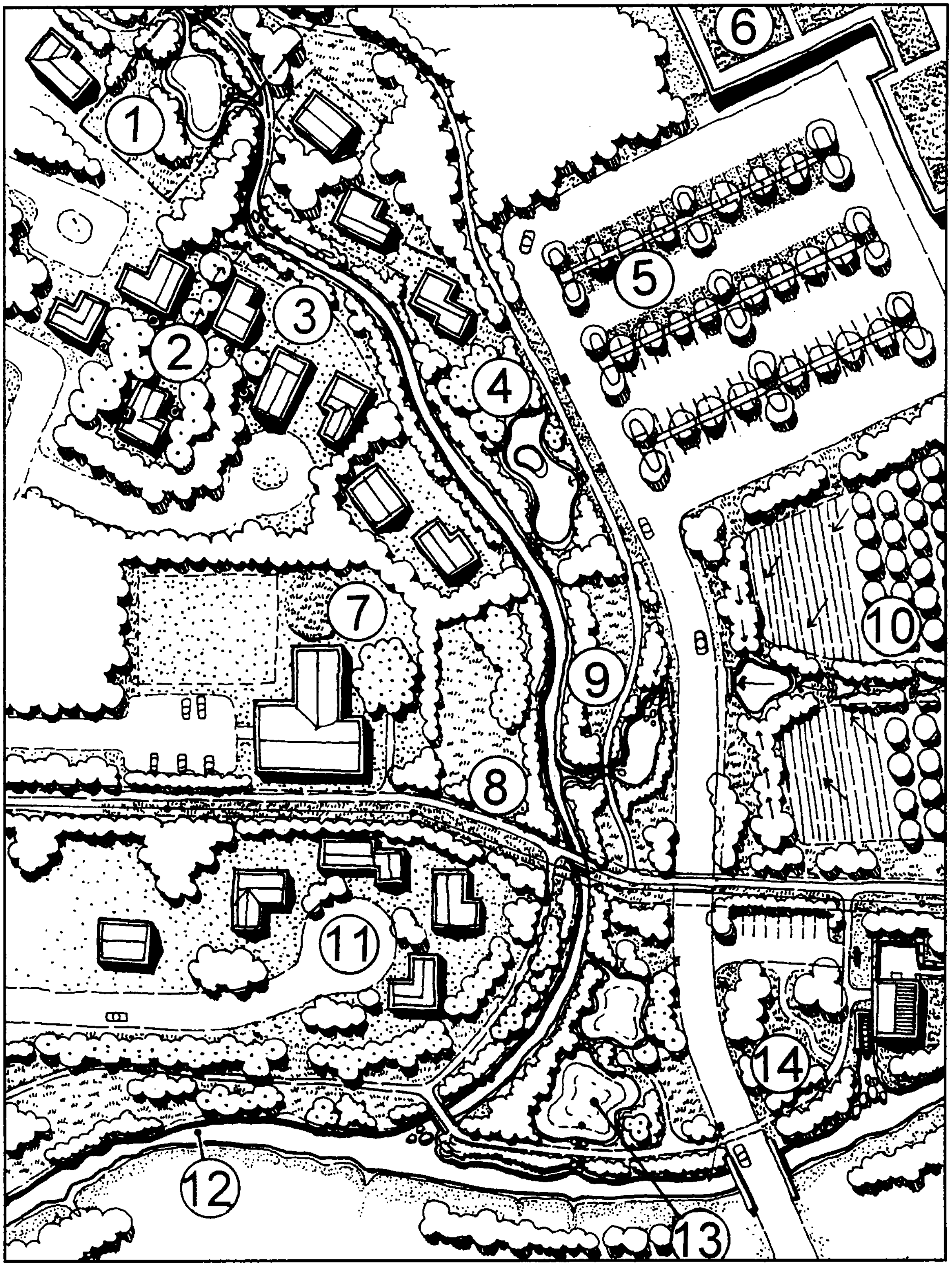
4. **Typical Problems / Opportunities Plan Diagrams**

The plan diagram on the following pages identify 14 problems or opportunities in a fictitious subwatershed area. The next two pages show plan diagrams of the same locale, with the appropriate Best Management Practices (BMPs) in place. It is hoped that these graphic descriptions will aid the reader in understanding the new language of BMPs, bio-engineering, bio-retention, stormwater recharge, erosion, siltation, riparian buffers and impervious surfaces.



BEFORE
Subwatershed Problems and Opportunities Identified

1. Unprotected Natural Spring
2. Intense Development - High Volume Runoff
3. Built Channel Increases Damage
4. Discharge from Pipe Increases Erosion
5. Extensive Impervious Paving
6. Large Roofed Area
7. Excessive Lawn Area
8. Existing Powerline Trail Opportunity
9. Culvert Increases Velocity of Runoff
10. Agriculture Causes Serious Pollution
11. Planned Subdivision will Prevent Buffer
12. Main Creek Channel Receives Damage
13. Public Open Space Unused
14. Historic Site in Poor Condition



AFTER
Acquisition, Restoration, Stormwater Management, Education & Watershed Management Projects

1. Off-line Spring - Fed Wetland on Acquired Site
2. Upland"Canopy" Landscape Improvements
3. Restore Streambank to "Natural" Condition
4. Detention Wetland in Restored Buffer
5. Bioretention Retro Landscape Improvements
6. Vegetated Roof Cover
7. On-site Education Projects at School
8. Trail and Meadow Development
9. In-line Riparian Buffer Wetland
10. Vegetated Swale and Check Dams
11. Resource - Based Cluster Retains Buffer
12. Main Creek Buffer Improved
13. Educational / Wildlife Habitat Wetland
14. Restore Historic Site

G. Community Involvement

13 of the 14 municipalities have been interviewed to determine their perception of resources, problems, opportunities, unique local open spaces, history and existing ordinances/regulations, open space and comprehensive plans if available.

A Steering Committee was formed with representatives from all municipalities, the Fairmount Park Commission, the Montgomery County Planning Commission, the Friends of the Wissahickon, the Wissahickon Valley Watershed Association and the Wissahickon Restoration Volunteers, D.E.P., D.C.N.R., the Philadelphia Water Department and the Philadelphia Planning Commission.

Public watershed-wide workshop meetings were held on four occasions to discuss issues, findings and recommendations. These meetings were held at Lower Gwynedd, Upper Dublin and Whitemarsh Townships, the Wissahickon Watershed Association and the Temple University Ambler Campus. In addition to formal workshops and steering committee meetings, several presentations were made to interested groups such as the Friends of the Wissahickon in Chestnut Hill and the Wissahickon Partners group meeting in Philadelphia.

DAY	MONTH	YEAR	MEETING TYPE	LOCATION
27th	August	1997	DEP Meeting	DEP Offices
13th	January	1998	Steering Committee	Ambler Campus
5th	March	1998	First Public	Upper Dublin Township
20th	October	1998	Steering Committee	Wissahickon Valley Watershed Association
5th	January	1999	Friends of Wissahickon	Springside School
12th	January	1999	Second Public	Lower Gwynedd Township
27th	April	1999	Steering Committee	Wissahickon Valley Watershed Association
12th	May	1999	Third Public	Whitemarsh Township
15th	June	1999	DEP / Partnership	Philadelphia Free Library
22nd	July	1999	Public Hearing	Wissahickon Valley Watershed Association

H. Concurrent Planning and Restoration Efforts

During the duration of the 2 year planning period, several other planning, design and restoration projects were in progress in the Wissahickon Watershed.

- *TMDL Study (Total Maximum Daily Load)* - The Wissahickon Creek watershed was one of two Pennsylvania watersheds on the Federal 303(d) list that was selected for a pilot study of the Environmental Monitoring and Management System. The three-year study is being conducted by the National Institute for Environmental Renewal (NIER), in conjunction with Pennsylvania Department of Environmental Protection (PADEP). The scope for the study involves an intensive mapping and monitoring program, coupled with detailed modeling of stream hydrology and water quality characteristics. Funding is provided by a grant from USEPA for developing total maximum daily loads (TMDLs). The Wissahickon Watershed Partnership was originally formed to provide stakeholder input to this process.

  The TMDL study has proceeded concurrently with the development of the Wissahickon Creek River Conservation Plan. The Plan alludes to and cites the on-going work of the TMDL study. However, the final report on this study will not be available until the year 2000. To avoid duplication of effort, the Plan has not focused on detailed attribute mapping, or on the technical aspects of stream assessment, water quality monitoring, or pollutant abatement.

- *Fairmount Park Natural Lands Restoration Program* - In 1998, the William Penn Foundation gave a grant of 26 million dollars to the Fairmount Park Commission for planning, educational programs and facilities and physical restoration/habitat enhancement work in the "natural" areas of the park. The Wissahickon Park will receive a substantial portion of this gift. Park staff is enrolled in special restoration/preservation programs in preparation for implementation.

- *Paper Mill Run Restoration Plan* - A separate study was prepared to develop a state- of-the-art restoration program for the Paper Mill Run Sub-Watershed in Wyndmore and Flourtown in Springfield Township. The Morris Arboretum has completed a reconstruction/restoration of a 900 lineal foot portion of the Paper Mill Run which flows through the Arboretum between Germantown and Stenton Avenues.

- *Wissahickon Creek Fort Washington State Park Trail Plan* - A proposal to develop an extension of the Philadelphia Wissahickon Park trail into Springfield and Whitemarsh Townships is underway. It would link via a bikeway/trail to Fort Washington State Park.

- *Sandy Run Sub-Watershed Plan* - Because of severe flooding in recent years which was the cause of two fatalities, a separate storm water management/ conservation plan was initiated by the Montgomery County Planning Commission for Sandy Run sub-watershed, the largest in the Wissahickon Watershed.

Over the past 25 years, several planning studies have been developed for the Fairmount Park portion of the watershed as well as numerous individual plans for Townships and Boroughs. Recently, several of the Montgomery County municipalities have prepared open space plans as part of the $100 million dollar Montgomery County Open Space Program. We have made an attempt to use this existing data wherever possible rather than to generate original natural and cultural resource inventory data and mapping which were beyond the resources of this study.

I. The Planning Process

The process used in this plan begins with an inventory of existing data from each municipality, aerial photography obtained from the Delaware Valley Regional Planning Commission, publications and plans from the Montgomery County and Philadelphia Planning Commissions, United States Coast and Geodetic Survey mapping, field reconnaissance, photography and discussions with all municipalities.

After completion of the inventory phase, a comprehensive base map was developed for the entire watershed and detailed land use and topography mapping was prepared for the three selected sub-watersheds for detailed on-site evaluation and identification of potential restoration and storm water management projects and for public open space evaluation.

The development of a list of recommendations of watershed-wide and subwatershed projects was the result of the analysis of natural and cultural resources, on-site inspection by the planning team, public discussion and Steering Committee workshop meetings.

The draft conservation plan was prepared for review by the Steering Committee, the residents of the watershed, the Fairmount Park Commission and the Montgomery County Planning Commission.

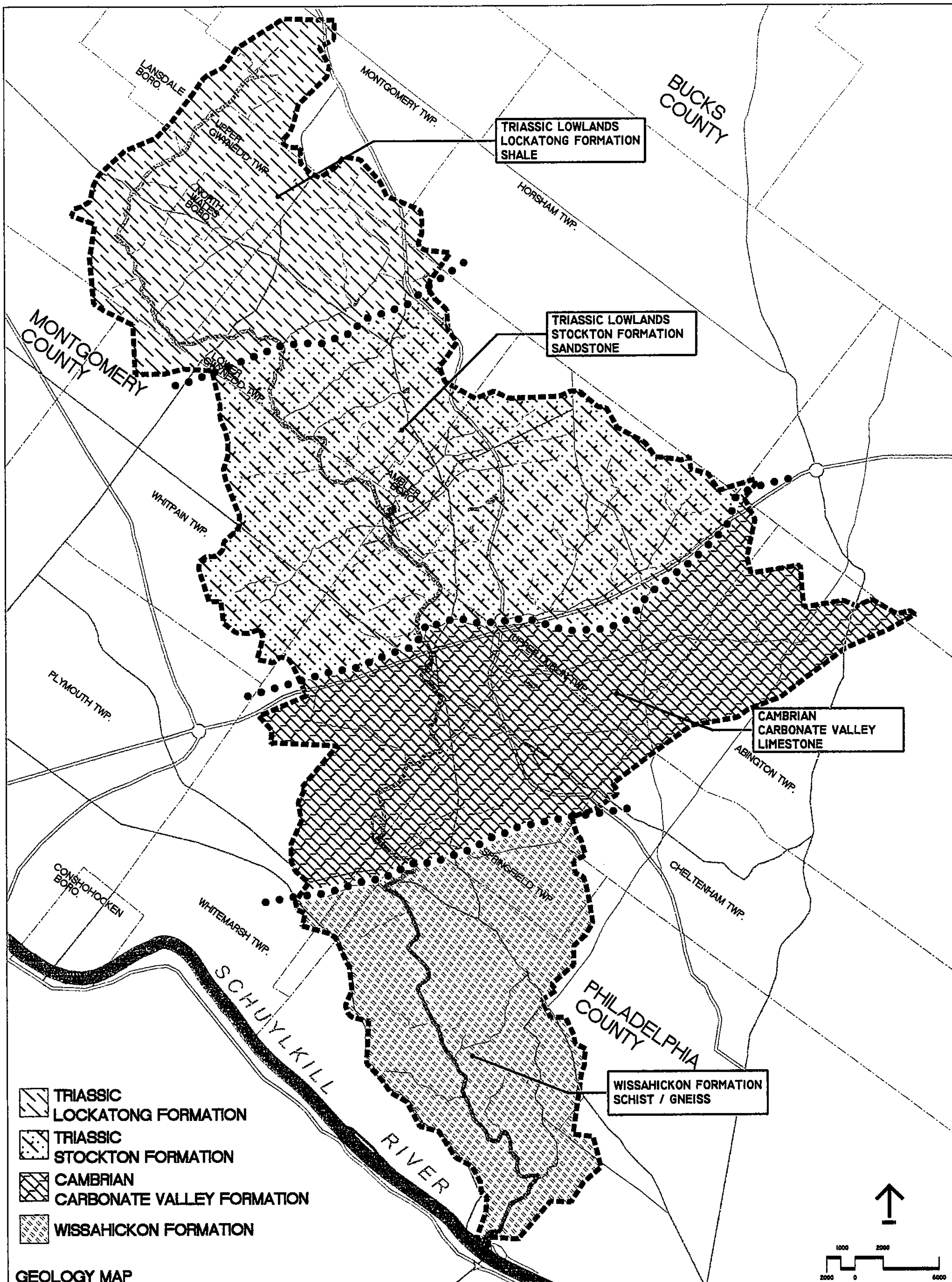
Based on review comment and discussion, the final, revised report was completed and approved by the Steering Committee including Montgomery County and Philadelphia representatives.

Once the plan is approved, it will be formally registered as an active River Conservation Plan. Application for funding can begin at this time.

Agreement concerning a strategy for administering on-going planning, project management / grant writing and coordination between municipalities should be set in place as soon as possible to assure continuity.

II. ANALYSIS

SANDY RUN SUBWATERSHED STORMWATER CHANNEL ABINGTON TOWNSHIP



GEOLOGY MAP

WISSAHICKON CREEK · RIVER CONSERVATION PLAN

FAIRMOUNT PARK COMMISSION, PHILADELPHIA, PA · MONTGOMERY COUNTY PLANNING COMMISSION · WISSAHICKON VALLEY WATERSHED ASSOCIATION · FRIENDS OF THE WISSAHICKON · WISSAHICKON RESTORATION VOLUNTEERS
PENNSYLVANIA DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

The Delta Group · C. Miller, FR · Steven Hatzmall · FAO, Inc · S. Edgar David · Temple University Department of Landscape Architecture and Horticulture

II. ANALYSIS OF NATURAL AND CULTURAL RESOURCES OF THE WISSAHICKON CREEK WATERSHED

A. Natural Factors

1. Landform, Geology and Soils

a. *Landform*

The Wissahickon Creek watershed extends across a gently rolling landscape, underlain by ancient rocks that have weathered to produce hills of generally low relief. In places, more resistant formations hold their shapes, leaving narrow ridges and steeper slopes. This surface expression of the underlying geology is called physiography and in Pennsylvania these areas of similar physiography are mapped as "provinces."

Physiographic provinces represented within the Wissahickon Creek watershed include the Triassic Lowland and Piedmont Uplands sections of the Piedmont physiographic province. The Triassic Lowland section is an uplifted plain of rolling hills formed in sedimentary rock that dips northward to northwesterly and is intruded in places by diabase, a fine-grained igneous rock (Geyer and Bolles, 1987). The Piedmont Uplands section is characterized by a series of northeast-southwest-trending uplands of rounded hills dissected by relatively narrow stream valleys (Geyer and Bolles, 1987). Highly folded and faulted metamorphic and igneous rocks of Precambrian to early Ordovician age underlie this section. As one moves downstream through the watershed and crosses the Triassic Lowland and Piedmont Uplands sections, topography changes as a reflection of differences in the underlying geology.

b. *Geologic Setting*

The following discussion is based upon a review of the geology (Berg and Dodge, 1981) of the five 7.5 minute USGS topographic quadrangles (Lansdale, PA, Ambler, PA, Frankford, PA-NJ, Norristown, PA, and Germantown, PA) that include portions of the Wissahickon Creek watershed.

- *Triassic Lowland Section*

The upper portion of the Wissahickon Creek Watershed, from its headwaters in Montgomery Township downstream to Fort Washington in Upper Dublin Township, is located in the Triassic Lowland section of the Piedmont physiographic province. Relatively narrow, alternating bands of the Triassic Brunswick Formation, "reddish-brown shale, siltstone, and mudstone, containing a few green and brown shale interbeds" (Socolow, 1980), and the Triassic Lockatong Formation, "a dark-gray to black, thick-bedded argillite containing a few zones of thin-bedded black shale" (Socolow, 1980), cross the upper part of the watershed from its headwaters as far south as Gwynedd Valley. Both formations weather to produce rolling hills of low to moderate relief with natural slopes moderately steep and stable (Chester County Planning Commission, 1973). However, the Lockatong Formation is more resistant to erosion than the Brunswick Formation and underlies broad, low ridges trending northeast to southwest such as the ridge on which sits Gwynedd Heights. In some places such as northeast of the intersection of Route 309 and Hartman Road just beyond the eastern edge of the Wissahickon Creek watershed, the Lockatong Formation has been quarried for crushed stone.

From Gwynedd Valley south to Fort Washington, a broad belt of the Triassic Stockton Formation, "a light-gray to buff, coarse-grained, arkosic sandstone that includes reddish-brown to grayish-purple sandstone, mudstone, and shale" (Socolow, 1980), crosses the watershed. The Stockton Formation weathers to produce undulating hills of low relief with moderately steep and stable natural slopes (Chester County Planning Commission, 1973). A northeast-southwest- trending dike of Triassic diabase, "dark gray, medium to coarse grained and composed of labradorite and various pyroxenes" (Socolow, 1980), crosses the watershed east of Fort Washington. This igneous rock is more resistant than the surrounding sandstone and holds up a narrow ridge.

- *Piedmont Uplands Section*

The lower portion of the Wissahickon Creek watershed from the area south of Fort Washington downstream to the confluence of the Wissahickon Creek and the Schuylkill River is located in the Piedmont Uplands section of the Piedmont physiographic province. Several different rock types underlie this portion of the watershed. However, the following discussion will be limited to those formations crossed by the creek.

The Cambrian Chickies Formation, "light-gray, hard, massive, *Scolithus*-bearing quartzite and quartz schist" (Socolow, 1980), holds up prominent ridges such as Fort Hill and Militia Hill in Fort Washington State Park and the one atop which sits the carriage house and Gates Hall of the Morris Arboretum. The formation is highly resistant to weathering, forming ridges with steep and stable natural slopes (Chester County Planning Commission, 1973).

Three carbonate formations that are less resistant to weathering than the Chickies Formation form the broad valleys of Whitemarsh Township. Solution weathering has produced sinkholes at scattered locations in these formations. The Cambrian Ledger Formation, "light-gray, locally mottled, massive, pure, coarsely crystalline dolomite" (Socolow, 1980), underlies the valleys north and south of Militia Hill. It weathers to produce undulating valleys of low to medium relief having gentle to moderately steep and stable natural slopes (Chester County Planning Commission, 1973). Extensive quarrying of this formation has occurred in places such as the Corson quarries along Stenton Avenue southeast of Joshua Road. The Cambrian Elbrook Formation, "microcrystalline limestone and marble, subordinate dolomite containing abundant phyllitic layers" (Socolow, 1980), lies south of the Ledger Formation. It weathers to produce a rolling valley of low relief having gentle and stable natural slopes (Chester County Planning Commission, 1973). The Ordovician-Cambrian Conestoga Formation, "light-gray, thin-bedded, impure, contorted limestone having shale partings" (Socolow, 1980), is the southernmost carbonate formation underlying the broad valley of Whitemarsh Township. It weathers to produce rolling valleys and hills of low relief with gentle and stable natural slopes (Chester County Planning Commission, 1973). The Wissahickon Creek follows a meandering course with few rapids through the carbonate valley.

South of the belt of the Chickies Formation that forms the southern Whitemarsh valley wall is a relatively narrow belt of felsic gneiss, pyroxene-bearing. This relatively resistant metamorphic rock unit was referred to as Baltimore gneiss by Bascom et al. (1909) in the original mapping of this area.

The lower part of the watershed from near Andorra Drive to the confluence of the Wissahickon Creek and the Schuylkill River is underlain by the Wissahickon Formation, oligoclase-mica schist with some small serpentinite and pegmatite bodies. The Wissahickon Formation, oligoclase-mica schist is more coarsely crystalline, excessively micaceous, and has more abundant feldspar than other variants of the formation found elsewhere (Chester County Planning Commission, 1973). The formation weathers to form undulating hills of medium relief with natural slopes that are moderately steep and stable (Chester County Planning Commission, 1973). In the dramatic Wissahickon Creek valley extending from Chestnut Hill to Ridge Avenue there are some exceptionally steep slopes that create a gorge-like effect. The creek alternates between rapids and falls and quiet waters through this stretch. The tributaries draining the surrounding uplands are generally short and straight with steep channels.

Two serpentinite, "includes serpentine, steatite, and other products of alteration of peridotites and pyroxenites" (Socolow, 1980), bodies, both elliptical in shape, are mapped in the lower Wissahickon Creek valley. The northern body parallels the north side of Bells Mill Road and the southern body is on the east side of the creek north of Cresheim Creek. Where Forbidden Drive crosses the northern body, one can readily feel the soapy quality of the rock. Barrens-type vegetation does not occur atop these serpentinite bodies as the soil is too thick and the rock too far below the surface for the unusual serpentinite soil chemistry (elevated magnesium, chromium, and cobalt levels and low calcium, nitrogen, and phosphorus levels) to affect the vegetation.

Pegmatite, "coarse to medium grained, granitic" (Socolow, 1980), dikes cut through the Wissahickon Formation in many places. A prominent dike is mapped near the southern end of the valley where the creek makes a hairpin turn northeast of the Henry Avenue Bridge.

Geyer and Bolles (1987) identify Devils Pool, located on Cresheim Creek near its intersection with Wissahickon Creek, as an outstanding scenic geological feature of Pennsylvania. Devils Pool is a pear-shaped depression approximately 30-feet deep and 30-feet wide beneath a waterfall. Large outcrops of mica schist and quartzite surround the pool.

The varied geology of the Wissahickon Creek watershed gives rise to differences in topography, drainage patterns, soils, and ultimately vegetation and land-use.

c. *Soils of the Wissahickon Creek Watershed*

Soils are dynamic, integral parts of the landscape that reflect climate, geology, topography, biology and time. Geological differences in the Wissahickon Creek Watershed set the stage for soil differences. The northern portion of the watershed lies in the Piedmont Lowlands underlain by various clastic sedimentary rocks while the southern portion of the watershed lies in the Piedmont Uplands underlain by a variety of sedimentary, metamorphic and igneous rocks. Topographic position differences further distinguish soils within a given geology.

There are 10 major soil associations, groupings of soil series occurring together in characteristic pattern within a geographic region, mapped within the Wissahickon Creek Watershed as shown in Table 1.

Table 1. Soil Associations within the Wissahickon Creek Watershed

Soil Association	Description	Associated Geology
	Montgomery County Moving From North to South	
Lawrenceville-Chalfont-Doylestown	Deep, moderately well drained to poorly drained soils formed in windblown silt deposits; on undulating uplands	Sedimentary rocks of Piedmont Lowlands
Abbottstown-Redington-Croton	Deep, moderately well drained to poorly drained soils underlain by shale and sandstone; on undulating uplands	Sedimentary rocks of Piedmont Lowlands
Reaville-Penn-Klinesville	Shallow to moderately deep, well drained to somewhat poorly drained soils underlain by shale; on rolling uplands	Sedimentary rocks of Piedmont Lowlands
Lansdale-Penn-Readington	Deep and moderately deep, well drained and moderately well drained soils underlain by shale and sandstone; on rolling uplands	Sedimentary rocks of Piedmont Lowlands
Rowland-Birdsboro-Raritan	Deep, well drained to somewhat poorly drained soils formed in old alluvial deposits; on flood plains and terraces	Alluvium of Piedmont Lowlands and Piedmont Uplands
Edgemont-Manor	Moderately deep and deep, well drained soils underlain by quartzite and quartz schist; mainly on ridges	Chickies Quartzite ridges in Piedmont Uplands
Made land-Duffield-Lawrenceville	Deep, well drained soils underlain by limestone; on undulating uplands	Carbonate formations of Piedmont Uplands
Manor-Glenelg-Made land	Moderately deep and deep, well drained soils underlain by schist and gneiss; micaceous soils on hilly uplands	Gneiss and schist of Piedmont Uplands
Made land-Glenelg-Chester	Deep and moderately deep, well drained soils underlain by schist and gneiss; on undulating uplands	Gneiss and schist of Piedmont Uplands
	Philadelphia County	
Urban land-Chester	Nearly level to sloping, well drained land types and soils on uplands	Gneiss and schist of Piedmont Uplands

*Descriptions taken from *Soil Survey of Montgomery County Pennsylvania* (USDA 1967) and *Soil Survey of Bucks and Philadelphia Counties* (USDA, 1975)

- *Soils of the Piedmont Lowlands*

The upper part of the Wissahickon Creek Watershed lies in the Piedmont Lowlands underlain by Triassic clastic sedimentary rock with some small areas of igneous intrusions. From the uppermost part of the watershed to immediately south of Trewellyn Creek, interbedded Lockatong argillite and Brunswick shale form the bedrock. The Lawrenceville-Chalfont-Doylestown and Abbottstown-Readington-Croton associations dominate this part of the watershed while the Reaville-Penn-Klinesville association covers a relatively small area.

The Lawrenceville-Chalfont-Doylestown association occurs in undulating upland areas. Its soils form in thick silt layers deposited by wind over shale and sandstone and have a fragipan (a dense, brittle subsurface layer) which impedes drainage to cause a seasonal high water table which limits agricultural use and septic suitability. Erosion is severe after soils of this association are disturbed.

The Abbottsville-Readington-Croton association occurs in undulating upland areas underlain by hard shale. The slow or moderately slow permeability of the subsoil, seasonal high water table and seeps limit agricultural and residential development uses of this association.

The Reaville-Penn-Klinesville association occurs in areas underlain by red shale that has weathered and eroded to form rolling hills cut by many streams. The soils of this association are variable in nature and suitability for agricultural and residential development use with drainage ranging from good to poor, slopes ranging from nearly level to steep, and depth to bedrock varying from less than 2 to more than 3 feet. Severe erosion has removed topsoil from much of this association.

Stockton sandstone underlies the watershed from immediately south of Trewellyn Creek to south of Ambler where ridges underlain by Chickies quartzite of the Piedmont Uplands rise adjacent to the Pennsylvania Turnpike. The Lawrenceville-Chalfont-Doylestown association covers much of this area with the Abbottstown-Readington-Croton, Lansdale-Penn-Readington and Rowland-Birdsboro-Raritan association are also present.

The Lansdale-Penn-Readington association occurs in areas of shale and sandstone that have weathered and eroded to produce low hills that have broad, rounded summits and short, steep side slopes. The soils of this association retain a moderate amount of moisture for plants and have few limitations for agriculture and moderate limitations for residential developments. The main limitations include short, steep, eroded slopes, bedrock near the surface and depressions having slow permeability.

The Rowland-Birdsboro-Raritan association extends along the Wissahickon Creek from the vicinity of Ambler downstream. Soils of this association develop in alluvium. The Rowland soils form in recent alluvium derived from shale and sandstone while the Birdsboro and Raritan soils form in older alluvium. Use of these floodplain soils is limited due to flooding, a seasonal high water table and slow permeability.

- *Soils of the Piedmont Uplands*

The prominent ridges underlain by Chickies quartzite that rise in the vicinity of Fort Washington and trend east to west mark the northern boundary of the Piedmont Uplands. The Edgemont-Manor association occurs on these resistant ridges and has soils with limited agricultural and residential development use due to stoniness, steep slopes, bedrock near the surface and excessive drainage.

Carbonate formations lie immediately south of the Fort Washington quartzite ridges and underlie the Whitemarsh Valley. The Made land-Duffield-Lawrenceville association covers this area. Made land refers to areas where the original soils have been so disturbed by human activities including quarrying operations that they can no longer be identified. The Duffield soils develop on limestone and are deep and well drained. The Lawrenceville soils develop in silty deposits, as mentioned earlier, and have a fragipan at depth that impedes drainage to limit use. The naturally high fertility of the carbonate-based soils makes them an especially important resource to preserve where they are still intact, as on the Dixon Estate. The carbonate valley as a whole, is sensitive to development due to the tendency for solution weathering of the bedrock which produces sinkholes, posing a threat to buildings and roads and providing a conduit for surface pollution to contaminate groundwater.

A quartzite ridge bounds the southern side of the carbonate valley and, like the northern ridge near Fort Washington, is covered with soils of the Edgemont-Manor association. Continuing south, the Wissahickon Creek cuts down through the hard gneiss and schist that typify much of the Piedmont Uplands to create the magnificent gorge that is the centerpiece of the Fairmount Park in this area. Manor-Glenelg-Made land, Made land-Glenelg-Chester and Urban land-Chester associations are mapped in this lower section of the Wissahickon Creek Watershed.

The Manor-Glenelg-Made land association covers steep, wooded slopes underlain by gneiss and schist. Soils of this association are well drained to somewhat excessively drained. Primary limitations to agricultural and residential development use include steep slopes, stoniness, moderate to low available moisture capacity and varying depth to bedrock. Areas of this soil association are suitable for parks and public open spaces.

The Made land-Glenelg-Chester association is similar to the previous association differing principally in having 50 percent of its area covered by Made land where original soils are unrecognizable due to filling and regrading. The soils of this association are deep over schist and gneiss, nearly level or gently sloping, well drained, retentive of a large amount of moisture for plants, and slightly to moderately limited for agricultural or residential development use.

The Urban land-Chester association consists of approximately 45 percent Urban land, areas built up and occupied by urban structures. Chester soils which comprise approximately 30 percent of the association are deep, well drained, moderately permeable, on the tops and sides of ridges and limited by stoniness and slope. The remainder of the association is comprised of minor soils. Sites of this association intended for use will require thorough and careful investigation for contamination and geotechnical soundness.

2. **Vegetation**

The Wissahickon Watershed is part of the Oak-Hickory deciduous forest, which covers more of the contiguous United State than any other forest type. The Oak-Hickory forest extends from north of Boston to San Antonio, Texas, north to Des Moines, Iowa and east to Chattanooga, then northeast throughout the Appalachian Mountains to the Philadelphia-New York area.

The American chestnut and the American elm, which were virtually eliminated by introduced pathogens in the early part of this century, have left a major gap in the character and composition of the native and man-made landscape. Both were gigantic trees, with very rapid growth rates. Both were a major part of the local Wissahickon forest and were an important source of lumber, wildlife and human food in the case of the chestnut.

The American Chestnut Association is in the process of developing Chestnut Blight-resistant trees by accomplishing back crossing between American chestnut and Asian species. They expect that this process will take a few more years until sufficient breeding work is accomplished, resulting in resistant seedlings with 90-95% of American chestnut characteristics.

Other work is being done involving the use of naturally occurring fungi which attacks the fungus that causes the blight. Reintroduction of the American chestnut may be a real possibility in the near future.

Research on the Dutch Elm Disease is on-going with periodic introduction of new treatments and resistant cultivars.

On the relatively dry upper elevations, chestnut oak, sweet birch, scarlet oak, red oak, American beech, pignut hickory, black oak, white pine, and black gum dominate the canopy, with huckleberry, mountain laurel, dogwood and sweet fern found in the understory.

In ravines with steep slopes, the tulip tree, white oak, black cherry, American beech, red maple, shagbark hickory, ironwood, red bud and dogwood are often present. Spice bush, maple leaf viburnum, umbrella magnolia and sassafras can also be found.

On cool north facing slopes, the Canadian hemlock, sweet birch, white pine, black cherry and red oak are likely to be present.

Along the stream within the floodplain, American sycamore, red maple, American basswood, river birch, white ash, ironwood, witch hazel, spice bush, black willow, elderberry, high bush blueberry and red stem dogwood are present.

On abandoned or cleared land, successional native plants such as red cedar, box elder, sumac, black locust, honey locust, black walnut, blackhaw viburnum, red stem dogwood, golden rod and many other herbaceous plants are present.

An annotated checklist of the more important and familiar of the higher (vascular) plants occurring in the Wissahickon Creek valley from the Schuylkill River to Northwestern Avenue in Chestnut Hill, includes 495 native and 159 introduced species and varieties (Fogg, 1996). With the numerous landscaped residential areas surrounding the Wissahickon Creek valley it is not surprising to see such a high percentage of introduced species. Some "new" species became established in the Wissahickon Creek valley over a relatively short period of time. Rhoads (1994) discusses how, based on herbarium records, umbrella tree, a native tree in more western parts of Pennsylvania, suddenly appeared in the Philadelphia area in the 1920s having either spread from cultivated sources or by means of natural dispersal. The species was first reported from the Wissahickon Creek valley in 1924 and was "well established" by 1964. Today, Rhoads (1994) reports that the sub-canopy tree with leaves up to two feet long is abundant along the slopes of Wissahickon Creek near Rittenhouse Village. In the Fort Washington State Park numerous umbrella trees exist as understory trees.

Some of the introduced species such as Japanese honeysuckle and garlic-mustard are extremely aggressive and are out competing the native species. Fogg (1996) notes that Japanese honeysuckle is "the most pernicious weed in the valley; in many sections completely obliterating the native vegetation by forming solid stands which cover wooded slopes and thickets." Intense white-tailed deer herbivory pressure compounds this problem because some of the introduced species such as Japanese barberry are less palatable to the deer than the native species leading to the enrichment of the introduced species over time. Siebold's viburnum, distinctive in having leaves that smell foul when crushed, is an introduced species that appears to have invasive qualities and to be on the "move" having reproduced over a wide range of habitats (Kunstler, 1993). Land managers in the Wissahickon Creek watershed where it is proliferating need to be aware of its potential threat to native vegetation.

The continued presence of native plants that make up the forest of the Wissahickon will depend on soil depth and quality, topography, elevation, hydrology, microclimate and animal populations. Robertson and Robertson (1995) discuss the problems of introduced plant species and an overabundance of deer in the nearby Pennypack Creek watershed and their efforts to restore mixed mesophytic forest like that occurring in the Wissahickon Creek watershed through introduced species control, reintroduction of native trees, shrubs, and herbs, and protection of plants from deer browse and rubbing. After nearly a decade of restoration work, they have learned many things that may be helpful to those involved in restoration efforts in the Wissahickon Creek watershed.

Sample Site Investigations

- *Robbins Park, Stockton Formation, Triassic Lowland*

Robbins Park, located northeast of the intersection of Route 309 and Butler Pike, is underlain by the Stockton Formation. Rose Valley Creek, a tributary to the Wissahickon Creek, flows through the park. Moving from the highest to the lowest part of the landscape here, one sees changes in vegetation structure and composition that are fairly typical for this part of the watershed.

An early successional field occurs on level, well-drained soils at the highest elevation. Scattered shrubs include multiflora rose, an aggressive introduced species, hawthorn, crabapple, flowering dogwood, russian-olive, raspberry, and assorted saplings such as white ash, black walnut, and tuliptree. A diversity of grasses, forbs, and vines occurs in the herbaceous stratum. Dominant species include Queen Anne's lace, self-heal, horse nettle, grass-leaved goldenrod, aster, small-flowered agrimony, common milkweed, purple loosestrife, purple-top, orchard grass, yellow foxtail, little bluestem, Virginia creeper, Japanese honeysuckle, and poison ivy. Without annual mowing to set back the woody species, fields such as this one fairly rapidly succeed through a dense shrubby phase to forest.

Moving downhill into the creek valley one crosses a steep forested slope with moderately mature trees. Red oak, beech, shagbark hickory, and black gum are dominant canopy trees while Norway maple, an aggressive introduced species, ironwood, and beech comprise the subcanopy. Mapleleaf viburnum, spicebush, black gum, privet, and white ash saplings are dominant shrubs. Beechdrops, a parasite on the roots of beech trees, is one the few species growing on the ground.

Wetland forest growing in inundated to saturated fine-textured soils extends across the floodplain in the lowest part of the landscape. Red maple dominates the canopy while spicebush, indigobush, and a viburnum species are the common shrubs. A dense herbaceous layer includes jewelweed and halberd-leaved tearthumb.

- *Forests at Ambler Campus of Temple University, Stockton Formation, Triassic Lowland*

On the southeastern part of the Temple University Ambler Campus along the south side of Meeting House Road is a moderately mature upland forest adjacent to less mature floodplain forest extending along Tannery Run to the Wissahickon Creek. Like Robbins Park, this area is also underlain by the Stockton Formation.

The moderately mature forest on well-drained soil has a canopy of beech, tuliptree, red oak, and black gum. Sassafras and black cherry grow in gaps. Winterberry holly and mapleleaf viburnum are dominant shrubs. Northern lady fern, New York fern, and Virginia creeper are dominant herbs and vines.

Pin oak, white ash, American elm, and red maple dominate the canopy of the floodplain forest, which has soils of varying drainage class. Arrowwood, multiflora rose, privet, blackhaw, and spicebush are common shrubs. Poison ivy and Japanese honeysuckle are dominant vines. Jewelweed, fowl manna grass, field garlic, and whitegrass fill the herbaceous layer.

- *Forest near Valley Green Inn, Wissahickon Formation, Piedmont Uplands*

Moving down the Wissahickon watershed and into the gorge near the Valley Green Inn, one can see changes in vegetation structure and composition reflecting differences in soil moisture, light, and temperature. Schist of the Wissahickon Formation underlies the east-northeast-facing slope. The soils along the upper part of the slope are relatively shallow and rocky, but have a silt loam texture that retains available moisture well. White oak, red oak, black oak, black gum, tuliptree, and beech comprise the canopy while red maple, hemlock, umbrella tree, and black gum compose the sub-canopy. Mapleleaf viburnum, spicebush, and young black cherry dominate the shrub layer. A sparse herbaceous layer supports New York fern. Heavy deer browse in the area is inhibiting regeneration.

At the bottom of the slope, it is cooler because of cold air drainage, shading and thicker and moister soils. Eighty-foot tall hemlocks, sweet birch, tulip tree, beech, and red maple occupy the canopy. Younger beech, flowering dogwood, box elder, black gum, umbrella tree, and Norway maple comprise the sub-canopy. Rosebay, spicebush, Japanese barberry, and witch hazel dominate the shrub layer. A variety of herbs including woodfern, northern lady fern, New York fern, and Christmas fern cover the ground. Asiatic bittersweet and Virginia creeper are two vines in the area.

- *Toleration Rock, Wissahickon Formation, Piedmont Uplands*

Toleration Rock located approximately a quarter mile north of the Walnut Lane Bridge on the east side of the Wissahickon Creek is an impressive schist outcrop of the Wissahickon Formation and affords a stunning view of the steep creek valley. Thin, dry soils cover the bedrock where it is not exposed and support a canopy of black oak, chestnut oak, red oak, white oak, and hemlock with a sub-canopy of red maple, black gum, and sassafras. A dense shrub layer dominated by mountain laurel (*Kalmia latifolia*) extends at chest height across the ridge crest. A sparse herbaceous layer includes white wood aster (*Aster divaricatus*), trailing arbutus (*Epigaea repens*), partridgeberry (*Mitchella repens*), and silver-rod (*Solidago bicolor*).

3. **Hydrology / Water Quality**

a. *Hydrology*

In its pre-colonial undisturbed state, the Wissahickon Creek was in hydrologic equilibrium with its watershed. The rate of runoff was controlled by the retention and infiltration of rainfall in the upland areas, while the forested slopes transitioned the flow to the watercourses, and the low-lying floodplains provided stable areas for streams to overflow their banks. Most tributaries flowed year round. Except for large storms that occurred once a year or so, the streams ran clear.

In the three centuries since the Watershed was colonized by European settlers, the fundamental hydrologic properties of the Creek have been severely disturbed. The changes in the Watershed began with clearing the land for agriculture. This increased runoff rates and destabilized stream banks, beginning the cycle of erosion and flooding that continues to this day. As development proceeded, entire tributaries and their drainage areas eventually disappeared to be replaced by residential subdivisions, urban streetscapes, manicured turf grass lawns, and piped stormwater.

The upper reaches of the Watershed are underlain by low-permeable shale and overlain by thin somewhat impervious, clay soils. Consequently, this area has always tended to produce comparatively high rates of runoff. Broad marshy floodplains acted like sponges to absorb and dissipate the energy of this runoff. The geologic conditions in the middle and lower watershed resulted in less runoff. Here most of the rainfall percolated into the deep soils and permeable bedrock. This water was subsequently returned as stable perennial flow to the streams. Areas in the lower watershed were characterized by swift-flowing rocky creek beds.

Construction within the floodplain was originally favored due to proximity to water power and transportation routes. Nearly all of the perennial reaches of the Creek and its tributaries were, at one time or another, dammed to provide water power. The remnants of weirs and mill dams can be found from Knapp Park to Livesy Lane. In recent decades, as the availability of land for development decreased, floodplains became attractive locations for residential development.

Development typically resulted in the partial filling of floodplains. This has been done to raise and level construction grades, thereby increasing the useable land area for construction and for recreational uses. To compensate for the filling of the floodplain, it is very common to increase the capacity of the streams by widening, deepening, or straightening. This process, called stream "channelization," was frequently the first step in a progression that led to the complete enclosure of the creek in a storm sewer. In densely developed areas such as Ambler, Lansdale and Philadelphia, many tributary streams have been completely eliminated. Recently, settlement problems have become serious in Philadelphia, requiring the demolition of numerous homes. However, severely channelized or enclosed streams can be found throughout the Wissahickon Creek Watershed. Examples include headwater tributaries in Upper Gwynedd Township, Abington Township, and Cheltenham Township.

Approximately, 60 percent of the land area in the Watershed was developed prior to the advent of runoff control ordinances that limit impervious area or required detention of excess runoff. Large expanses within the Watershed have been paved without any runoff controls. Furthermore, past and present drainage practices promote rapid runoff from impervious surfaces directly to nearby watercourses. Practices for managing runoff found with in the Wissahickon Watershed include:

- Interceptor sewers with inlets installed in a line along roads that lead directly down slope toward outfalls at stream crossings.
- Intensively sewered urban districts that outfall directly to streams
- Discharge of roof downspouts to paved driveways or directly to sewers
- Inlets in parking lots that shunt runoff directly to nearby streams
- The consequence of these and related measures has been to convert most of the Creek and its tributaries to stormwater disposal canals.

Engineering practices have frequently attempted to alleviate impacts by improving the efficiency of shedding rainfall from developed areas and conveyed downstream. These measures have starved the shallow groundwater system which, in the undeveloped condition, absorbed 45 to 60 percent of all rainfall. As a result, the number of miles of tributary streams dry up completely in the summer has increased greatly. In fact, during dry periods the baseflow in the Wissahickon Creek is sustained almost entirely by effluent discharged from 12 wastewater treatment plants.

In contrast, the quantity and rate of runoff from all areas of the Watershed is many times greater than in the undeveloped watershed. The increase is proportionately greatest for the small frequent storms. As a result the streams regularly flow swifter and deeper. Under these changed conditions, streams throughout the Watershed actively erode and become turbid with entrained sediment during every significant rainfall.

b. *Water Quality*

The Wissahickon Creek and its tributaries are classified as a Trout Stocked Fishery (TSF) under the PADEP Water Quality Standards. This designation calls for streamwater quality to be sufficient to provide for the maintenance of stocked trout from February 15th until July 31, and the maintenance and propagation of fish species and additional flora and fauna indigenous to a warm water habitat.

Comprehensive watershed-wide investigations of stream water quality are limited, with the two most frequently cited ones having been conducted in 1988 and 1996 by the Pennsylvania Department of Environmental Protection (PADEP). A recent watershed-wide study was also conducted by NIER and is expected to be completed soon.

The PADEP water quality surveys extended the full length of the Wissahickon Creek and also included one sample station on a major tributary creek, Sandy Run. Page II-13, the Hydrology Map, shows the location of the 14 water quality monitoring stations along the main stem of the Wissahickon Creek and Sandy Run. Water quality parameters studied included chemical, physical and biological indicators of stream quality.

Volatile Organic Compounds Pollution:

A national study released by the U.S. Geological Survey found that 47% of urban wells contain volatile organic compounds. This study was described in an article published in US News and World Report in December of 1999.

These are a class of toxic chemicals found in gasoline, paints and plastics and used for industrial purposes.

Approximately 32 million people in urbanized areas use groundwater which contains one or more of these compounds. Because they are water-soluble and persist in the environment, they are of real concern.

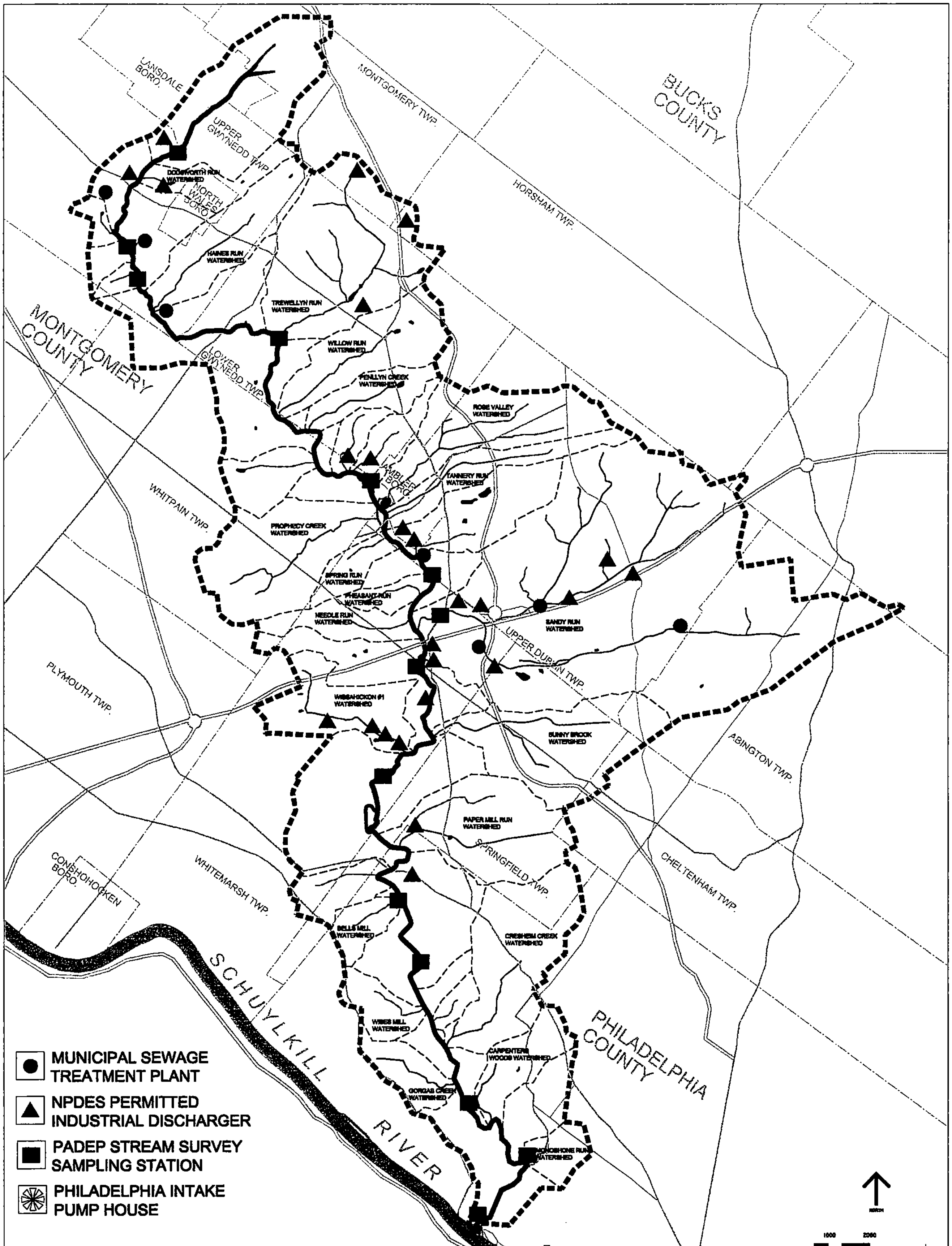
Leaking sewers and water mains, lawn irrigation and leaky gasoline tanks and pipelines are the primary source of VOC's.

The health issues involved in long term ingestion of VOC's are cancer, reproductive and developmental problems, according to J. Charles Fox, EPA's assistant administrator for water.

Protecting ground water resources should be a high priority in establishing a Wissahickon Watershed management program.

The overall conclusion of the most recent PADEP study in 1996 was that the stream water quality and biota in the Wissahickon Creek have improved somewhat since the 1988 survey.

Throughout the Watershed, the dedicated efforts of various organizations have succeeded in protecting large portions of the stream corridor and floodplain from development. However, this is only the first step. Many preserved reaches are already severely disturbed by filling, channelization, erosion, and the removal or trampling of bank vegetation. It is also common to find expanses of preserved open space that were formerly active floodplains, but which are now hydraulically isolated due to past filling or channelization projects. Examples include portions of the lower Trewellyn Creek, the Montgomery Township Natural Area, and the Moore Products campus. These areas represent potential assets that will require grading modifications and landscape changes to restore their full hydrologic value. There are also excellent examples within the Watershed of how a floodplain can be protected or rejuvenated. These include the John Parry Bird Sanctuary, Knapp Park, and Cresheim Valley Park.



HYDROLOGY MAP

WISSAHICKON CREEK · RIVER CONSERVATION PLAN

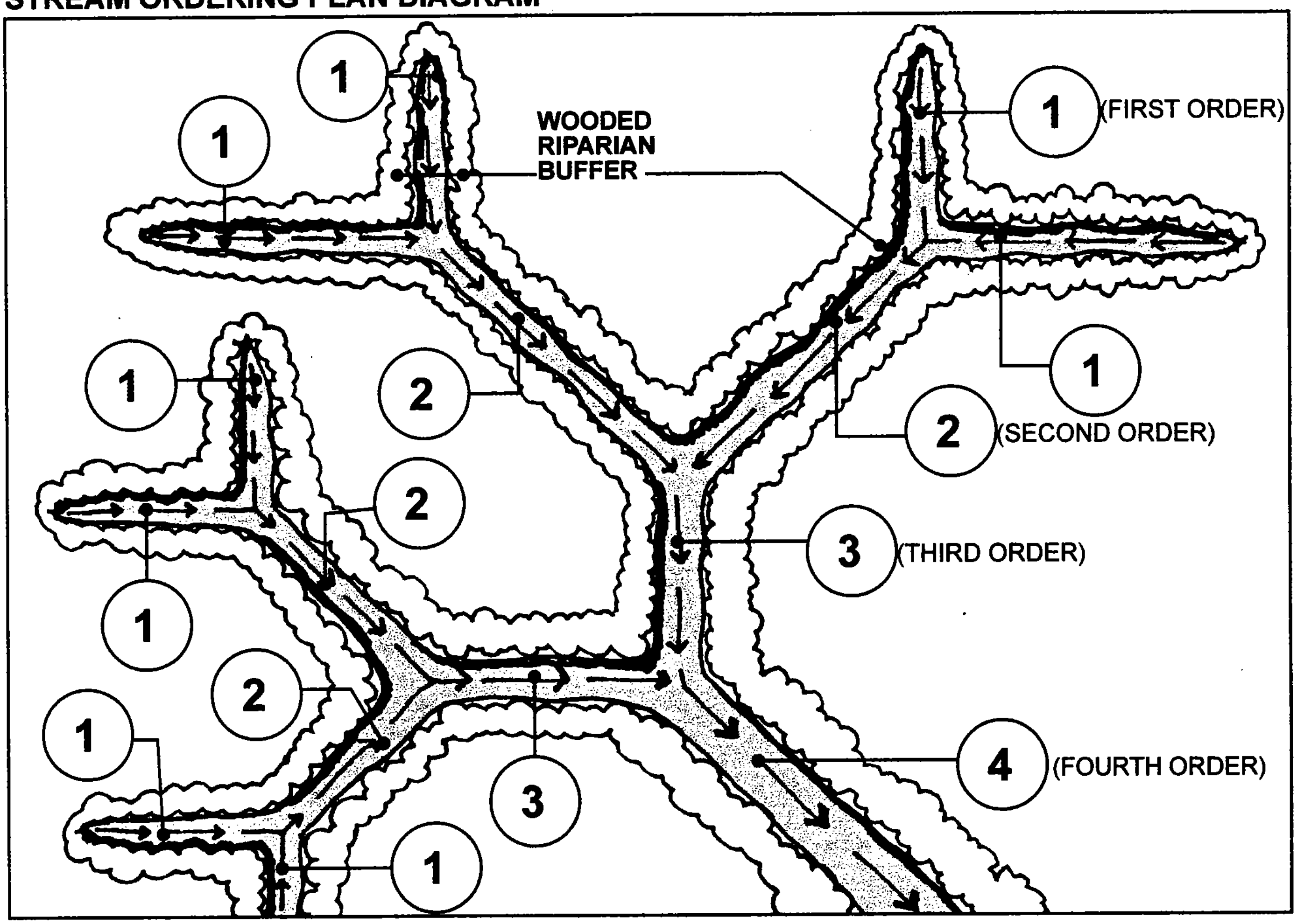
FAIRMOUNT PARK COMMISSION, PHILADELPHIA, PA· MONTGOMERY COUNTY PLANNING COMMISSION WISSAHICKON VALLEY WATERSHED ASSOCIATION· FRIENDS OF THE WISSAHICKON · WISSAHICKON RESTORATION VOLUNTEERS
PENNSYLVANIA DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
The Delta Group · C. Miller, PE · Steven Hammel · PAQ, Inc · S. Edgar David · Temple University Department of Landscape Architecture and Horticulture

Stream Ordering

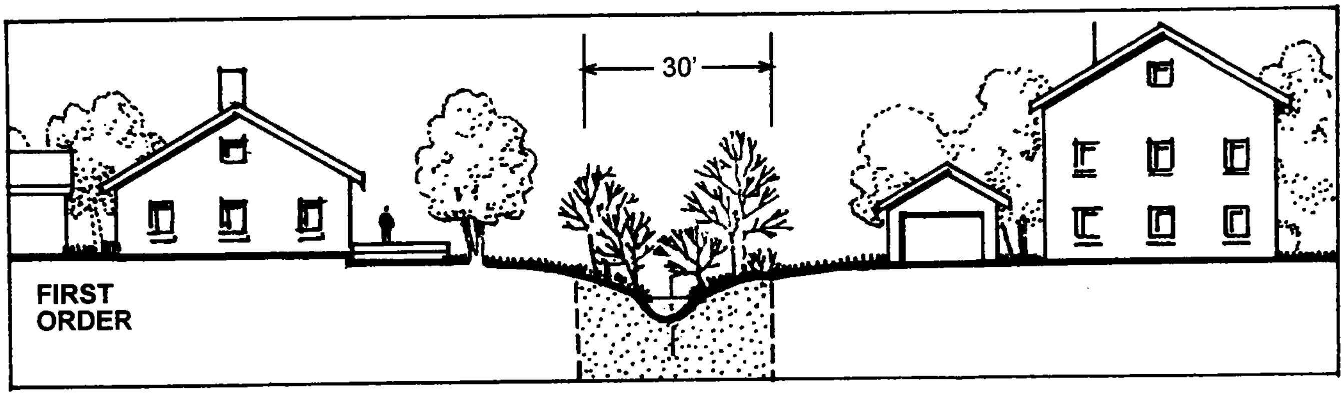
The concept of stream ordering is useful for classifying streams. Since it is based on the size of a contributing runoff area to a channel it helps in understanding the spatial relationship of a particular part of a stream and its watershed. The stream ordering method assigns a low number to the smallest tributaries in a drainage network. Thus the first small drainage channels in the upper reaches of a watershed are called first-order streams and their drainage area likewise referred to as a first-order basin. The first-order channels have no other branches. Second-order streams are created by the joining of two first-order streams. Third-order streams occur where two second-order streams join, etc.

First and second-order streams are collectively known as "headwater" streams because they tend to be relatively short and drain small areas. This dendritic branching of stream orders results in headwater streams making up the largest proportion of total stream length, generally 75% or more. This means that the headwater streams are highly influential in the overall condition of the stream system. Therefore, the treatment of land uses immediately surrounding these numerous small headwater streams is critical to improving and maintaining the health of the watershed.

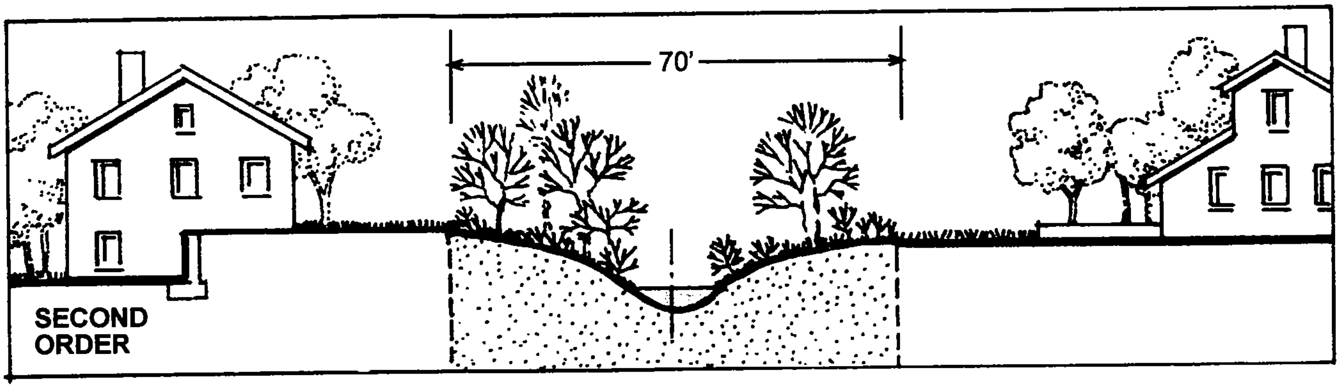
STREAM ORDERING PLAN DIAGRAM



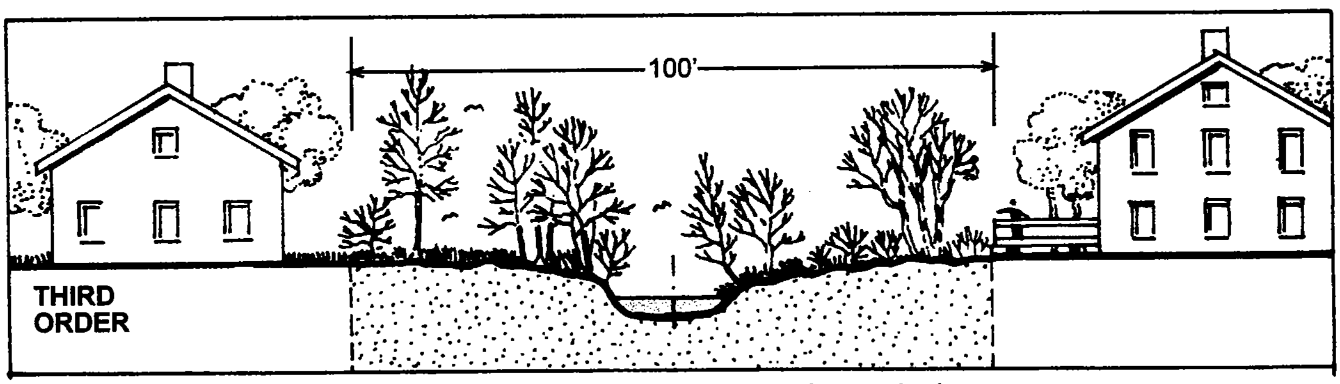
MINIMUM WIDTH RECOMMENDATIONS FOR NEW AND APPROPRIATE EXISTING DEVELOPMENT
RIPARIAN BUFFER WIDTHS BASED ON STREAM ORDER



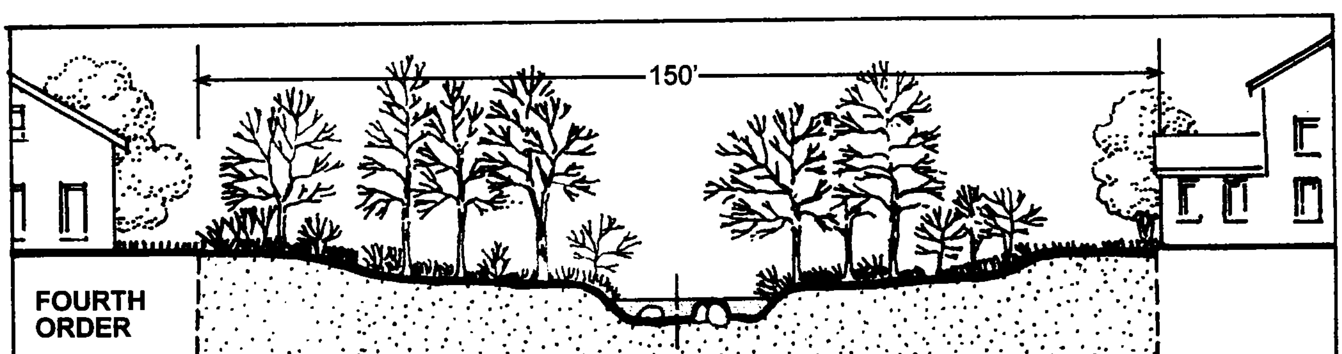
Ephemeral creek or swale. Dry except during / after rainfall, less than 5' wide.



Intermittent stream, mostly dry in summer, less than 15' wide, most in private lands.



Primary subwatershed streams, perennial flow, most hydro-active of watershed.



Perennial flow, water storage for large storms, sustained flow from third order tributaries, sewage treatment plants and quarry.

Throughout the Watershed, ways must be found to reduce runoff rates (especially from frequent storms), delay the concentration of runoff in sewers and watercourses, and reinvigorate floodplains. In general, large detention basins designed for the control of large storms will not achieve the benefits that are sought. To date, efforts to employ advanced runoff management practices have been sporadic and uncoordinated. Nonetheless, there are many good examples within the Watershed that can point the way to future solutions:

- Extended detention basins (e.g., Foulkeways Retirement Village)
- Created wetlands (e.g., Moore Products)
- Vegetated swales and disconnected downspouts (e.g., Hunt Club Apartments)
- Floodplain preservation using grade control structures (e.g., John Parry Bird Sanctuary)
- Wooded filter strips (e.g., Gwynedd Lea development)

A watershed-wide approach is required that will inventory and protect the remaining hydrologic assets, promote the use of best management practices, and manage the water resource.

4. **Wildlife Issues**

The inability of the native forest in the Wissahickon Park to reproduce has several causes. Animal predation, drought, human activities and disease/insect infestations are all involved. Severe soil compaction is also a cause.

Deer browsing on seedlings and branches of the hardwood trees and shrubs is indeed a problem, but not the only reason for this serious condition. Gray Squirrels are a part of the problem, as they eat tremendous numbers of acorns, beech and hickory nuts and other tree seed. They also have a very high population in our region. They not only pick and consume the seed, they will also uproot one year oak seedlings to eat the remains of the acorns below.

Mice are also responsible for a very high percentage of seed loss. Insects do their part as well. The Nut Weevil larva, implanted in young acorns, consume the viable seed from within the shell. This grub is responsible for the destruction of countless oak seed. Birds are also a problem, especially for small seeds, such as birch, hemlock and ironwood. The Woolly Adelgid, a soft bodied insect and plague of the Canadian Hemlock groves in the Wissahickon Park are almost impossible to combat effectively.

5. **Climate**

The drought and storms of the summer of 1999 caused serious damage to the vegetation of the Wissahickon Watershed and the agricultural areas of eastern Pennsylvania. In addition to the outright death of numerous trees, shrubs and herbaceous plants, the damage to tree seed crops is also serious.

The 1999 drought, although the most dramatic, followed several years of “perennial” summer droughts. Global warming is becoming widely accepted as fact, based on the records of the past decades. The first-order intermittent streams and many first-order perennial streams have been totally dry for most of the recent summers. This condition dictates the selection of plants for riparian buffer restoration that can withstand both very wet and very dry conditions. This limits the number of species that can succeed in these highly stressed environments. Red maple, winterberry, red and gray stem dogwood, shadbush, ash, red oak, and red bud are some examples of strong “survivors”, once established.

The other contributing climatic factor is the increased temperatures and drying winds caused by the urban heat dome, that ranges between 5 and 10 degrees higher in the city than in the outlying suburbs. Plants such as Canadian hemlock, which in Philadelphia are at their southern-most limit, are terribly stressed. The warmer winters do not control the wooly adelgid as a colder winter would, and the excessive heat and drought conditions of summer both take a heavy toll.

Selection of a plant palette for urban restoration and residential landscapes of a more southern hardiness zone is one solution, but remains subject to potential loss if a severe winter returns.

Flash flooding is becoming an increasingly serious problem in the Wissahickon basin. Highly urbanized communities in the city, the three boroughs and portions of the township have excessively high percentages of impervious surfaces. Coupled with the piped and channelized drainage courses, the combination of very high stormwater volume and a "streamlined", rapid delivery system to the Wissahickon Creek, is beyond the ability of the restricted floodplain to safely accommodate the flood waters.

The prevailing winter winds are from the northwest, and the summer breezes from the southwest. Average precipitation totals approximately 43 inches a year.

6. **Summary**

Perhaps human activities, both past and present, have exerted and continue to exert the most profound influence on vegetation, erosion, wildlife and water quality of the Wissahickon Creek watershed. Extensive land clearing, both historic and modern-day, has greatly reduced and fragmented the once-continuous cover of forest. Today, forest covers sections of creek valleys, scattered upland patches, and ridges such as those at Fort Washington State Park that were too steep and rocky to farm and are now under benign ownership. Management efforts within the watershed should generally attempt to connect these fragments of forest to one another and expand forest cover overall. In both upland and wetland settings, forests provide a variety of important functions including improvement of air and water quality, a cooling effect, increased privacy and provision of wildlife habitat.

The useful information to be derived from a review of landform, geology and soils factors in the Wissahickon Watershed is that serious conditions causing excessive runoff problems exist in both the lowland and upland piedmont zones, in other words, throughout the entire Watershed.

The lowland triassic area includes 2 major soil types, the Lockatong and the Stockton soils. In the northernmost Lockatong, there is very shallow depth to impervious red shale bedrock and the presence of periodic impervious clay "lenses" called fragipan, both prevent rainfall from percolating into the soil. The heavy clay soils which overlay the shale and subsoil are productive for agriculture but very prone to virtual physical destruction from earth moving equipment and landscape activities, especially during wet conditions. Compaction of these soils eliminates the pore spaces that are necessary to accommodate air and water penetration, into the soil.

The two upland areas, including the Carbonate Valley and the Wissahickon Park in Philadelphia, present different issues. The limestone valley has deep, high quality well drained soils over limestone bedrock. While the potential for recharging stormwater exists, there is local resistance to infiltration techniques because of the potential for increasing the development of sinkholes, common in water soluble limestone areas. This indicates the need for flexibility in preparing ordinances, to accommodate unique localized conditions.

In the Philadelphia area of the park, the Manor-Glenelg soils are also deep, well drained, high quality soils. The topography in this area is extremely steep, which when combined with serious compaction and tree canopy loss in the park and a high % of impervious surfaces in built-out parts of the watershed, an extremely high percentage of most rainfall rapidly runs off rather than penetrates the soil.

The conclusion is that managing and restoring the forest landscapes of the Wissahickon Watershed are among the most important challenges for the 14 municipalities that will become the pro-active stewards of this unique resource.

A detailed analysis of Water Quality issues is being developed by the National Institute for Environmental Renewal. It is anticipated that this report will provide guidance in dealing with this important issue.

Solutions to the serious problems of excessive volume and rate of stormwater runoff will require a new mindset for civil engineers, landscape architects, architects, landscape / plumbing contractors and the public, to avoid the traditional over use of inlets and buried stormwater piping to remove runoff from the built landscape. Keeping stormwater on the surface and using grading techniques and planting design to encourage recharge is a much more logical approach.

Roof downspouts, inlets in parking lots, roadways and lawn areas are normally tied together to collect almost all stormwater from the site and to pipe it to natural drainage courses as quickly as possible where it is discharged. This approach robs the site of necessary stormwater for infiltration, instead turning this water, a priceless resource, into an unintended environmental "weapon" against downstream communities.

Stormwater management basins, while well intentioned, often cause more environmental damage than benefits. They are also generally unsightly, and almost valueless as habitat. Improving the grading design to avoid the earthen "bath-tub" look, planting wildflowers, tall grasses, trees and shrubs which slow and filter stormwater can improve their visual appearance and functional value.

Depending more for runoff management on reforestation and creative grading design on development sites, rather that on basins alone, should become a more accepted part of the site planning and design process.

B. Cultural Factors

1. History

Before European settlement, the Wissahickon Watershed was inhabited by the Lenni-Lenape Indians. Hunting, fishing and farming were the primary means of subsistence for these peace-loving people.

At the time of William Penn's arrival in 1682, there were approximately 15,000 native Americans living in the Philadelphia area. Imported disease, firearms and violence took a heavy toll on the Lenni-Lenape population, who had generously assisted the settlers in surviving the rigors of the new world.

The first settlers in the watershed were English, Welsh and Germans who continued to be the dominant nationalities throughout the 18^{th} Century. The earliest industry was farming. Milling was probably the next most important industry. Flourtown at the western end of Springfield Township took its name from its early milling activity. The Wissahickon and its tributaries supplied water power which gave rise to 52 grist, saw and paper mills.

In the fall of 1777, significant military activity took place in Whitemarsh Township, Abington Township and the Chestnut Hill/Mt. Airy/Germantown areas in Philadelphia. Two battles took place between the forces led by General George Washington and their British and German enemies, then occupying Philadelphia.

The Battle of Germantown took place on October 4, 1777 and began near the intersection of Gowen and Germantown Avenues in Philadelphia. The second battle, called the Battle of Edge Hill, took place in Abington Township in part of the Sandy Run Subwatershed, on December 8, 1777 when General Howe and General Cornwallis led the British Army garrisoned in Philadelphia to the Edge Hill fortifications of the Revolutionary Army, accompanied by a large force of German Hessians. There they had a brief but intensive encounter with the previously untested American troops. The outcome was inconclusive. Several soldiers on both sides were killed.

Washington's nearby encampment and fortified positions in Whitemarsh, on the present day Fort Washington State Park site, were considered impregnable by the British.

On December 11th, Washington moved his forces from Whitemarsh and began the march to Valley Forge, where they spent their harrowing winter encampment.

Many important historical buildings and places exist in Montgomery County including the Fort Washington area and nearby Plymouth Meeting area. Both areas had an important role in the Civil War era, as well as their role during the revolution.

In addition to rich farm land, Springfield Township also had lime and iron ore resources. The community of Oreland in the northernmost part of the township was named for its industry. Native stone was also quarried, crushed and used to build local roads. The limestone was quarried then heated in kilns to be dehydrated and crushed into powder. The powder was used to sweeten soil and to make to make mortar for plaster and masonry construction. Oreland was the principal source of iron ore in the township, although iron was also mined in Flourtown and Erdenheim.

In 1868, the Fairmount Park Commission acquired the Philadelphia portion of the Wissahickon Valley as public park land. The protection of the natural beauty and water quality were accomplished by this visionary decision.

World War Two began a trend that significantly changed the watershed. Several manufacturing plants were constructed at that time and became major employers. The SKF Bearing Company built a plant along the Stony Creek Railroad south of Sumneytown Pike and the National Union Radio Corporation built a plant along the Reading Railroad on Church Road. Ford Aerospace and Communications replaced National Union Radio. In the 1950's, Leeds and Northrop manufactured electronic controls and equipment.

When the 309 Expressway was completed in 1959, Lower Gwynedd attracted more light industry because the township identified available open spaces most suitable for limited industrial use and research. A number of companies have opened campus style plants in Lower Gwynedd. Rohm and Haas, a chemical / research firm, acquired 140 acres of mainly farmland on Norristown Road in Spring House and opened its research campus in 1960. McNeil Pharmaceutical acquired 170 acres in Lower Gwynedd in 1980. MacNeill Laboratories became a division of Johnson and Johnson in 1959. Moore Products, a manufacturer of industrial instruments, acquired 154 acres on Sumneytown Pike in Spring House in 1963. ITE Imperial, manufacturer of circuit breakers, built a switch gear division in Lower Gwynedd in 1972. An innovative, well-designed shopping center was also built as a result of the 309 Expressway exit at Spring House. The center opened in 1972 at the corner of Sumneytown and Bethlehem Pikes.

For detailed inventory and description of historic resources of the Wissahickon Watershed, see "Inventory of Historic Sites" published by the Delaware Valley Regional Planning Commission in 1969.

2. Recreation

a. *Major Parks*

The 1,400 acre Philadelphia Wissahickon Park is a recreational destination of major regional significance. Fifty-five percent of the 750,000 annual visitors are from beyond the Philadelphia City limits. Fishing, hiking, biking, running, horseback riding, bird watching, nature study, photography and visiting the Valley Green Inn to dine or feed the ducks are the most popular forms of recreation activities available.

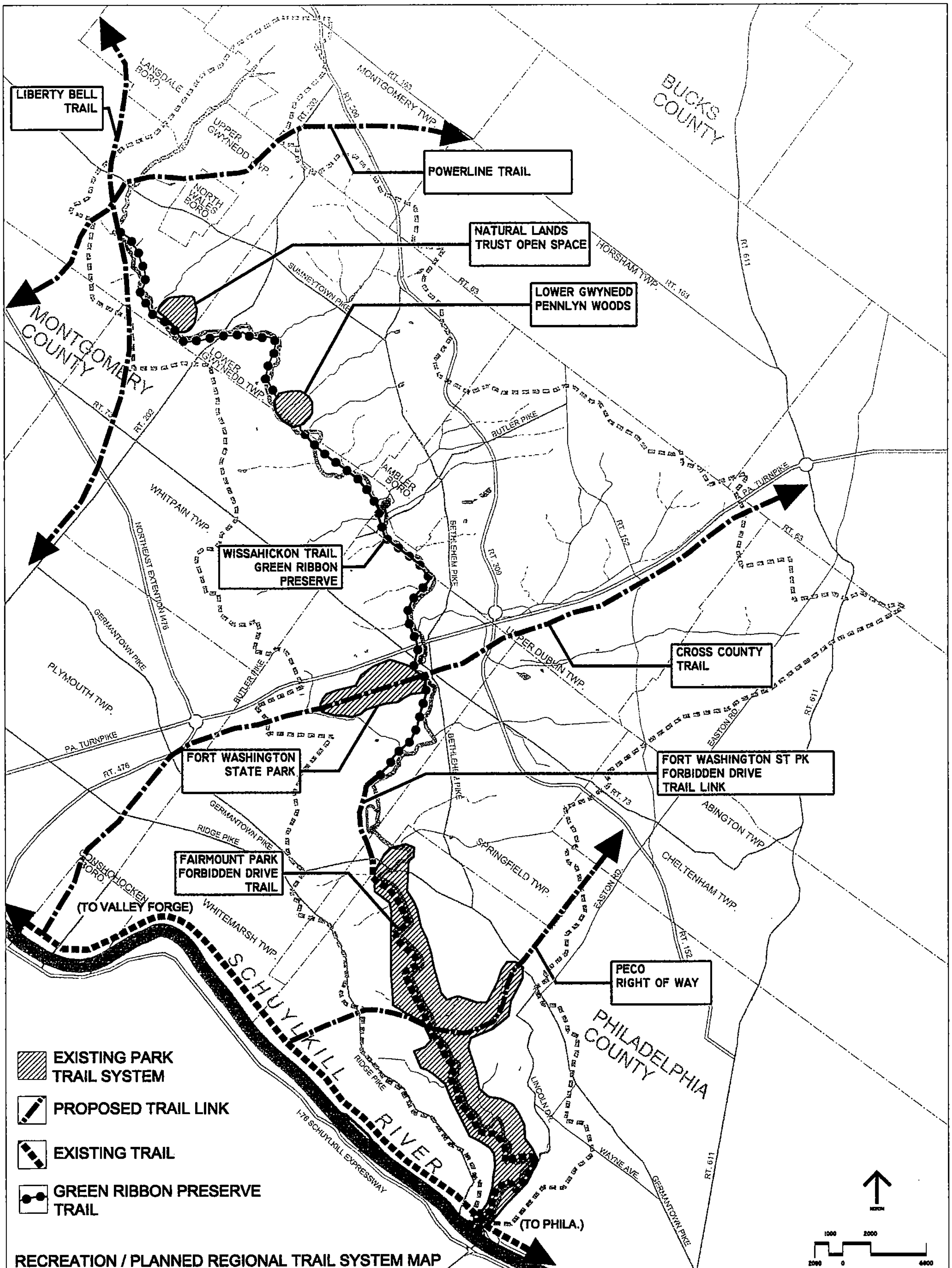
The 483 acre Fort Washington State Park and the adjacent 143-acre Wissahickon Valley Park combine to form a major recreational open space resource in a central location in the Montgomery County-Wissahickon Watershed. Picnicking, hiking, raptor watching, group outings and field games are typical activities.

b. *The Green Ribbon Preserve*

Beginning in 1957, the Wissahickon Valley Watershed Association (WVWA), a non-profit conservation group, has protected or acquired 285 acres in Montgomery County along the Wissahickon Creek corridor. Their intent is to establish a permanent lineal park the length of the creek. Portions of this Green Ribbon are publicly accessible while others are not accessible without trespassing on private property. The combined state, county, local municipal and WVWA land provides protection for approximately 90% of the total 21 mile corridor within the greenway.

c. *Regional Open Space/Trail System*

The Center City Philadelphia to Valley Forge trail was a concept developed in 1976 by the Delta Group principals, who prepared the initial master plan for the Philadelphia Chapter of the Sierra Club. This now operational 22.5 mile long trail was designated as a National Recreation Trail (NRT) in 1994. The same year, the use of the Schuylkill River Bikeway, the only trail developed in Montgomery County, had the third highest visitation among all the county parks.



WISSAHICKON CREEK · RIVER CONSERVATION PLAN

FAIRMOUNT PARK COMMISSION, PHILADELPHIA, PA· MONTGOMERY COUNTY PLANNING COMMISSION WISSAHICKON VALLEY WATERSHED ASSOCIATION· FRIENDS OF THE WISSAHICKON · WISSAHICKON RESTORATION VOLUNTEERS
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Trails offer an alternative to motorized travel to and from work, school, retail or other destinations. Efforts to expand and enhance trail facilities have increased in recent years. Public transportation policy now looks upon bicycling and walking as legitimate forms of transportation due in large part to the federal ISTEA Act of 1991 which provides funding for pedestrian/bicycle facilities to be incorporated into the transportation networks.

The ability of a trail to serve a transportation function is dependent on whether it is readily accessible to people's homes and connects to places where people want to go. DVRPC's 1995 Bicycle and Pedestrian Study for the Philadelphia metro area provides a reference point for identifying routes that people would likely choose if they traveled by bicycle or walked for short utilitarian trips.

The 1991 Pennsylvania Public Opinion Needs Survey for Outdoor Recreational Facilities included 40 categories. The five categories that received the highest percentage responses included bicycle paths, picnic areas, hiking trails, jogging and fitness trails and natural and wild areas. On the Schuylkill River Trail User Survey, 70% were cyclists, 13% were walkers, 10% were skaters, 4% were joggers and 2% in other categories.

Of the total number of visitors to the Montgomery County Park System, about 15% used this trail. Since it is only 1% of the county's park land, the trails are used far more intensively than any other portion of the traditional parks. Trails are extremely popular because they satisfy the interests of a wide range of users: walkers, joggers, cyclists, skaters, equestrians, nature enthusiasts, parents with strollers and physically challenged persons.

There is a strong demand for additional trails in Montgomery County. They serve an ever increasing portion of the county's open space and recreation needs. The trend is not unique to Montgomery County. It also occurs at regional, state and national levels. The limited number of trails must be expanded. While there is strong public support for the trail concept, there are, however, critics and opponents as well.

The Schuylkill Greenway, the name given the entire Schuylkill River corridor between the Delaware River and the headwaters above Pottsville in Schuylkill County, is the "main stem" from which several "spur" greenway connections have been planned. The Wissahickon is one of the major tributaries to the greenway and should be more clearly linked to the Schuylkill Greenway. The greenway connects to the Georgia-to-Maine Appalachian Trail at Port Clinton, PA.

This important greenway initiative was largely the result of the Schuylkill River Greenway Association, headquartered in Wyomissing, PA, a broadly based environmental group, founded by former Reading Mayor, Victor Yarnell, who led the effort to establish the entire Schuylkill River corridor as a greenway.

d. *Existing Trails*

Forbidden Drive in the Philadelphia Wissahickon Park is the most well-known and heavily used trail in the entire Wissahickon watershed. In fact, the intensive usage is reaching a critical level. Conflicts between bikers, hikers, equestrians and the resulting environmental damage that overuse is causing, has led to considerable friction at peak times. A Wissahickon Trails Master Plan, by Simone and Jaffe, was completed in 1996. The recommended separation of conflicting users on the existing trails has been implemented in part, with beneficial results.

In the northern municipalities, a number of successful trails have been implemented. The WVWA trail along the creek in Lower Gwynedd, begins at the Township's northwestern border with Upper Gwynned and runs uninterrupted to the southeast corner at the Whitpain line. The Horseways Trails system is one of the oldest and finest riding trail networks in the Delaware Valley. Horseways marks and maintains their trails. The township's trail system is a more recent development. One objective is to have the trail accessible to all Lower Gwynedd residents and to have it traverse the entire Township and connect to trails in neighboring municipalities.

Coordination between Wissahickon Watershed municipalities is already taking place. The Upper and Lower Gwynedd; Whitpain and Montgomery Townships actively participate in joint efforts to link their trails.

e. *School Recreation Facilities*

Active recreation, including baseball, softball, soccer, football, tennis, track, swimming and basketball/volleyball usually takes place at local high school, junior high school and elementary school sites as well as in municipal parks and playgrounds.

In some cases, local colleges permit the use of campus fields for community sports. The Temple University Ambler Campus, for example, has made the campus available to Upper Dublin soccer players.

In most cases, active recreational needs appear to be met. The availability of public, high quality natural areas for passive use are not generally available. As the average residential property has considerable outdoor space, the need for the normal standards of open space is often questioned. The need for establishing and managing sufficient ungroomed landscape to support hydrologic, wildlife, vegetation, passive recreation and visual goals is another question.

f. *Golf Courses*

There are 10 golf courses in the Wissahickon's Watershed. In many cases, they perform an important role in providing overbank flood water storage such as Whitemarsh Valley Country Club. Their visual quality and recreational value are also important attributes. A number of these courses rank among the highest quality in the U.S.A. There are, however, environmental problems caused by golf courses as well. Runoff-laden with nutrients and pollutants from turf management procedures, high volume and rate of runoff and interruption of streambank woodland buffers where courses abutt creek banks are examples.

g. *Scenic Agriculture District*

The Wissahickon Creek flows through an exceptionally beautiful and uniquely scenic agricultural district in the Paper Mill Run Subwatershed. The Morris Arboretum, the Dixon Estate / Farm, Carson Valley School, Chestnut Hill College and St. Joseph Academy all are part of this special area. The architecture, grazing livestock, expansive rolling fields and long vistas are important attractions to numerous motorists and cyclists who visit this area. A bikeway trail is planned to link Forbidden Drive from Harper's Meadow to Fort Washington State Park. This would traverse this scenic agricultural district. Adjacent to the Dixon Farm, the former Corson's Quarry continues to produce aggregate and other limestone products. The quarry is a major contributor of fresh water, which is pumped to the Wissahickon.

3. Land Use

During the 18th century, land uses in the Wissahickon Watershed were primarily agriculture, quarrying, water-powered mills, inns, taverns and large estates. Throughout the nineteenth century residential development in communities such as Ambler, North Wales and Lansdale, and at crossroads, along major roadways in suburban areas and in the northwestern area of Philadelphia, in Chestnut Hill, Mount Airy and Germantown. Other than the former Roth farm owned by Delaware Valley College in Upper Gwynedd, only a few farms remain in Horsham and Montgomery Township. Agriculture has all but disappeared from the Watershed.

In the early part of the 20th century, a number of major institutions were developed within the watershed. They included the Pennsylvania School for the Deaf, now The Church of the New Covenant in Mt. Airy, Temple University Ambler Campus, originally the Pennsylvania School of Horticulture for Women, Chestnut Hill College, Saul Agricultural High School, Gwynedd Mercy College, Beaver College and Textile College, now called Philadelphia University.

Following the Second World War, a major surge in new single family residential development, coupled with a rapid increase in corporate construction took place. Rohm and Haas, Merck, McNeil Pharmaceutical and Moore Products are examples. This dramatic increase in development had a major impact on the natural systems in the Watershed.

Private open space development, especially the construction of golf courses and corporate campus-style landscapes followed. (Public open space is described in recreation section.)

The area around the Routes 63 and 309 intersection is very heavily developed in commercial and industrial uses. Route 309 north of route 63 is a strip commercial zone of intense development with a very high percentage of impervious cover.

Large scale, multiple dwelling residential developments are existing in Lansdale, The Folkways Retirement Community in Lower Gwynedd, in Chestnut Hill Village and Mt. Airy.

4. Transportation

The watershed is served by interstate, arterial and local roadways, commuter rail and bus service and by trails along the Schuylkill River and the Wissahickon Creek in Philadelphia.

Wings Field Airport in Whitpain Township, provides commuter air service to Philadelphia International Airport. The future use of this large property is of concern to the adjacent community.

Regional highway facilities include Route 309, which runs north - south and intersects the east - west Pennsylvania Turnpike (I - 276) in the middle of the watershed. The area adjacent to the intersection, the Fort Washington Office Center has developed into a major employment site.

Interchanges on the east - west Pennsylvania Turnpike are located just beyond the watershed boundaries in both directions. On the west, the Plymouth Meeting interchange connects to I – 476 to the Philadelphia Airport and I-95, to the south and north to the Lansdale, Quakertown and the Allentown / Bethlehem areas.

Several historical roadways remain as very heavily traveled routes. Ridge Pike, Germantown Avenue, Bethlehem Pike, Skippack Pike, Church Road, Butler Pike and Easton Road all date from before the American Revolution era. A few of the old intersections remain without the typical "sprawl" character. The crossroads at Butler Pike and Susquehanna Avenue is an example of a well preserved intersection.

The heavily used S.E.P.T.A. commuter rail service provides the neighborhoods of Mt. Airy, Chestnut Hill and Germantown with excellent transportation options. The R - 7 and R – 8, Chestnut Hill East and West lines parallel the Wissahickon Creek and Germantown Avenue. The outlying suburban communities of Abington, Glenside, Jenkintown, Fox Chase, Doylestown, Hatboro, Lansdale and North Wales, also have rail service. A new east-west rail system has been proposed and is in the planning stage.

S.E.P.T.A. bus routes provide service to shopping centers and to Center City Philadelphia.

The Schuylkill River trail, West River Drive, Kelly Drive and the Wissahickon Forbidden Drive and bike trails support cycling commuters.

5. **Ordinances**

The development of most of the Wissahickon Creek took place without benefit of stormwater management controls. This has left the municipalities with the dilemma of identifying problems and potential remedies on private properties as well as undeveloped land.

The existing municipal ordinances vary in their level of detail and degree of protection for the water courses and floodplain areas. Most provide controls for 25, 50 and 100 year storm frequencies, but ignore the 1 through 5 year storms, which are the source of most of the severe damage.

Generally, existing ordinances do not promote Best Management Practices such as, bio-engineering, porous paving, roof "meadows" or stream bank and riparian buffer restoration. Prescribing the use of native plants for canopy, understory and herbaceous layers, using species found in natural plant associations could be very beneficial. Permitting the development of appropriately graded areas that encourage temporary ponding of rainwater, (rain gardens), rather than always requiring "positive" drainage, is another technique that would increase recharge.

Limiting the amount of turf grass, on excessive slopes for instance, and where the proposed use of the property does not require lawn as a surface material, could be beneficial. Combining reforestation and meadow landscape for large, unprogramed spaces can improve the health of the environment, and eventually reduce maintenance costs. Planting of existing detention basins should also be part of the retroscape effort.

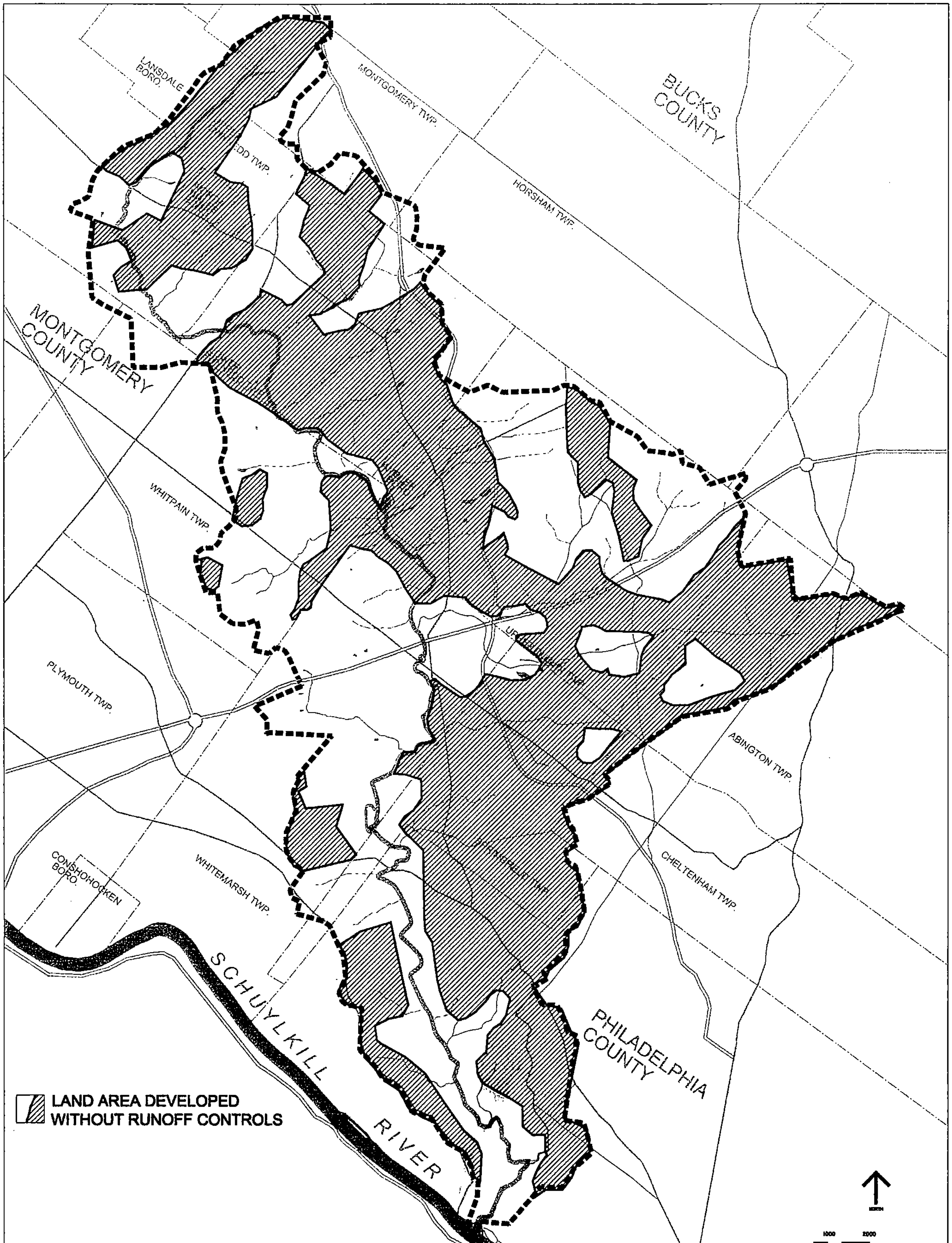
These and other issues relating to ordinances are discussed in further detail, and are found in Section V G. Ordinances.

One of the major recommendations of this report identifies the potential for a watershed-wide ordinance review process which can benefit each individual municipality and their unique conditions, as well as address larger scale issues that could improve the whole Wissahickon Watershed. This is to be found in the Action Plan.

6. **Summary**

The Map on the facing page shows the approximate amount of land developed in the Wissahickon Watershed prior to enactment of stormwater regulations.

This is by far the most telling graphic in this report. It reinforces the conclusion that to repair the damage and heal the wounds of the watershed, finding a methodology to involve private participation in this effort is the most difficult problem all the municipalities' face.



DEVELOPMENT BEFORE STORMWATER CONTROLS

WISSAHICKON CREEK · RIVER CONSERVATION PLAN

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III. GOALS AND STRATEGIES

YOUNG OAK / HICKORY FOREST WITH PLENTIFUL TREE SEEDLINGS AND UNDERSTORY RIVERSIDE, PA

III. RESTORATION GOALS / STRATEGIES

General Watershed Wide Strategies

Restoration of the Wissahickon Watershed can be best viewed as integrating the built environment with the natural systems, open space and ecology of the Watershed to create the most sustainable landscape possible. Restoration involves activities that help mitigate the harmful activities associated with development and human impact. Understanding the ecological and functional characteristics of the Eastern Deciduous Forest is important in achieving successful restoration. Active, physical restoration must be an ongoing process throughout the watershed with the objective of reestablishing appropriate native landscapes that are designed to restore and enhance the ecological functions, diversity and richness of our forests and to improve water quality throughout the watershed. The built or man-made landscape should minimize impacts on those natural resources that are vital to our physical and mental health.

The success of a watershed wide restoration / enhancement effort is dependent on communities working together to achieve a greater common goal. Private landowners as well as municipalities, corporations and institutions are all equal and essential shareholders that must be engaged in order to be successful. A philosophy of restoration / enhancement must be the foundation of achieving a sustainable landscape that will slowly emerge from the step by step process of repairing and healing a severely damaged ecosystem.

The following is and outline of restoration / enhancement strategies that should be incorporated throughout the watershed.

A. Riparian and Woodland / Wildlife Corridor Preservation / Restoration / Enhancement

- *Riparian Corridors*

  A minimum forested riparian corridor is recommended, for the four stream orders, sized to relate to the magnitude of the stream, to buffer streams and associated wetlands, to enhance migration of flora and fauna and to encourage biological species diversity. All communities should work toward restoring and protecting riparian corridors along the streams and swales. The major tasks will be to:

  - Acquire by purchase, gift, or lease available stream corridor property
  - Improve stream corridor and riparian protection ordinances
  - Reforest or enhance stream corridor and riparian habitats
  - Manage invasive species
  - Establish Woodland / Wildlife Corridors
  - Develop upland forest areas
  - Manage utility rights of way to improve habitat quality

  Uninterrupted corridors of woodlands with well-stratified layers of native vegetation are needed to facilitate species migration and genetic diversity. Creating new greenways and enhancing existing corridors are essential to long term stability of the Wissahickon.

B. Streambank Restoration / Bio-Engineering

A significant portion of the Wissahickon's first and second order tributary streams have been severely degraded as a result of land use changes, particularly the conversion of forest to impermeable cover. The cross-sectional areas of these streams are in constant adjustment to accommodate increased flows that result in severe erosion and sediment loading throughout the watershed and beyond. Regrading of eroded streambanks and establishment of native streambank vegetation through applications of bio-engineering will greatly enhance the bank stability and visual and aesthetic characteristics of the watershed.

- Regrade eroded streambanks and establish bio-engineering stabilization techniques
- Create / improve streambank protection and enhancement ordinances
- Create incentives for privately owned streambank protection and enhancement projects
- Manage invasive species

C. Wetland Creation

Over the last 300 years, the conversion of the Wissahickon Watershed to its present land use and cover has resulted in the loss of many naturally occurring wetlands. These wetlands historically performed many vital hydrological functions throughout the watershed. The creation of new man-made wetlands will be a valuable means of mitigating impacts associated with stormwater and restoring valuable wildlife habitat. Wetlands will help reduce nutrient and sediment loading and reestablish needed base flow to streams. The creation of wetland habitat should be integrated with the creation of BMP's for managing stormwater.

- Develop / improve stormwater management ordinances to improve the habitat value of stormwater basins. See Ordinances

D. Invasive Species Management

Many opportunistic (invasive) species are well entrenched throughout the Wissahickon Valley and several new species are beginning to emerge. These aggressive plants are particularly prevalent on disturbed sites and threaten the stability and biological diversity of native flora. If allowed to continue unchecked, these invaders can rapidly migrate into healthy ecosystems. The management and eradication of exotic invasive species must be closely tied to a reforestation/planting program.

The Fairmount Park Commission through the Natural Lands Restoration and Environmental Education Program (NLREEP) is developing a data base on invasive species management that will be a valuable resource for municipalities and organizations involved in restoration.

E. Bio-diversity Enhancement

Restoration of the watershed must include increasing the diversity and frequency of native species. Documentation of species occurrence from past studies indicate much greater species diversity and occurrence than is present in the watershed today. Many areas undergoing natural succession are suppressed because the availability of appropriate seed sources to further the succession process are no longer available. An extensive program to reintroduce and establish diversity of native species is recommended.

- Establish colonies of native species as sources of restoration/bio-engineering materials

F. Private Land Restoration

Large portions of the open space within the Wissahickon Watershed are in private ownership, particularly residential, industrial and corporate holdings. The majority of these landscapes are managed using traditional practices that could be revised to significantly upgrade the ecological integrity of the watershed. The management practices of these areas could include reforestation and meadow establishment to improve the watershed landscape quality. These activities would:

- Reduce volume and rate of runoff.
- Increase infiltration.
- Eliminate excess impermeable surfaces.
- Reforest unused parcels of land.

G. Hydrologic Management / Stormwater Management

The integration of best management practices (BMPs) into new development as well as redevelopment of existing projects can help restore the hydrologic balance of the watershed. In recent years a wide variety of BMPs have been introduced and proved to provide valuable functions such as:

- Nourishing baseflow to streams by providing more opportunities for rainfall infiltration.
- Reducing pollution by filtering runoff.
- Reducing stream velocities and erosion, by retarding the rate of run off from developed areas.

Many of these measures can readily be introduced into previously developed areas. In fact, since most BMPs incorporate the native vegetation as a functional component, they can also become a means of improving the appearance and livability of urban communities.

BMPs are used most advantageously when they treat runoff near its source, such as the edge of paved areas. Generally, speaking they tend to be small-scale devices that are implemented on privately owned land. The effective use of BMPs requires the widespread adoption of these measures in site design. Therefore, the challenge will be to create incentives for the voluntary construction of BMPs by the residents, businesses, corporations and institutions in the watershed.

H. Restoration / Education / Legislation

Education at all levels will be an important component to establishing a knowledgeable and caring population in order to create a sustainable watershed. Beginning with the youngest classes, school curricula need to be linked to foster an understanding of the natural landscape on which they depend for life. Students should learn how they impact their environment and how they can affect change in positive ways. Local schools throughout the Wissahickon Watershed should adopt their school grounds and local stream corridors and play and active role with an added hands-on dimension to the restoration and care of these landscapes.

- Create school grounds landscape restoration and habitat enhancement projects.
- Integrate restoration and enhancement into school curricula.
- Create school programs where classes become involved with managing local stream corridor.

In large part, the future quality of the watershed will be shaped by the land use decisions and regulations of the municipalities that compose the Wissahickon Watershed. The collaboration of the municipalities, working together to develop strong environmental standards, will play an important role in determining the ecological quality of the watershed. Legislation to protect natural areas and create new ones as part of a normal process will greatly enhance the future watershed quality.

Create / improve Landscape Ordinances to:

- Require use of native species in plant association groups
- Require reforestation of stream corridors
- Shade streets and parking lots
- Create/improve Stormwater Management Ordinances to incorporate BMP's
- Establish Redevelopment Ordinances to upgrade site standards

I. Stream Monitoring

- Developing an effective stream monitoring program that integrates volunteer monitoring activities with qualified technical analysis will be an important component of a restoration plan.

IV. ORGANIZATIONS INVOLVED IN RESTORATION AND BEST MANAGEMENT PRACTICES

VOLUNTEER RESTORATION STUDENT WORKERS CRESHEIM CREEK SUBWATERSHED

IV. ORGANIZATIONS INVOLVED IN RESTORATION AND BEST MANAGEMENT PRACTICES

Landscape preservation, restoration / enhancement and management projects that promote a more sustainable landscape have been ongoing throughout portions of the watershed by several organizations and institutions. Although these projects and activities are often small in context to the larger watershed, they represent a significant commitment toward achieving a healthier and more sustainable watershed system. These projects also represent a significant pool of demonstration issues in landscape restoration/enhancement and management and will become models and educational tools for implementation on an even larger scale throughout the Wissahickon Watershed. The following institutions and organizations have been instrumental in promoting a restoration ethic in the Wissahickon Watershed:

A. Not-for-Profit Organizations

1. Friends of the Wissahickon

For many decades, the Friends of the Wissahickon have been actively pursuing reforestation within the Fairmount Park portion of the Wissahickon Valley through the Friends general membership. Within the past 6 years, the FOW has established the Wissahickon Stewardship Program (WSP), a Community Based Natural Resource Management Program (CBNRMP), for the purpose of involving community groups in vegetation management and reforestation activities. The WSP program has engaged several local schools to adopt and manage portions of subwatersheds within the Fairmount Park section. The emphasis of the restoration activities have been on establishing native canopy species in forest gaps and the management of invasive exotic species, particularly Japanese Knotweed, which displaces native flora and fauna.

2. Wissahickon Restoration Volunteers

The Wissahickon Restoration Volunteers is a recently formed organization with the sole mission of playing an active role in the restoration of the Wissahickon Valley. Activities have been focused on forest restoration, vegetation management and control of invasive species, trail restoration and public outreach. The WRV has been actively coordinating volunteer groups to facilitate restoration projects. This coordination is an important function necessary to achieve restoration and a means to educate the public. Although past activities of the WRV have been focused primarily in the Fairmount Park portion of the Wissahickon Valley, great benefits would result from expanding this program, or developing one like it, throughout the entire watershed.

3. Morris Arboretum

The Morris Arboretum, in conjunction with the Patrick Center for Environmental Research and the Schuylkill Riverkeeper, has recently implemented a 900 lineal foot demonstration riparian corridor/streambank restoration project along the Paper Mill Run. Funding is from the EPA and USDA Urban Forestry Council. This can be a valuable prototype example of riparian restoration and management techniques.

4. Wissahickon Valley Watershed Association

The Wissahickon Valley Watershed Association historically has been very successful and actively involved in land preservation through acquisition and the establishment of easements on environmentally sensitive properties. Recently, the WVWA has created a new land manager position with the intent of becoming more actively involved in land management and ecological restoration.

The association is also heavily involved in educational programs for school children in the region. They have also led efforts to convince corporations to develop programs to improve or create habitat enhancement projects with considerable success.

B. Educational Institutions

1. Temple University Ambler - Department of Landscape Architecture and Horticulture

Through the Department of Landscape Architecture and Horticulture, a master plan for riparian zone restoration and open space management has been prepared for the 187 acre campus. Riparian corridor reforestation and management of previously mown fields as herbaceous meadows have been initiated. The LA / Hort department is also working with the Center School located in the upper reach of the Sandy Run Watershed to develop a restoration and management plan for the school grounds. A native plant nursery, operated by the Temple horticultural staff, provides woody native plants for restoration efforts.

2. Robins Park Environmental Education Center

Robins Park has been actively involved in forest restoration and environmental education in Upper Dublin Township. It is also adjacent to the Temple University Ambler Campus.

3. Delaware Valley College

Delaware Valley College owns and operates agricultural programs at the Abraham Roth farm in Upper Gwynedd. Restoration training programs could be introduced into this curriculum.

4. WiSP Institutions

The following schools have adopted watersheds and are currently involved in restoration and management activities under the Friends of the Wissahickon Stewardship Program:

Saul High School
Springside School
Philadelphia University
Chestnut Hill Academy

C. Cities / Townships / Boroughs

1. City of Philadelphia Fairmount Park Commission

The Fairmount Park Commission is implementing a 26 million dollar grant from the William Penn Foundation to provide urban wildlands restoration and education within Philadelphia. The Natural Lands Restoration and Environmental Education Program (NLREEP) will utilize a portion of these resources for restoration in the Philadelphia section of the Wissahickon Valley. A pilot reforestation project was implemented in the fall of 1998 near the Walnut Lane Bridge, along Forbidden Drive. This model reforestation project includes both an enclosed (exclosure) reforestation area and an unfenced portion to determine the impact of deer browse on reforestation activities.

The Fairmount Park Commission has also been actively involved in stormwater management including projects near the Walnut Lane Bridge, the Bluestone Bridge, the Monastery and along Forbidden Drive.

2. **Office of Watersheds, Philadelphia Water Department**

The newly formed Office of Watersheds is very active in promoting, funding and coordinating restoration projects throughout the City's watersheds. Active projects include the design and installation of a constructed treatment wetland to remediate water quality impacts at a combined sewer overflow impoundment basin on the Pennypack Creek Watershed. On the Wissahickon Creek watershed, the Office is completing a project to identify and eliminate sanitary sewer cross-connections. Hundreds of restoration projects have been identified and are being prioritized by the Office for implementation. These include wetland creation, stream-bank stabilization, dam removal, reforestation, and open-space rehabilitation on vacant public land. Funding is through State and Federal programs including Section 319, Non-Point Source Implementation Program, NLREEP, and Pennsylvania Act 339, Sewer Treatment Plant Operations Grants.

3. **Shade Tree Commissions**

Many of the municipalities in the watershed have shade tree commissions. These groups can fill an important role in improving landscape standards for redevelopment projects and promoting urban reforestation initiatives.

D. Businesses and Corporations

A number of businesses and corporations in the watershed have been active in restoration activities. Corporations often control large parcels of land, much of it managed as high maintenance landscape, that provide real opportunities for restoration. Example completed projects are:

1. **McNeil Consumer Products**

McNeil Consumer Products has been managing several acres of their corporate campus as meadows and successional fields. Tree planting and reforestation activities have been ongoing in several of the wet area habitats.

2. **McNeil Pharmaceutical**

McNeil Pharmaceutical has been managing several acres of their corporate campus as meadows and successional fields.

3. **Rohm and Haas Company**

Rohm and Haas has developed and manages fifteen acres of their corporate Spring House campus as meadows and successional fields. The project includes warm season grass and wildflower meadows, stream corridor buffers, upland and wetland forest groves. The area was previously maintained as mown turf grass lawn. The installation was primarily done by volunteer employees of the Rohm and Haas Company led by staff and a professional consultant, over three successive years.

V. TOOLS

NATIVE PLANT NURSERY – TEMPLE UNIVERSITY AMBLER CAMPUS

V. RESTORATION IMPLEMENTATION TOOLS

In order to implement the restoration strategies outlined in Chapter III: Restoration Goals and Strategies, a series of restoration implementations tools must be developed. Tools discussed cover a range of activities, including the acquisition of key open space; hands-on physical changes of the landscape with an emphasis on the use of best management practices; developing appropriate ordinance programs and finding incentives that will encourage interest and participation by individuals, organizations, businesses and municipalities.

A. Open Space Acquisition

1. There are often very good reasons to acquire land. Among the most important reasons are to create linkages, to protect important resources or to provide recreational uses and access. There are several ways that open space land can be acquired:

   - *Easement* - This method does not require purchase of the property. An agreement is concluded to permit use of the site either free or by paying a rental fee. Usually a time limit is part of the agreement . Many utility rights-of-way and abandoned railroad corridors are used to create trails or greenways. Public access is not a requirement of an easement agreement, which can be for landscape conservation and preservation.

   - *Fee Simple Purchase* - The outright purchase of the property for an agreed sum is the most permanent and clear cut solution.

   - *Donation* - The gift of a parcel of land can be negotiated to include a tax incentive for the Donor.

   - *Grant* - The acquisition of land by means of an open space grant is another technique. The Montgomery County Open Space Program, which includes a $100 million dollar grant program, has assisted many municipalities in acquiring open space. Upper Gwynedd Township has recently purchased a 2.5 acre parcel in the Headwaters of the Wissahickon, making an important link in the "Green Ribbon" Park. Funding was provided by the County Open Space Program.

   - *Cluster Development* - This form of development often yields public open space, made available through the site planning process. The inclusion of usable, accessible, high environmental quality areas of the site rather than only unusable portions is recommended.

B. Landscape Modification / Restoration

One of the most straightforward and beneficial implementation tools for improving the quality of the watershed environment is through the restoration of native landscapes. These include:

1. **Meadow Development**

A particularly useful landscape improvement tool is the development of, tall warm-season grass or wildflower meadow on areas of previously unused lawns. Most people are unaware that over-use of lawn grasses also contributes to environmental degradation caused by soil compaction (mowing when wet), increased runoff, pollution from herbicides, fertilizer, lime and the use of a great deal of water if irrigated.

2. **Forest Development / Reforestation**

Reforestation of unnecessary large lawn areas is also of great benefit to the environment, providing cooling, reduction of runoff, increased percolation, habitat for wildlife, privacy and reduced maintenance. Working with the natural processes of forest succession and use of the appropriate native plant species which grow together in nature, makes for a more successful project. Planting riparian buffers with native plants along existing drainage swales or intermittent streams are the most easily accomplished way to contribute to the health of the stream corridor. No regrading will be necessary in most cases.

3. **Wetland Creation**

In recent years, the concept of creating wetlands to mitigate (repay the environment for losses of natural wetlands in development projects) has greatly increased. This involves the excavation and regrading of a land area to create the containment of storm water and to provide a shallow 6"-12" zone at the edge for growing emergent plants and deeper water in the central portion of the basin to create fish habitat. This generally avoids problems of children entering the pond, as the emergent zone discourages access. The provision of a smaller basin to intercept the stormwater permitting the settlement of solids prior to discharge into the larger pond is recommended.

C. Bio-engineering Nursery

Many of the ingredients of streambank restoration include bio-engineering materials. The branches of live black willow, elderberry, red stem dogwood and a few other wetland species of trees and shrubs are used to make bundles (fascines), build matting, stakes for reinforcement of banks, and to hold bio-logs in place. These cuttings are intended to take root and become a dense, thicket of the original plant species.

In order to install these bio-engineering restoration devices, considerable cutting material must be available which is generally very difficult to buy or collect. Purchase of stock plants, from which cuttings are taken, can be made from commercial nurseries.

A half acre of moist land, planted in spring with cuttings taken in January and stored in the dark, in moist sand until April, could produce a great quantity of cutting material the following winter. It would also replenish even more cutting material on an annual basis, with very little maintenance.

Woody plants (native trees and shrubs) could be grown in a watershed wide nursery, purchased locally or contract-grown for reforestation work, but the bio-engineering materials would best be grown in the above described manner. The Temple University Native Plant Nursery could be a good source of locally grown native plants.

D. Invasive Plant Management / Testing

One of the most difficult problems involved in the management of urban " natural" landscapes is controlling or eliminating exotic invasive plant species. Many of these invaders are extremely competitive, able to reproduce from seed, rhizomes and cuttings. Several were actually introduced to America by nurseries and plant collectors.

Japanese knotweed is one of the most serious, and is resistant to many control measures. It is so strong, in fact, that it has been known to grow through asphalt paving. This plant, thought by many to produce infertile seed, has proven to be highly successful at reproducing from seed, when tested by the Temple University Ambler Nursery in 1998.

It is recommended that a number of test plots be established and several control measures and techniques be applied and evaluated for knotweed and other major problem species such as Norway maple, ailanthus, honeysuckle, multiflora rose and porcelain berry. Physical removal to a depth of 6" to 8" followed by herbicide spraying of the new emerging growth is the most generally preferred management technique.

E. Best Management Practices (BMP's)

The effective use of BMPs begins with the preservation of existing features of the landscape that perform vital functions. In particular, natural depressions and vegetated waterways provide opportunities for rainfall to infiltrate, filter runoff, and transition flow into the receiving streams. Where possible, these should be preserved and integrated into site plans. Frequently, the best place to site a BMP, such as a rain-garden, will be in these low-lying areas.

Designing with BMPs is always less intrusive than conventional approaches using centralized dry detention ponds. Furthermore, BMPs can be combined to create systems or "treatment trains" that replace many of the hydrologic functions lost during the development process. No site is too densely developed that BMPs cannot be found that will improve the character of runoff.

The following is a summary of BMPs that may be suitable for a variety of settings throughout the watershed. Descriptions of these BMPs can be found in the new "Pennsylvania Handbook for Best Management Practices in Developing Areas" (PACD, 1998). Starred measures (*) are well suited to retrofit installations in previously developed areas. The suitability of measures in parentheses will depend upon a sites hydrogeologic characteristics.

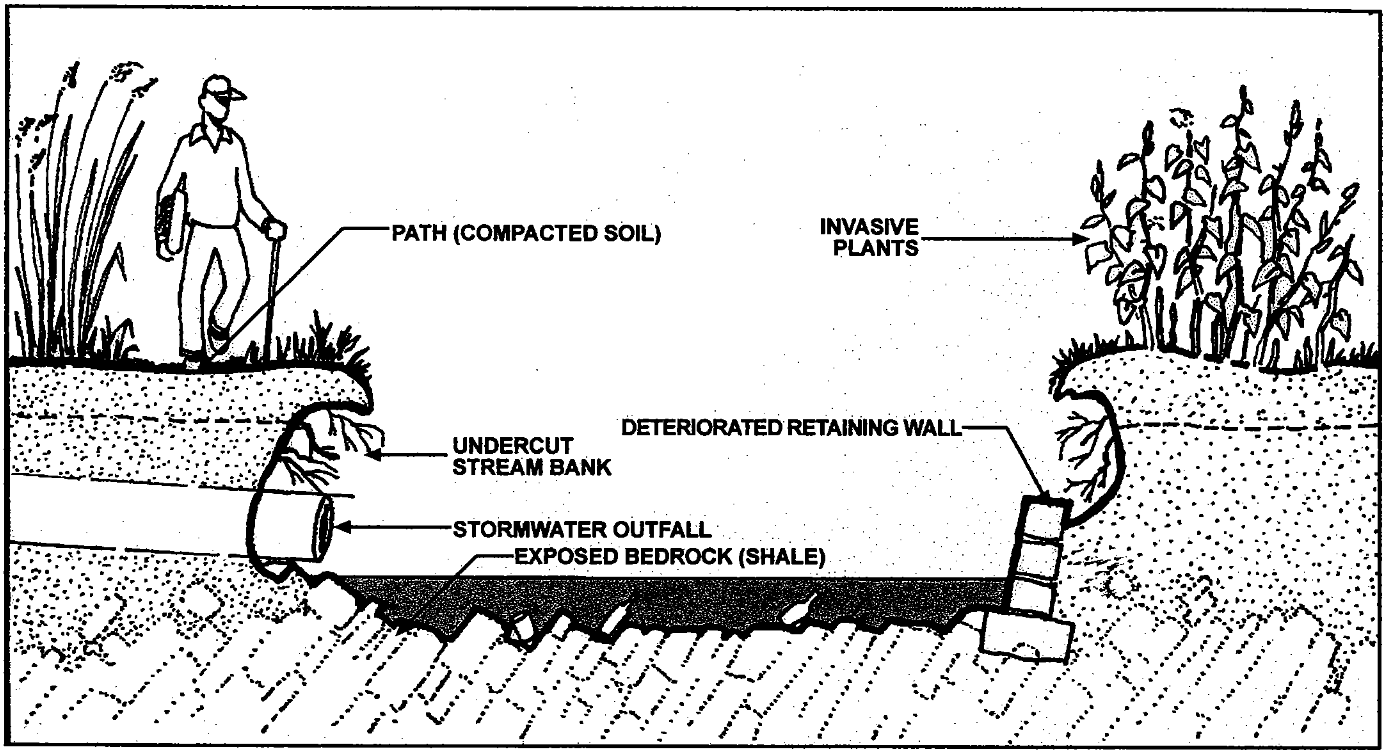
- Residential Development
  - Wooded Filter Strips
  - Rain Barrels
  - Bioretention Terraces (a.k.a. rain-gardens)
  - Vegetated Swales
  - Bio-retention Cul De Sac Islands
  - Large Bio-retention Facilities [1]
  - Extended-Detention Ponds [1]
  - Open Sand Filters
  - (Infiltration Trenches and Galleries)
  - (Dry Wells)
  - (Wet Ponds)[1] These can be created by modifying existing dry detention ponds

- Institutional and Commercial Developments
  - Vegetated Roof Covers
  - Bio-retention Parking-Lot Islands [1]
  - Open Sand Filters
  - Large Bio-retention Facilities [2]
  - Extended-Detention Ponds [2]
  - Permeable Pavement [3]
  - (Infiltration Trenches and Galleries)
  - (Dry Wells)
  - (Wet Ponds)
  - (Constructed Wetlands)

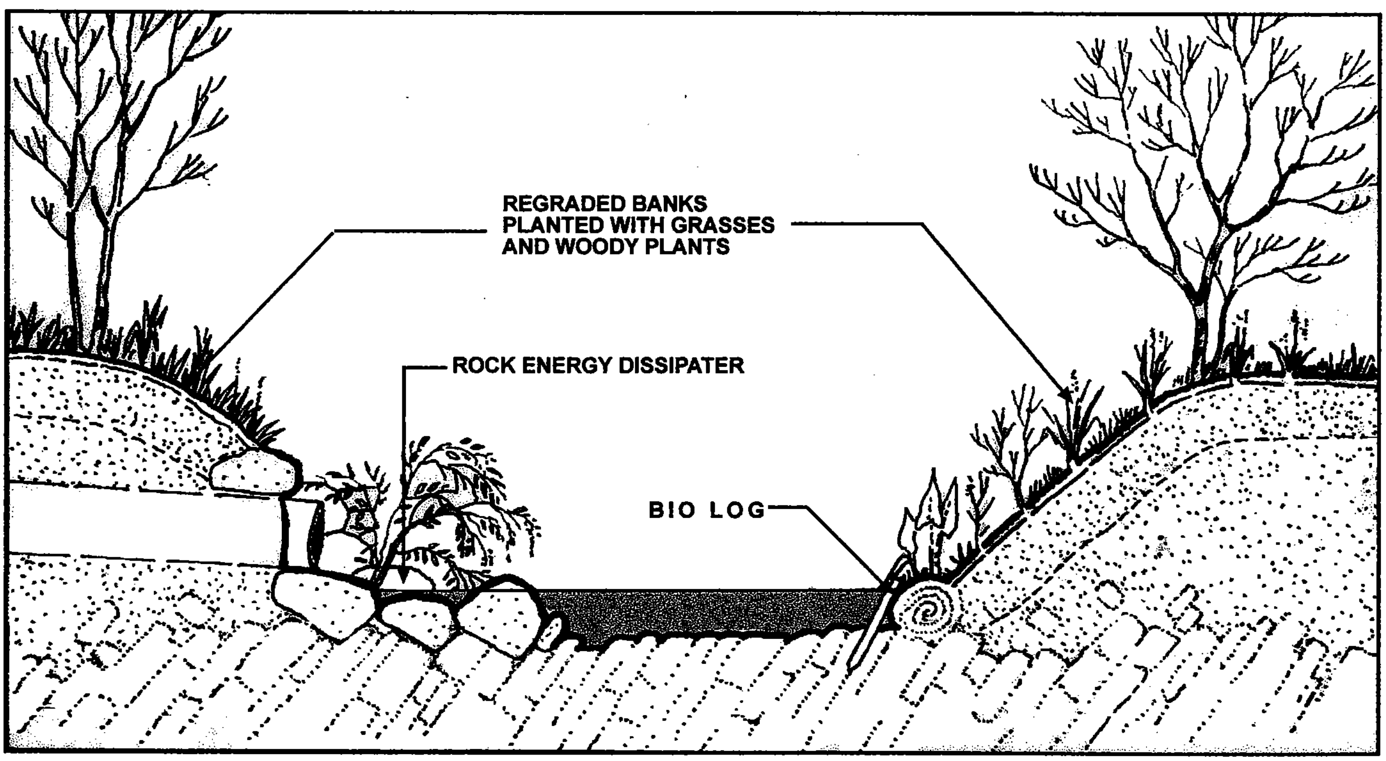
  [1] Retrofit is feasible at locations where curb inlets are located next to existing landscape islands.
  [2] These can be created by modifying existing dry detention ponds.
  [3] Institutional sites only.

- Tributaries in the Riparian Corridor
  - Grade Control Structures
  - Check Dams and Weirs
  - Current Deflectors (stone or gabions)
  - Outlet Stabilization at Sewer Outfalls

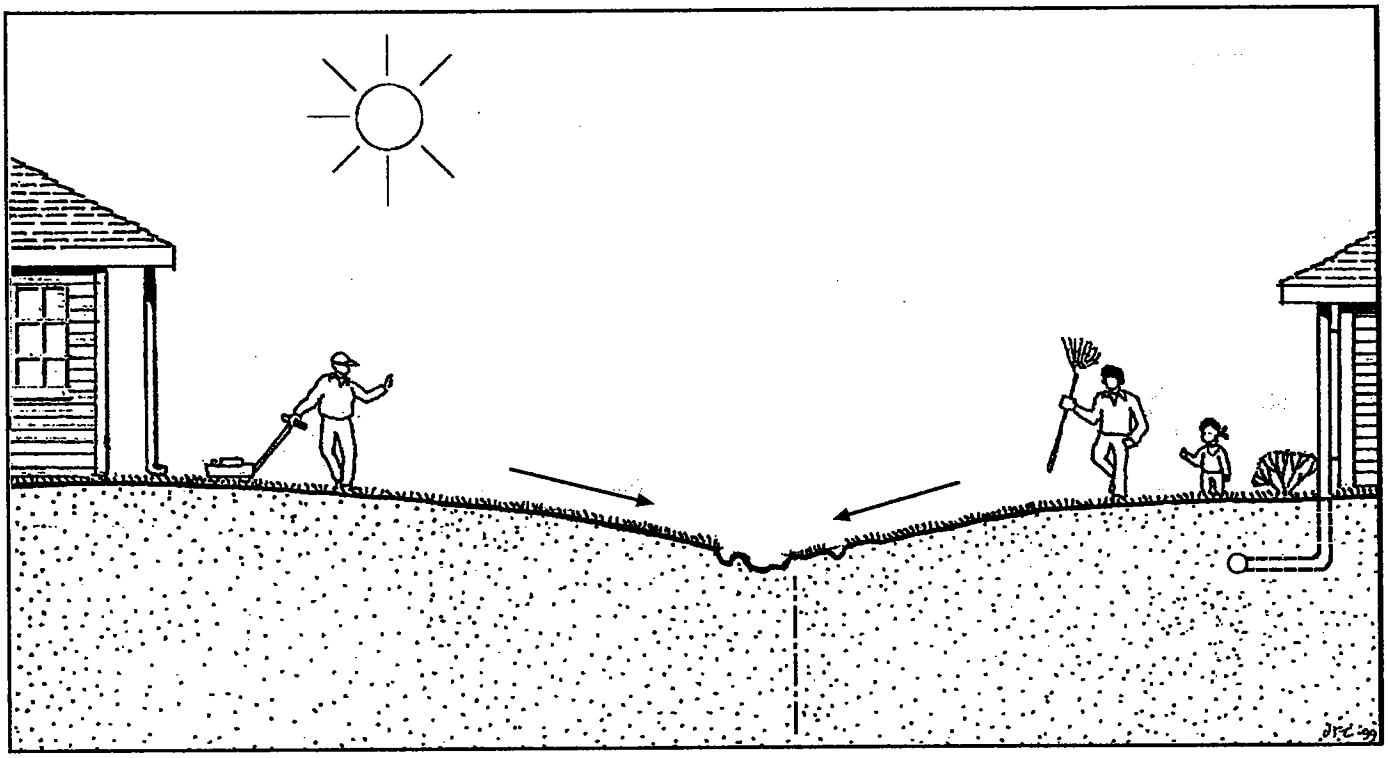
The next several pages show graphically how some of these conditions appear before and after BMP implementation.



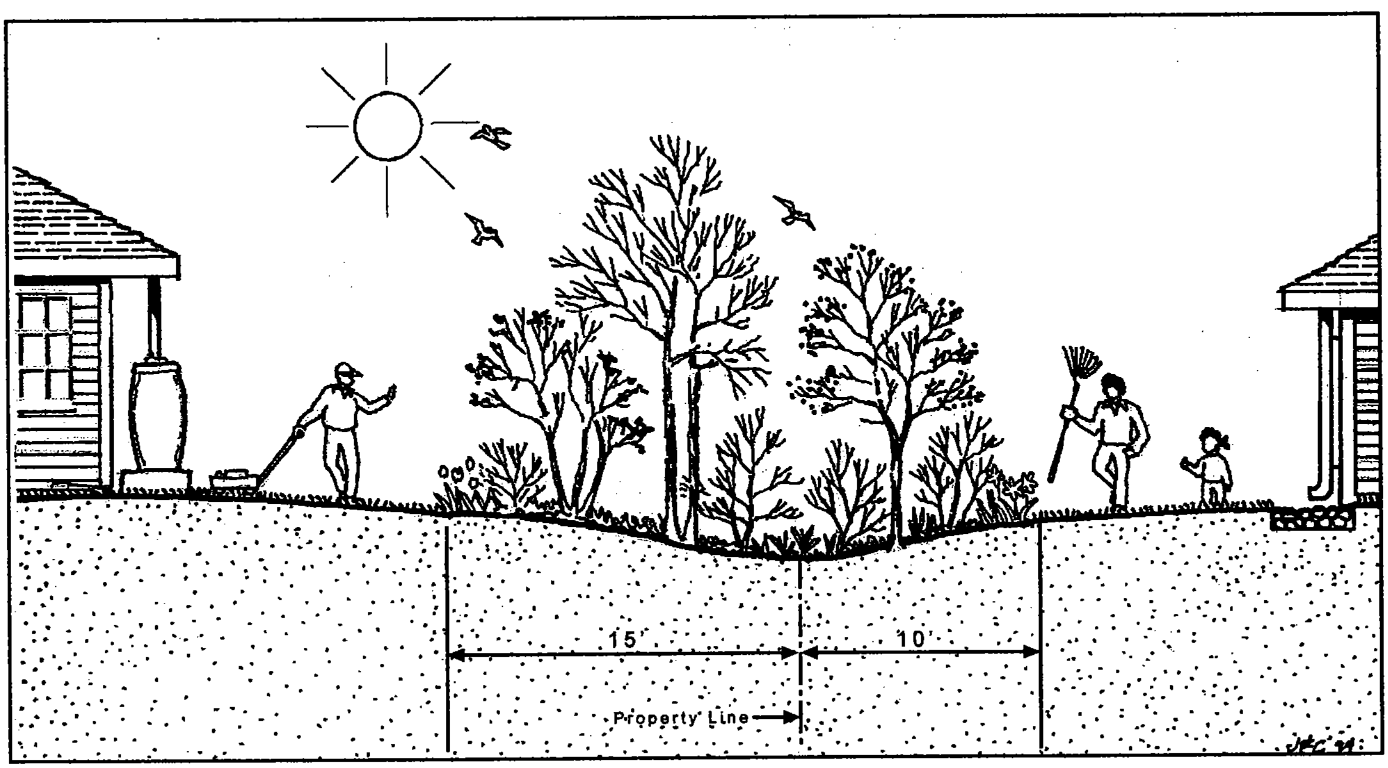
BEFORE: EXISTING STREAM CORRIDOR PROBLEMS
This shows typical conditions in the lowland triassic area.
Stream bottom has been cut to bedrock.
This type of stream is continually being eroded and scoured.



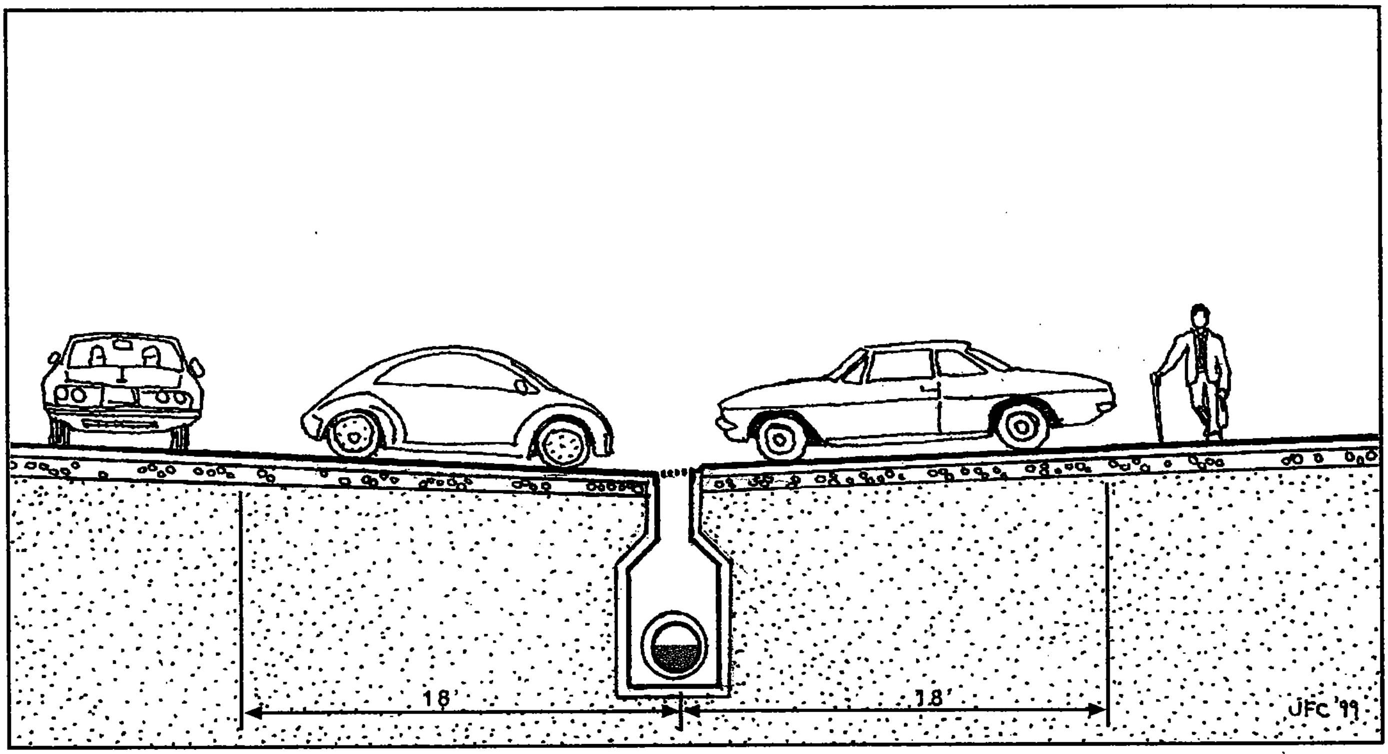
AFTER: RESTORED STREAM CORRIDOR CONDITION
The section shows regraded slopes, reinforced with coconut fiber mesh, a bio-log on the right side to stabilize the slope with a boulder energy dissipater on the left under the pipe outfall. Native woody plants and grasses are used on both bands.



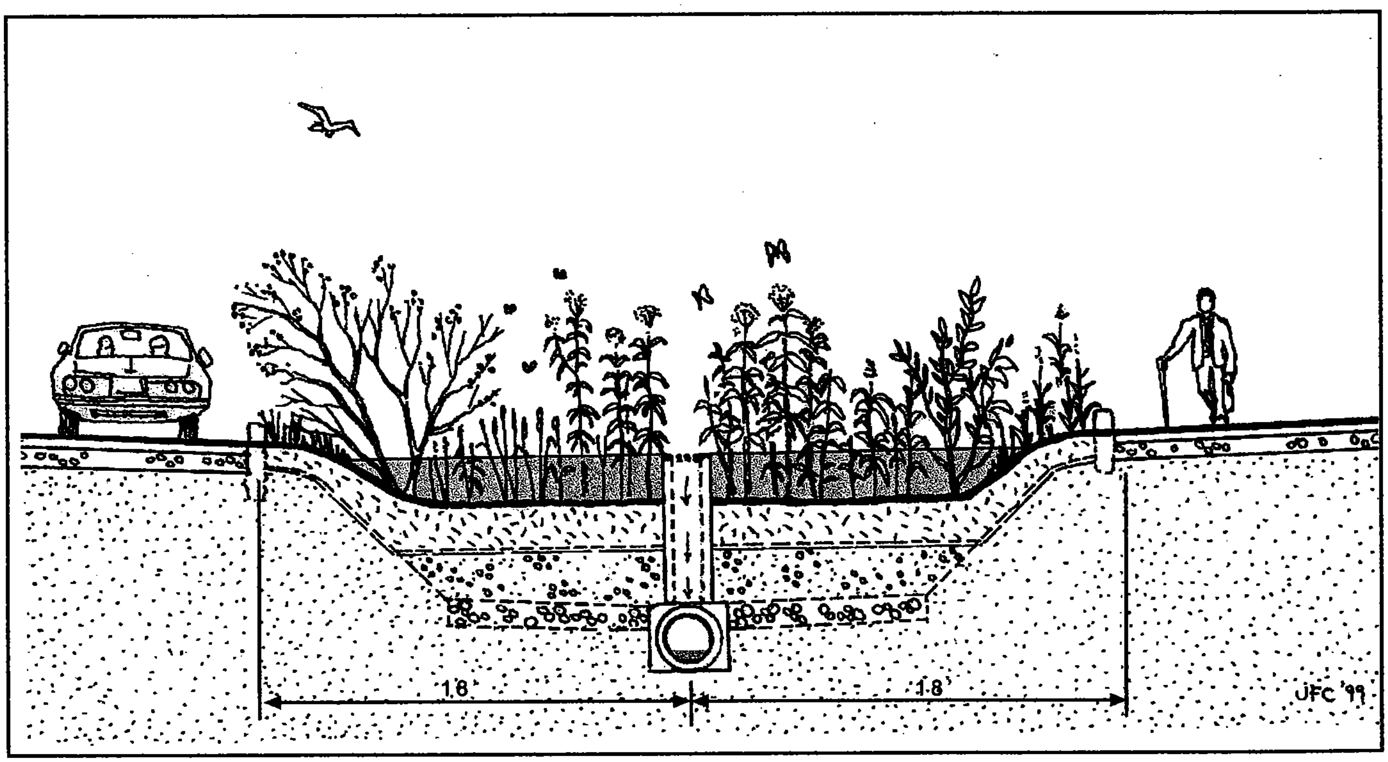
BEFORE: DRAINAGE SWALE IN RESIDENTIAL DISTRICT
Unproductive, no privacy, rapid runoff, erosion, downspout connection to drain system.



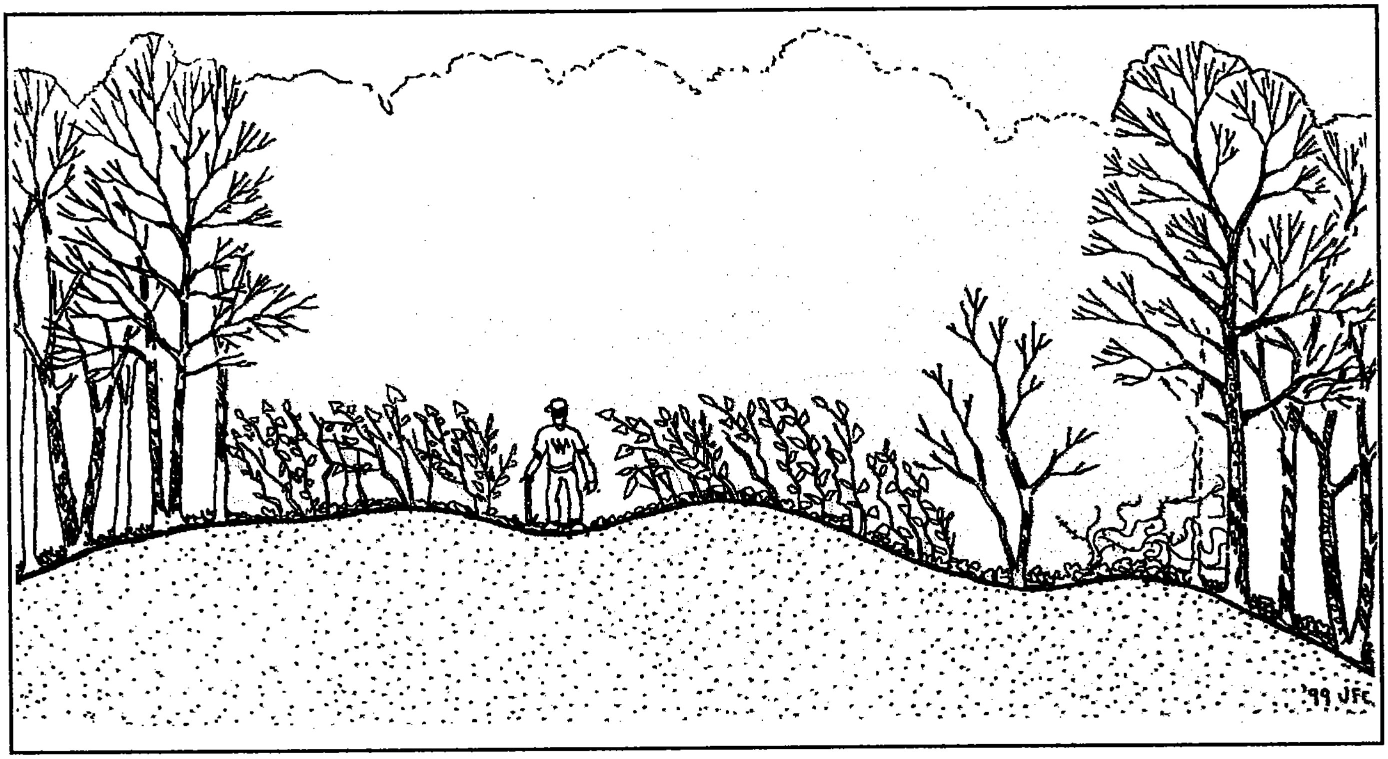
AFTER: VEGETATED DRAINAGE SWALE
Rainbarrel and planting reduce runoff impact, provide privacy, wildlife habitat, and improved water quality filter. Disconnected downspout, outfall into rock energy dissipator



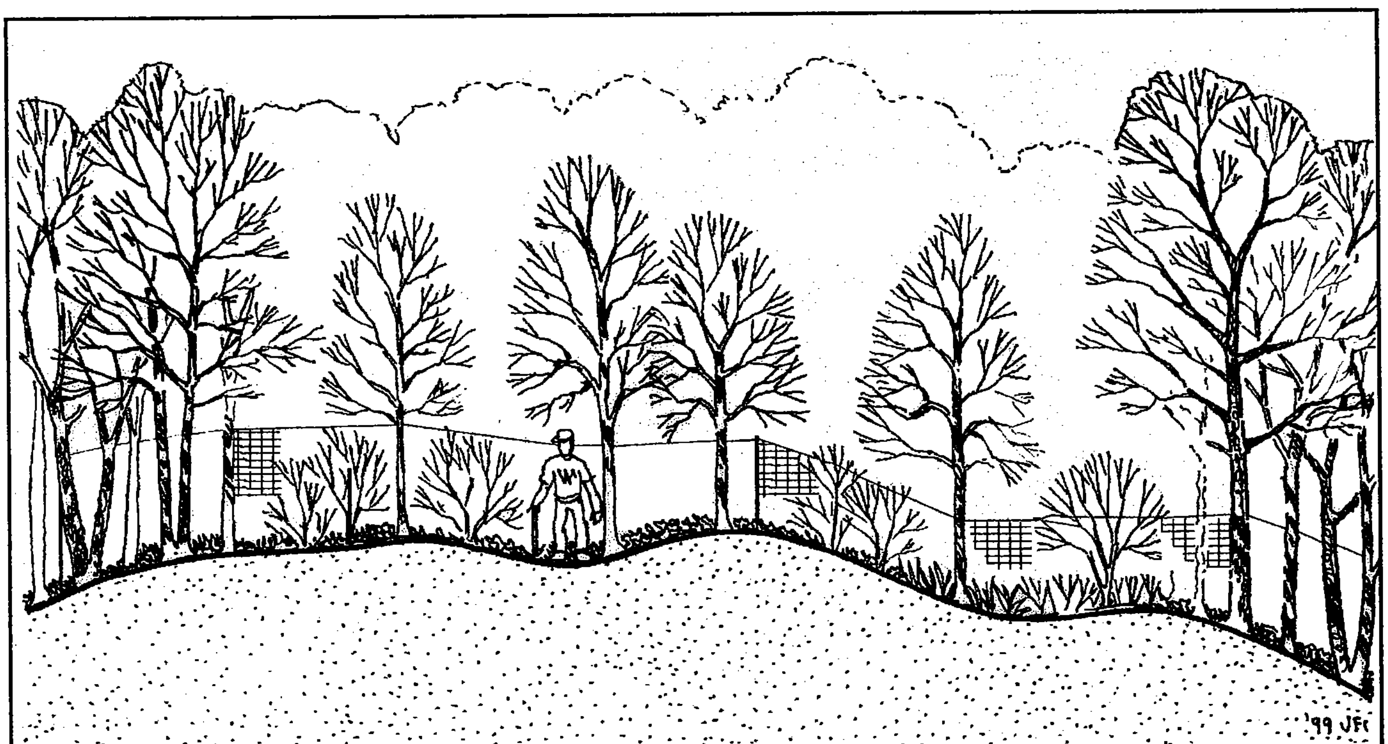
BEFORE: EXISTING PARKING LOT DRAINAGE
Totally impervious surface, no infiltration, total runoff!



AFTER: BIO-FILTRATION POND/WETLAND
Wetland plant species in special soil mix over sand filter bed with geo-textile between soil and sand. This project would require the use of 4 parking spaces in existing lot, 18' x 36' in a new lot.



BEFORE: CANOPY FOREST GAP (UPLAND)
Infestation by invasive exotic plants, erosion of soil, opportunity to reforest with "enclosure" fence protection, to protect new plantings from wildlife predation.



AFTER: REESTABLISHMENT OF ALL FOREST LAYERS
Canopy, understory, shrub and herbaceous layers of plants added after removal of invasives and fencing.

F. Structural Project Implementation

1. <u>Public Works Projects</u>

Administered by the responsible municipality (or shared if there is multiple municipal involvement). Publicly-owned sub-watershed projects can be either modifications to existing development or related to new work.

The larger, more complex projects involving major excavation, grading, construction and bio-engineering effort will require the participation of appropriate landscape architect, civil engineer and wildlife biologist consultant experts. The process would include survey, preliminary design, contract documents and competitive bidding by approved contractors as required for most public work. Formation of a Wissahickon Watershed Restoration Team, sponsored by all fourteen municipalities or other acceptable procedures for handling shared funding and implementation can be worked out on a pro-rated basis.

Created wetlands, ponds, weirs, check dams, culvert reconstruction, major stream bank reconstruction, grading to permit overbank flooding and parking infiltration retroscape efforts would be typical projects in this category.

2. <u>Private Facilities</u>

Improvements to existing privately owned centralized facilities, such as detention basin changes in outlet configurations and the addition of native woody and herbaceous plantings, are examples of the types of modifications that should be made to improve water quality and reduce down stream erosion. Often these earthen "bath tubs" are devoid of visual or wildlife habitat value, which can be greatly improved by the application of design principals and native plant knowledge.

G. Ordinances

One of the most important recommendations made in this plan is to implement strong ordinances for watershed-wide stormwater management controls.

While the perception exists that the watershed municipalities are "built out", there continues to be considerable large and small scale construction / development underway throughout the watershed.

Establishing performance-based regulations on buffers, setbacks, restorative measures, reforestation, habitat protection, stormwater infiltration and on-going management requirements.

The recommended ingredients of a suitable ordinance package are included in the following outline. Input, involvement and approval by all municipalities will be required to develop a fair, understandable, highly effective and meaningful document.

1. <u>Stormwater ordinance</u>

a. *General characteristics*: Stormwater management ordinances should be consistent with the approach presented in the "<u>Pennsylvania Handbook of Best Management Practices for Developing Areas</u>" (1998), that emphasizes control of small storms. By and large it is the uncontrolled small storms that are causing most of the observed problems in the watershed.

Comprehensive ordinances should provide:

- Performance standards
- Appropriate design storms
- Lists of recommended BMP's

Guidelines for the application of various BMPs should respect the specific hydrologic context of various subwatersheds. For instance, infiltration BMPs will afford greater value when applied on subwatersheds underlain by moderately well drained soils associated with weathered schist or carbonate bedrock, the two southernmost geological types. In Whitemarsh Township, bio-filtration is not seen as desirable, as the limestone bedrock is prone to develop sinkholes, causing considerable problems similar to the Ridge Pike sinkhole, which developed a few years ago west of Joshua Road. BMPs provide a range of functions, including:

- Attenuating peak runoff rates
- Infiltrating runoff
- Minimizing sediment transport and preserving water quality

The Handbook provides guidance for the selection of appropriately sized design storms to evaluate each of these functions. The effective application of BMPs in many townships will require changes to existing ordinances. At present only Upper Dublin Township has enacted a stormwater ordinance which incorporates explicit criteria for water quality protection and runoff retention, as well as the attenuation of peak runoff rates. This ordinance was adopted in 1998.

b. *Reassess Stormwater Management Objectives*

Many municipalities already have a significant investment in open space and in stormwater management facilities. In these communities, opportunities to mitigate impacts to the Creek may be generated through a reassessment of stormwater management objectives. This is particularly true where the management of runoff peak rates has been focused on the large storms (e.g., 10- to 100-year return frequency storm. Evaluation of the performance of stormwater management facilities will frequently identify chronic problems associated with small storms which are not effectively controlled.
By relaxing detention requirements for large storms, it may be possible to optimize stormwater controls to achieve overall improvements in flood or erosion-related problems. In general, municipalities will benefit by improving control of the small storm event and by instituting appropriate measures to safely release the large storm (e.g., flood proofing and levees at critical locations).

c. *Requirements for Redevelopment*

Many existing impacts on the watershed are the result of development, which occurred prior to ordinances requiring runoff peak rate controls. Since the Wissahickon Creek watershed is mostly developed, ordinances that only address runoff controls on new construction will not be sufficient to mitigate these impacts.
One approach is to require commercial and industrial properties that undergo redevelopment to install measures that control runoff peak rates and runoff infiltration to <u>predevelopment</u> levels. In highly developed subwatersheds, the control of storms larger than the 1and 2 year frequency may be impractical. However, given the importance of storms of this size and smaller, in determining the hydrology of streams, measures addressing the frequent storms can be extremely beneficial. The ordinance adopted by Montgomery Township requires that post-development runoff peak rates be controlled to levels which are lower than existing (developed) conditions. However, this ordinance has yet to be tested in a redevelopment scenario. The Montgomery Township ordinance is particularly interesting since it includes an implied incentive; developers that control runoff peaks to existing levels through the installation of on-lot BMPs (other than detention ponds) can avoid more stringent detention requirements.

d. *Requirements for the Management of Roof Runoff*

Roof runoff is a critical factor in increasing runoff peak rates. Direct connection of roof spouts to storm sewers, although a requirement in all but one municipality, should be eliminated as a practice where possible. Outside the City of Philadelphia, most roof runoff is currently managed in an inconsistent manner. This is due to the fact that many developments were completed before the new ordinances requiring connection to storm sewers were enacted. Furthermore, many lots are too distant from sewer lines to allow connection. For this reason, it may not be difficult to revise policy regarding roof runoff management in neighborhoods.

A range of roof runoff control measures are available, including: establishing minimum setbacks from stream banks for the discharge of runoff from roof spouts, minimum travel path lengths across vegetated open-space for roof runoff, or the installation of cisterns, rain barrels or dry wells (only where soil and geology permit). Not all measures will be appropriate for all subwatersheds.

e. *Requirements for Agricultural Lands*

In a few areas of the Wissahickon Creek watershed, isolated farmlands continue to coexist with suburban development. To protect the water quality of down grade streams, these areas should participate in the USDA soil and erosion control program and implement active farm Conservation plans filed with the respective township. Townships should require these plans be updated to include stable crop rotations, contour terracing, vegetated buffers (either permanent hay or forested strips) and integrated pest management (IPM) programs.

2. **Stream Corridor Protection Ordinance**

Existing floodplain zoning districts and local ordinances intended to protect floodplains focus on the need to insure the safe conveyance of stormwater and prevention of flooding. For the most part, these do not impose strict limits on the landscaping, grading or filling of floodplains, provided the capacity of the streams to convey stormwater flow are not impeded. In the mind of most watershed residents, the floodplain is either a wild area that should be tamed by grading and landscaping, or a place to "dispose" of runoff. In particular, it is common for residents with homes butting the streams to clear wooded wetlands and replace them with "manicured" landscapes dominated by turf grass. These changes inevitably increase runoff rates and velocities, and destabilize stream banks. Furthermore, while flood elevations for large storms may not be significantly increased by these activities, the high water conditions during small storms become more frequent and typical flow velocities increase.

Specific prohibitions are required to prevent the filling of the floodplain, the construction of stream bank revetments, and the removal of forested buffers. Where possible, incentives should be provided for homeowners to remove existing walls or rip rap and landscape the floodplain with appropriate native trees, shrubs and herbaceous plants. Guidance is required that will educate residents about the appearance of natural stream corridors and provide aesthetically pleasing landscape alternatives that are consistent with the functions of the floodplain.

Comprehensive floodplain protection provisions are required, if the quality of the stream corridors are to be preserved. These include:

- Lists of recommended and prohibited plant species
- Guides for appropriate landscaping with native plant species
- Prohibitions against any filling within the floodplain, except by special exception
- Prohibitions against the construction of stream bank revetments of any type

- Specific criteria for the construction (and reconstruction) of storm sewer outfalls to streams. These should include specifications for energy dissipation devices and sedimentation controls. Much damage is currently caused by the direct discharge of storm sewers to creeks.

- Specifications for bio-engineering techniques for use in the stabilization of stream banks, the construction of grade control structures, or the installation of silt dams. With few exceptions, bio-engineering techniques are preferable to hard engineering structures, including gabions and riprap.

- Guidelines for the construction of current deflectors

- Develop an erosion control program that addresses specific problems encountered in the watershed.

Grade control structures are effective in arresting the upstream progress of stream bank and channel erosion. They also provide sedimentation control and enhance flood protection in downstream reaches by promoting backwater flooding onto protected floodplains. Grade control structure are already in use on the watershed. In particular, benefits of grade control structures can be observed on the Trewellyn, Cresheim, and "Headwaters" subwatersheds.

Current deflectors, typically constructed from boulder piles or gabions, are measures that can be used to stabilize and rebuild eroded stream banks. The strategic placement of current deflectors will create low-energy eddies along eroding stream banks where sedimentation will begin to rebuild banks. Current deflectors should be used in concert with bioengineering techniques to create permanently vegetated stream banks and point bars. Current deflectors are also useful in narrowing creek channels widened by erosion. As a result, swifter and deeper flow can be achieved during low-flow conditions.

Erosion control measures are needed in upland portions of many drainage basins. In particular, erosion is frequently a problem where road inlets, roof spouts, or parking areas discharge to sloping terrain. Measures are also needed to prevent erosion and gullying along pedestrian trails. Specific standards and guidelines for the protection of these and other vulnerable areas are needed. For instance, an erosion control program should include alternative designs for check dams that are suitable for installation on eroding drainage ways in the watershed.

3. **Landscape ordinance**

Landscape provisions enacted in various local ordinances are usually directed at achieving aesthetic and screening objectives. Environmentally-based Landscape improvement can be an essential tool to promote restoration and conservation of the Wissahickon Watershed. The following characteristics can be gained through adoption of an effective landscape ordinance:

1. Protecting and enhancing the quality of natural areas adjacent to developed landscapes.

2. Creating corridors between preserved open spaces and enhancing the quality of regional ecological systems.

3. Slowing the rate of runoff from individual lots to reduce impact on streams and natural drainage systems.

4. Increasing groundwater infiltration and recharge of the water table.

5. Improving local and regional water quality through bio-filtration. By planting native vegetation in detention ponds, runoff is filtered and outflow is slowed during small storm events.

6. Protecting structural components, such as detention ponds and bio-retention facilities.

Several townships have ordinances which require the construction of landscaped islands in parking areas. However, all existing ordinances are incompatible with the installation of advanced bio-retention islands. These islands have been proven to provide a range of functions, including runoff peak rate attenuation, water quality preservation and groundwater recharge. However, these systems are constructed as depressed rather that raised topographic features and have specific planting requirements that are not compatible with the traditional plant list used in most locations.

An Environmentally Based Landscape Ordinance

Drafting a new landscape ordinance is an opportunity to redefine and shape the landscape in a positive way. A well developed and unified landscape ordinance will be an important tool in the healing process of the Wissahickon. A landscape ordinance should include the following characteristics:

1. Require site landscaping practices that incorporate filter strips with woody shrubs and trees in lieu of turf grasses, and provide depressions and terraced bio-retention areas planted with woody and herbaceous wetland vegetation. The addition of appropriate plantings to existing detention ponds can improve water quality, habitat value and reduce peak storm flow.

2. Require that portions of properties be managed as native woodland communities. Appropriate species and densities need to be defined. These areas should be adjacent to existing natural areas when possible. Woodland plantings will also improve habitat, water quality and infiltration.

3. Require the replacement of any woodlands / trees that are damaged or removed during construction.

4. Require a minimum reparian woodland buffer and filtration strips along all streams.

5. Require shade trees along all streets and driveways, and within and surrounding all parking facilities to provide adequate shading. Parking lot minimum tree spacing of 55' O.C. both ways, or closer, should be established.

6. Reduce the allowable use of lawn chemical herbicides, pesticides and fertilizers, which can cause water pollution and nutrient overloading.

7. Promote the reduction of impermeable surfaces. Porous paving, gravel, ground cover or leaf mulch should be encouraged.

8. Limit the amount of mown turf cover, to accommodate reasonable athletic or social functions, based on slope, soil, shade and drainage patterns.

9. Require removal of existing invasive plant species, which represent forms of biological pollution.

10. Ban the use of invasive plant species, which represent a form of biological pollution.

11. Protect existing vegetation and natural resources during construction or other activities.

12. Define appropriate management of garden mulch, grass clippings, compost / debris to promote nutrient recycling and proper waste management.

The landscape ordinance should specifically address:

- Retention and detention basins
- Parking lots, roadways and paving surfaces
- Streams / Wetlands / Swales
- Existing woodlands
- Roofscape

Landscape ordinances may also be the appropriate place to introduce "good housekeeping" requirements for professional landscape contractors. With the recent boom in residential landscaping, "fugitive" silt and landscape debris are becoming an important part of the sediment delivered to the stormwater management system. Stricter policies for the on-site control of wastes from these small, but ubiquitous, land disturbing operations would reduce the loads on community stormwater management facilities and the receiving streams.

4. **Subdivision ordinance**

a. *Site grading requirements*

In many instances, the grading requirements in existing ordinances will make the installation of advanced on-lot BMPs impossible. In particular, ordinances must be amended to permit grading plans that intentionally retard the rate of runoff, through the use of vegetated depressions, bio-retention terraces and swales.

b. *Cluster development ordinances*

Present cluster development ordinances have been mostly ineffective in preserving functional blocks of open space. Nonetheless, cluster developments do eliminate one common threat to floodplains; the extension of residential lots into the floodplain of Creeks and major tributaries. When floodplains are designated as open space, it is less likely that residents will look on these areas as potential lawn.

For the most part, the potential of cluster development as a mechanism to preserve on-site hydrologic assets has not been realized. Perhaps it would be useful to assess the reasons for this failure and amend cluster ordinances to include appropriate incentives for better site design.

H. Components of Watershed Ordinances

Many ordinances have been enacted in recent years that incorporate provisions for stream preservation, water quality improvement, and baseflow augmentation. The emphasis of these ordinances varies, depending upon the hydrologic setting and upon the perceived needs of the communities.

The process of developing effective ordinances will require coordination among all the municipalities in the Watershed. In order to expedite the process it may be advisable to enact separate ordinances covering individual topics such as:

- New land development projects
- Redevelopment projects
- Floodplain management
- Landscaping

Furthermore, land development and subdivision ordinances should be modified to encourage low-impact design features, including narrower streets, smaller road setbacks, development clustering, etc.

New or revised ordinances in the Wissahickon Watershed should be responsive to the fact that development is already far advanced. Therefore, it is important to encourage preservation of the remaining assets and also to introduce remedial measures. The following is a generalized outline and checklist for ordinance development.

1. **Applicability**

A statement of the types of activities that are regulated by the ordinance. Generally, a threshold area for new or expansion development is included. Projects for which the impervious area additions are less than the threshold are not regulated. Occasionally, this clause can be used to create incentives for low-impact site development. For instance, the threshold area can be increased for projects that incorporate pervious pavement, preserve or restore wooded buffers, or replace turf grass with native vegetation.

The redevelopment of sites that have no previous runoff controls should be regulated. Redevelopment includes site improvements that will replace existing buildings and structures, modify the existing grades, or alter drainage patterns (e.g., changes to gutters, curbs, inlets or storm sewers). A regulatory threshold can be established, based on the percentage of the site that will be affected by the redevelopment. As with new and expansion development projects, incentives can be included that will encourage the use of low-impact techniques. Redevelopment projects should be regulated regardless of whether imperviousness is increased by the proposed activities.

2. **Purpose**

Ordinances that wish to implement the recommendations of the River Conservation Plan should explicitly include the goal of preserving and restoring the riparian corridors of the Creek. This includes management of runoff to arrest on-going streambank erosion and destabilization, baseflow augmentation, protection of water quality, and restoration of wooded buffers. Other goals that are often included in ordinances are:

- Mitigation of existing flood impacts
- Water supply protection

At least one ordinance has a stated purpose of achieving “no net increase” in nonpoint source pollution, sediment loading, stream channel erosion, and runoff volume.

3. **Compatibility With Other Permits and Ordinance Requirements**

In general, it will be necessary to describe how the provisions of the new ordinance will influence the requirements for site plan approval, zoning approval, land disturbance permits, etc. Also, some communities may participate in Act 167 stormwater management studies or develop comprehensive watershed management plans. These may include specific requirements for release rates and nonpoint source BMPs for water quality remediation.

4. **Definitions**

Clear definitions for technical terms are essential for the unambiguous interpretation of ordinances. There are a number of unconventional definitions that apply to BMPs. The following definitions are particularly useful in defining BMP design and performance criteria:

Water quality velocity: The flow velocity experienced within a water quality BMP during the water quality design storm.

Water quality volume: The total volume of runoff that is delivered to the inlet of a water quality BMP during the course of the water quality design storm.

Runoff capture volume: The minimum volume of rainfall that can be retained on-site. It is also equal to the rainfall quantity associated with the runoff capture design storm.

Retention volume: The water storage volume for which there is no outlet except for vertical percolation to subgrade soils or to an engineered underdrain system.

Detention volume: The water storage volume for which outflow is constricted by a hydraulic outlet.

Extended detention volume: That portion of the detention volume that will require at least 24 hours to drain via the hydraulic outlet.

5. **Design Criteria**

a. *Design Storm*

In general, four types of design storms should be specified. In order of increasing magnitude, these are the:

- Runoff Capture Design Storm
- Water Quality Design Storm
- Detention Storm
- Spillway Design Storm

An approach for selecting appropriately sized design storms is provided in the recently published "Pennsylvania Handbook for Best Management Practices in Developing Areas". Detention storms should include the 1 and 2 year return frequency storm, since these events most influence the evolution of streams and creeks. On the other hand, detention measures for the 25, 50 or 100 year storms may be limited to "flood mitigation districts." These are areas that are presently experiencing flooding impacts. This approach is consistent with recent guidelines from PADEP.

b. *Performance Objectives*

The performance objectives are important to engineers who wish to comply with ordinances with BMPs or approaches not specifically addressed in the ordinance. A well-drafted Performance Objectives section will encourage innovative and creative solutions to site design problems. Examples of performance objectives are provided below.

c. *Groundwater recharge*

- Preserve the same volume of infiltrated rainfall as in pre-development condition (based on average annual rainfall)

- Retain first ¾ inch of rainfall on-site

d. *Water quality*

- The quality of water discharged should support an unimpaired aquatic community (based on rapid stream assessment technique)

- Insure clear-water discharge at the site boundary for all design storms

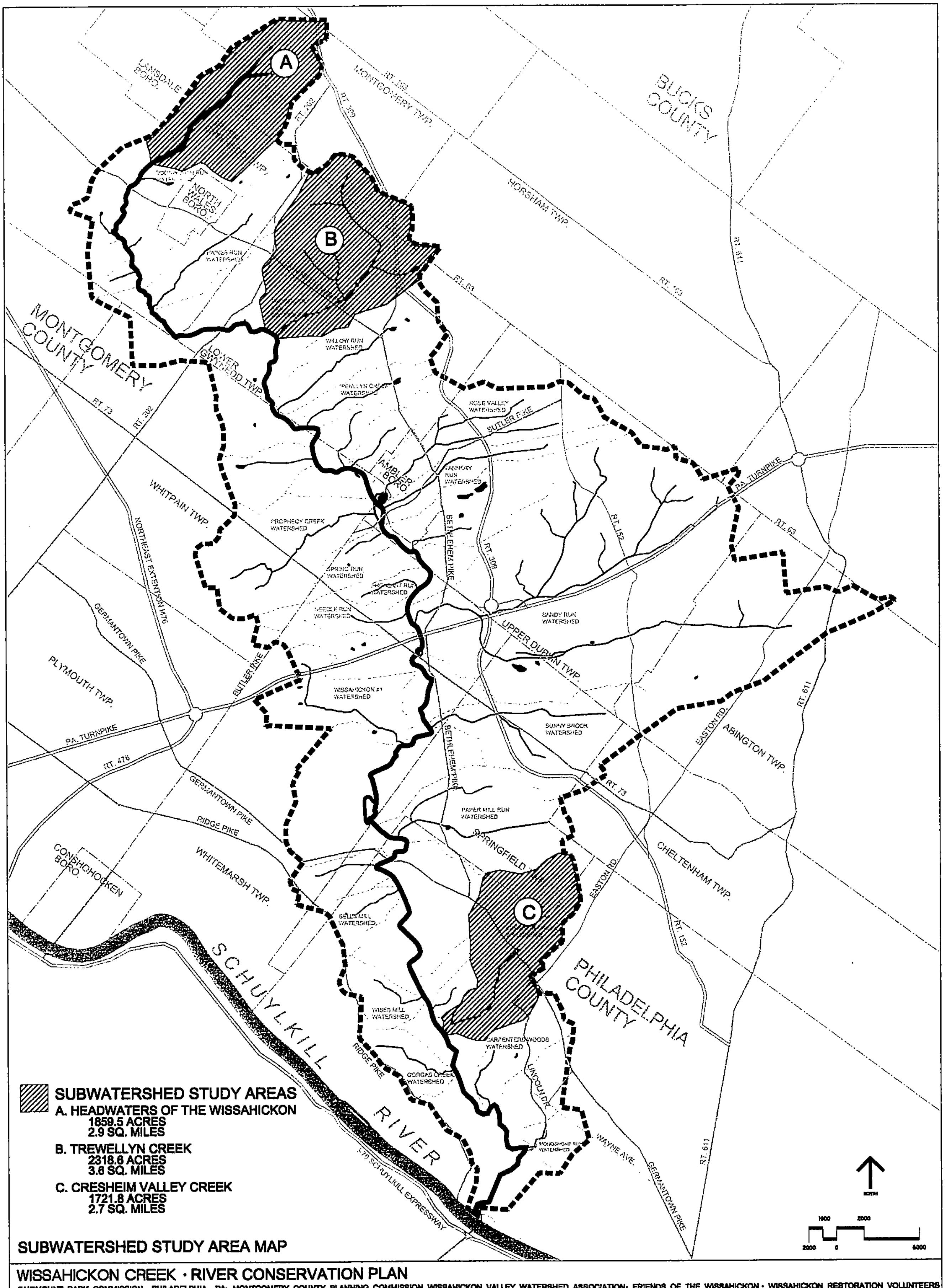
- All detention facilities must incorporate an extended detention function for the water quality design storm volume

- Require approved water quality measures to treat runoff from designated landuses (e.g., roads, parking lots, industrial storage yards, roof areas, agricultural fields and pastures, etc.)

Note: Due to the difficulty and cost of water quality monitoring, it is generally recommended that water quality performance not be stated in terms of pollutant removal rates.

VI. SUBWATERSHEDS

MERMAID PARK POND, WYNDMOOR SPRINGFIELD TOWNSHIP


A
B
C
BUCKS COUNTY
MONTGOMERY COUNTY
PHILADELPHIA COUNTY
SCHUYLKILL RIVER
LANSDALE BORO.
MONTGOMERY TWP.
HORSHAM TWP.
NORTH WALES BORO.
LOWER GWYNEDD TWP.
AMBLER BORO.
WHITPAIN TWP.
UPPER DUBLIN TWP.
PLYMOUTH TWP.
WHITEMARSH TWP.
SPRINGFIELD
ABINGTON TWP.
CHELTENHAM TWP.
CONSHOHOCKEN BORO.
RT. 202
RT. 309
RT. 63
RT. 73
RT. 152
RT. 611
RT. 476
PA. TURNPIKE
NORTHEAST EXTENTION I-476
BUTLER PIKE
BETHLEHEM PIKE
GERMANTOWN PIKE
RIDGE PIKE
EASTON RD.
LINCOLN DR.
WAYNE AVE.
476 SCHUYLKILL EXPRESSWAY
WILLOW RUN WATERSHED
PENLLYN CREEK WATERSHED
ROSE VALLEY WATERSHED
TANNERY RUN WATERSHED
PROPHECY CREEK WATERSHED
SPRING RUN WATERSHED
NEEDLE RUN WATERSHED
SANDY RUN WATERSHED
WISSAHICKON #1 WATERSHED
SUNNY BROOK WATERSHED
PAPER MILL RUN WATERSHED
BELLS MILL WATERSHED
WISES MILL WATERSHED
CARPENTER'S WOODS WATERSHED
GORGAS CREEK WATERSHED
MONOSHONE RUN WATERSHED
SUBWATERSHED STUDY AREAS
A. HEADWATERS OF THE WISSAHICKON
1859.5 ACRES
2.9 SQ. MILES
B. TREWELLYN CREEK
2318.6 ACRES
3.6 SQ. MILES
C. CRESHEIM VALLEY CREEK
1721.8 ACRES
2.7 SQ. MILES
SUBWATERSHED STUDY AREA MAP
WISSAHICKON CREEK · RIVER CONSERVATION PLAN
FAIRMOUNT PARK COMMISSION, PHILADELPHIA, PA· MONTGOMERY COUNTY PLANNING COMMISSION WISSAHICKON VALLEY WATERSHED ASSOCIATION· FRIENDS OF THE WISSAHICKON · WISSAHICKON RESTORATION VOLUNTEERS
PENNSYLVANIA DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
The Delta Group · C. Miller, PE · Steven Hammell · PAQ, Inc · S. Edgar David · Temple University Department of Landscape Architecture and Horticulture

VI. SUBWATERSHED PLANNING

As recommended by the Center for Watershed Protection in Silver Springs, Maryland, we have chosen to develop detailed analysis and recommendations at the sub-watershed scale. Three representative sub-watersheds have been chosen to facilitate the process of identifying problems and opportunities and potential projects for implementation. They are: **A. The Headwaters of the Wissahickon** (high density neighborhood, large scale impervious surfaces) **B. The Trewellyn Creek** (rural, relatively open, low density) **C. Cresheim Creek** (high density, urban neighborhoods and trail linkage potential). If plans for 3 sub-watersheds were developed and implemented each year, the remaining 28 would take approximately 9 years.

In addition to recommending the subwatershed approach, the Center for Watershed Protection also makes a strong case for avoiding emphasis on technological planning tools, while emphasizing strong community participation, the need for a permanent management structure and strong comprehensive regulatory ordinances.

The once heavily forested piedmont landscape of the Wissahickon Creek watershed has been fragmented over the centuries by successive waves of development. Roadways, commercial and industrial sites, town centers and residential areas have replaced the creeksheds, forests, wetlands, wildlife habitats and ponds in the watershed, leaving behind many isolated and disconnected fragments of the natural landscape. With the vision of reconnecting these remnant patches, many communities are developing lineal 'greenways' along riparian, railroad and utility corridors.

The three subwatersheds selected for a detailed study are described as to their general characteristics and recommendations for various stormwater management (S); restoration of water quality (R); and public education (E) projects. Potential acquisition sites are also identified (A). Management recommendations are identified as (M). The plan on the previous page shows the location of the three subwatersheds selected for detail study.

Budget Estimates:

The proposed project sites have not been surveyed to document existing site details including acreage, property lines, topography, vegetation, utilities and structures. Therefore no detailed design or engineering has been possible as yet.

The budget figures provided in this report are based on a very preliminary review of the project type, size, location and complexity and on approximate current unit prices for materials and labor.

It is assumed that most of the larger projects will be constructed or implemented by professional contractors who will be selected after a competitive bidding process.

Municipal staff may also be utilized to complete some of the projects, while others may be accomplished by volunteer groups. The cost will vary greatly depending on which of these three groups are involved in implementing the work.

Sample Budget Estimate:

The following is a sample project budget estimate for three ponds in a restoration / stormwater management project within the Cresheim Creek corridor in Springfield Township, shown as project S-1 on the project map and list.

1. Project / Site Preparation (125,000 SF Site Area)

• Site clearing, grubbing / demolition	125,000 SF at $1	=	$125,000
• Invasive plant removal	50,000 SF	=	$25,000
• Topographic survey			$15,000
• Design / Engineering			$50,000
• Administration			$20,000
• Bid Process and contract Award			$2,500
• Permits			$3,000
• Stakeout			$5,000
• Temporary fencing			$8,000
			$233,500

2. Construction

• Erosion / sedimentation protection	700 LF at $2	=	$1,400
• Earthwork, grading, trenching	60,000 SF at 5' deep at $12 CY	=	$133,333
• Piping and spillways	3 at $30,000		$90,000
• Walkways paving	600 LF AT 8' wide at $20 SY	=	$10,660
• Topsoil	1,203 CY at $22	=	$26,466
• Pond clay liner	1,466 CY at $30	=	$43,999
• Seeding	7,220 SY at $1.50	=	$10,830
• Planting (195 trees, 650 shrubs, 180 herbaceous)			$60,000
			$376,688

3. Maintenance

• Weeding, invasive removal, watering, mowing etc. (15% of 1 and 2 above)		=	$91,528
Total Project Budget		=	$701,716
A 10% contingency is recommended		=	$70,171
Project Total			$771,887

For budget purposes we rounded this figure to $770,000.

A. Headwaters of the Wissahickon

Located in the red clay soils / red shale bedrock Triassic Basin, this 2.9 square-mile subwatershed includes portions of Montgomery and Upper Gwynedd Townships and Lansdale Borough. The Headwaters has a high percentage of impervious surfaces (parking lots, roads and roof area). It also includes a mix of high density residential and commercial development. There are five schools and a considerable amount of active development underway within the watershed, primarily along the Welsh Road corridor. PECO Energy rights-of-way traverse the southern portion of the subwatershed. Most of the Wissahickon Creek corridor is in public ownership, except for the northern most drainage course which is in private residential ownership and the southernmost corridor which is owned by PECO.

Of the three subwatersheds investigated, the Headwaters is the most threatened by loss of essential hydrologic functions.

Distinguishing hydrologic features of the Headwaters:

- Absence of effective runoff controls over most of the subwatershed

- Encroachment of high and medium density development on the creek and its floodplain
- Intensive use of piped stormwater directed at rapidly draining upland areas
- Mix of land uses, including multi-family, large-lot residential, commercial, industrial, recreational and town-core development. These have been constructed over an extended period of time without a coordinated stormwater management plan.
- Geology and soils of this subwatershed tend naturally to promote rapid runoff and are not conducive to groundwater infiltration.
- As a result of geologic conditions, the natural floodplain of the Creek is characterized by wooded marshes.
- There is a tradition among residents of encroaching on the Creek by constructing vertical walls and paved banks that has aggravated stormwater impacts.

1. **Assessment**

Most of this subwatershed is underlain by shale of the Brunswick Formation. The natural tendency of this terrain to produce rapid runoff has been aggravated by development of the watershed. It is now common for the main channel of the Creek to go completely dry during the height of the summer. On the other hand, residents describe the overbank flooding events as becoming increasingly frequent. Furthermore, flooding events both rise and recede very rapidly.

Approximately 30 percent of the subwatershed lies within the borough of Lansdale. There are no runoff controls within this area, and storm sewers outfall directly into the Creek. With the exception of commercial districts at Montgomery Mall, Five Points Plaza, and Sandy Brooke Mall, most areas in suburban Montgomery and Upper Gwynedd Townships are also without effective runoff controls.

The principal outcome has been a large increase in the magnitude and frequency of overbank flooding. As a result the Creek is widening and deepening. In most reaches the Creek has eroded to bedrock. Typically, stream banks are barren, nearly vertical slopes that have been eroded from floodplain clay soil. Undermining of stream banks is widespread.

The Creek is evolving from a meandering stream into a straight channel with flood-dominated features, such as *chute bars*. The principal process is erosion and transport of fine sediment out of the subwatershed. Consequently, sedimentation, a common problem in many other subwatersheds, is not important here. However, these conditions in the Headwaters subwatershed are undoubtedly contributing to sedimentation problems further downstream in the Wissahickon Creek.

Down cutting of the stream has diminished the effectiveness of the floodplain, even where the floodplain has been preserved. The new, deeper channel tends to accelerate the flow during storm events. Instead of being dispersed onto the floodplain, stormwater is concentrated in the deepened channels where it further erodes and destabilizes the banks. Gullies tend to form at the confluence of tributaries as they downcut to reach the Creek bed elevations.

These effects are recent. Long-time residents can recall when the Creek and its tributaries had gentler, vegetated banks. Many residents with homes adjacent to the Creek do not understand how the Creek is changing, and believe that the present steep banks are a natural or desirable feature. As a result, a pattern of stream encroachment has developed in which residents seek to stabilize the Creek by filling the floodplain and constructing environmentally damaging walls.

Most of the natural tributaries have been replaced by storm sewers. At present only two secondary tributaries have been preserved for a length of more than 200 yards.

EXISTING LAND USE MAP

COMMERCIAL	RESIDENTIAL (high density)	UNDEVELOPED OPEN SPACE
INSTITUTIONAL	RESIDENTIAL (medium density)	STREAM
INDUSTRIAL	RESIDENTIAL (low density)	MUNICIPAL BOUNDARY
AGRICULTURE	PUBLIC OPEN SPACE	ROADS

WISSAHICKON CREEK · RIVER CONSERVATION PLAN **HEADWATERS OF THE WISSAHICKON**

FAIRMOUNT PARK COMMISSION, PHILADELPHIA, PA · MONTGOMERY COUNTY PLANNING COMMISSION · WISSAHICKON VALLEY WATERSHED ASSOCIATION · FRIENDS OF THE WISSAHICKON · WISSAHICKON RESTORATION VOLUNTEERS
PENNSYLVANIA DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

The Delta Group · C. Miller, PE · Steven Hammell · PAQ, Inc · B. Edgar David · Temple University Department of Landscape Architecture and Horticulture · Date: · Scale: 1" = 400'

The Headwaters of the Wissahickon Creek can be considered in four segments:

1. *Headwaters to Knapp Road*

The headwaters incorporate three tributaries. One of these, (tributary I) originates at the Five Point Plaza, located immediately south of Route 463. Runoff from the Plaza is collected in a large extended-detention pond before being discharged to the local storm sewer system. Down slope from Sunset Drive, runoff is discharged to the Creek in the Montgomery Township Natural Area. This is an open-space green belt that encloses and preserves a wide forested buffer for the Creek.

Storm sewers that serve the adjacent residential developments discharge to a tributary channel (tributary II) that follows the southeastern edge of the Natural Area. This is an unstable steep-sided man-made gully that is eroding and highly disturbed. This channel joins the main Creek just upstream of Knapp Road.

At Knapp Road, the main channel is joined by another tributary (tributary III) With the exception of the last 200 yards, where the wooded floodplain is preserved, this tributary has been replaced by storm sewers and residential grass swales. Effective runoff controls are absent. An exception is the Montgomery Mall, where runoff is treated and held in a large wet pond prior to being discharged to the tributary. The pond is located immediately east of North Wales Road.

The floodplain within the Montgomery Township Natural Area is mostly intact and has the potential to provide excellent flood water storage functions. The drainage has been modified to minimize access by the Creek's tributaries to the floodplain. As a result the Creek is experiencing scour damage.

2. *Knapp Road to Main Street*

This segment is dominated by floodplain modifications that are related to recreational facilities in Wissahickon Park. In particular, the channel has been narrowed and the wooded buffer has been replaced by turf grass. The original topography of the floodplain, however, has been essentially preserved.

This segment experiences the rapid accumulation of runoff from surrounding Lansdale neighborhoods. Half a dozen storm sewers outfall directly to the Creek. Although most of the floodplain has been converted to turf grass, it continues to provide valuable overbank detention during flooding events. The narrowing of the channel may enhance this function. A grade control weir at the Main Street bridge also helps to accentuate overbank flooding in its vicinity and minimizes the tendency of the channel to erode by generating backwater during storm events. Overall, the segment appears to offer essential flood control functions which allow the creek to absorb the large influx of stormwater. These might be further enhanced through minor grade modifications and landscape measures, which improve the control function of the floodplain.

One reach of this segment includes a historic mill pond. The pond's embankment has been intentionally breached to reduce the potential for an uncontrolled release from the impoundment. An artificial channel has been roughly cut along the southeastern side of the pond levee to receive piped and overland runoff from adjacent developed areas. This channel is unstable. Regrading of this area and planting with native vegetation may reduce erosion and enhance stormwater control.

3. *Main Street to the railroad grade*

The combined effects of uncontrolled stormwater runoff and disruption of the floodplain are aptly illustrated in this segment. Eleven storm sewers outfall directly to the stream; one of these serves a large commercial district located immediately southwest of Main Street. Additional sewers discharge to tributaries within a short distance of the main channel. With few exceptions, these tributary drainages have no effective runoff controls.

Most of this section is highly degraded, with eroded and undermined stream banks. The level of disturbance increases progressively downstream from Main Street. While conditions in upstream areas may aggravate some impacts, it is apparent that most of the difficulties in this area are the result of harmful construction practices that exist within this area.

Where residential lots abut the Creek, it has become very common for homeowners to build vertical walls using mortared stone, concrete block, timber cribs, or wire cages. The area behind these revetments is then filled to extend lawns. This is an on-going process on this reach. Typically the revetments are completed to a height of 5 feet, the depth of flooding that occurs, on average, several times each year. These encroachments are undoubtedly aggravating already severe flooding caused by uncontrolled stormwater discharges.

Much of the floodplain on the southeastern bank of the reach is protected open-space, owned by Upper Gwynedd Township. Opportunities may exist to rehabilitate this part of the floodplain. Also, these lands offer the possibility of constructing "off-line" stormwater detention facilities in the floodplain.

A major tributary joins the main channel drainage about 400 yards downstream from Main Street. The headwaters of this tributary are in Montgomery Commons, and an adjacent commercial district and residential development. Most of this area is served by extended-detention ponds.

Immediately downstream of these detention facilities, the reach has been aggressively encroached upon by homeowners. The resulting channel has been reduced to a 5-foot by 5-foot rectangular cross-section in some cases. The limitations of detention ponds in controlling smaller storms, and the extreme modification of the stream channel are causing chronic flooding impacts. This reach is in the final stages of producing a completely channelized, "built", drainage system such as now exists in Roslyn, Abington Township.

Ironically, the reach immediately downstream is one of the most beautifully preserved streams in the subwatershed. An intact wooded buffer owned by Upper Gwynedd Township protects this area from erosion and from chronic flooding. This example illustrates the critical importance of appropriate treatment of stream corridors. Throughout most of this segment, housing setbacks from the Creek and its tributaries are adequate to allow the restoration of the riparian corridor. However, this will require public education and the cooperation of homeowners if it is to be accomplished.

Due to recent increases in runoff peak rates, the culvert at the railroad embankment is now causing significant backwater flooding in the Lansdale neighborhood located immediately upstream.

4. Railroad Grade to Sumneytown Pike

This segment receives direct runoff from a large industrial district, located immediately north of Wissahickon Avenue. This area is not storm sewered and has no effective runoff controls. Inlets along Wissahickon Ave. collect and concentrate most of the runoff and discharge to the Creek immediately upstream of the bridge. The type of erosion-related damage observed in segment 3 is also typical of this segment.

A very wide, wooded wetland buffer is preserved along the entire length of this segment. The floodplain has been disturbed by previous human activities and also has sustained acute impacts associated with frequent flooding events. These include:

- Mostly barren stream channels that are either eroded or filled with sediment
- Debris choked channels

Large quantities of sediment that is eroding from upstream areas is being deposited on the marshy floodplain in this segment. Therefore, this area may play an important role in both reducing sedimentation and flood impacts in downstream areas. The accumulation of debris may be beneficial, since it promotes overbank flooding and enhances sedimentation on the floodplain. However, under present conditions, resuspension of sediment may be a significant problem.

This subwatershed includes a patchwork of intensively sewered neighborhoods and areas with extensive drainage management practices. Interceptor sewers which concentrate runoff and deliver it directly to the Creek have been installed along prominent streets, including Normandy, Knapp, Main, Hancock, Wissahickon, and North Wales. These storm sewers are effective in rapidly draining the upland areas. However, this function is achieved at the expense of the Creek, which is now subjected to erosion by extremely high runoff peak rates.

2. Proposed Projects for Headwaters Subwatershed

The following map on page VI-13 and list of proposed projects have been developed in response to the analysis of the conditions on-site, discussion with the municipalities involved and comments received at public workshops.

The reconstruction of a storm water wetland pond complex in Lansdale Borough between Route 63 (Main Street) and Knapp Road in the existing park could reduce downstream erosion/sedimentation problems considerably, while establishing an important recreational and wildlife habitat for public enjoyment and education. The existing conditions of the dam ruins and pond are in an unmanageable condition and are somewhat hazardous.

Developing demonstration "retroscape" parking lot and roofscape stormwater recharge and detention projects in each subwatershed would provide the opportunity to monitor the effectiveness and cost of these more innovative projects.

High density neighborhood "retrofit" stormwater storage programs should be developed whereby rain barrels and canopy trees could be made available at low or no cost to homeowners who would agree to install the rain barrels and to plant the trees on their private property.

Establishing or restoring private property and public open space riparian buffers, reconstructing stream banks and establishing trails on PECO Energy rights of way are other examples of physical improvements that are recommended.

Educational projects could include involvement of students and faculty in reforestation/meadow and bio-engineering projects, both in the stream corridors and on school grounds.

Acquisition of two parcels or leases negotiated with PECO Energy are recommended as well.

These projects lists were reviewed with Upper Gwynedd and Montgomery Township representatives and the elected officials to establish prioritization.

Opportunities for Best Management Practices

The Creek in this subwatershed is rapidly changing character due to management practices implemented over the past 20 years. However, ample opportunities exist to reverse existing damage and preserve the Creek as a valuable amenity for the community. However, due to the intensive development in many neighborhoods, most of these opportunities are confined to the main channel and its floodplain. Elsewhere, on-lot measures offer the only practical approach for slowing the concentration of runoff and reducing impacts to the Creek. Some suggestions for BMP implementation include:

- Modify the grades in and adjacent to the tributary #2 to allow the water to flow out onto the floodplain. (S-1) Shown on the plan page VI-13.
- Evaluate the effectiveness of the large pond, which serves the Montgomeryville Mall. Undertake modifications to the outlet, if advisable, to improve control of small storms.
- Regrade the artificial channel in segment 2 to create a stable cross-section and plant with native vegetation. (R-6)
- Where possible, reposition sewer outfalls at the edge of the floodplain. Using public land in the floodplain, introduce terraced and vegetated check dams to transition flow from storm sewer outfalls to the Creek. One of the best opportunities for implementing this practice is at the recreational area between Main Street and Knapp Road (Segment 2).

- Restore the detention function of the old mill pond, (mentioned earlier) by raising a low embankment where the old levee has been breached. Ideally a wet pond with fringe wetland could be created here. Modifications at this location could be focused on the control of small storms. (S-9)

- Construct "off-line" stormwater detention facilities on publicly owned land lying between Hancock Road and the Railroad grade.

- Evaluate the effectiveness of the existing extended-detention ponds in the Montgomery Commons area. Undertake modifications to outlets, if advisable, to improve control of small storms. Vegetate these basins with appropriate native wetland tolerant plants.

- Remove walls that constrict the channel cross-section and limit access by flood waters to the adjacent floodplain (Segment 3). Stabilize stream banks using bio-engineering methods.

- Reconstruct a destroyed weir located downstream from Hancock Road. Design the weir to create backwater to reduce channel velocities and provide runoff peak rate detention during small storms (note: this facility will have little impact on large storms)

- Introduce a stormwater detention facility to serve the Wissahickon Avenue storm sewer, northwest of the bridge. Use open space adjacent to and within the highly disturbed fringe wetland buffer. (alternatively, on-lot measures could be installed by businesses in the Industrial Park)

- Install weirs and check dams to enhance overbank flooding in the marshy floodplain south of the Wissahickon Street bridge. Stabilize stream banks and floodplains using bio-engineering methods.

Effect of Public Policy (Zoning and Subdivision Ordinances)

This subwatershed occupies portions of the borough of Lansdale, and the townships of Upper Gwynedd and Montgomery. Upper Gwynedd Township has required the control of storm runoff. All development, including redevelopment projects, that will increase impervious surface must control the runoff peak rates for the 2- and 50-year return frequency storm to existing levels. This has the effect of maintaining the *status quo*, but will not address the impact of previous development that did not include runoff controls. The vast majority of this subwatershed was developed without them.

An ordinance requiring runoff peak rate controls was adopted by Montgomery Township. Runoff peak rates for the 50-year storm must be controlled to the existing 10-year level, and runoff from the 10-year storm must be controlled to the existing 2-year level. The provisions of the ordinance are triggered whenever the runoff peak rates from the site are projected to exceed existing peak rates, and it applies equally to new construction and redevelopment. This ordinance is specifically intended to solve flooding problems resulting from previous development. Its focus is on reducing the impact of large storms. The implementation of this ordinance to new development on the Headwaters subwatershed has resulted in the construction of a large pond (serving the Montgomeryville Mall) and large extended-detention ponds that serve the commercial areas at Montgomery Commons and Five Points Plaza. In their present configuration, these ponds may not be ideal for the control of small storms. However, they could be readily modified to conform to revised performance criteria. The impact of this ordinance on redevelopment cannot be assessed, since it has not yet been applied.

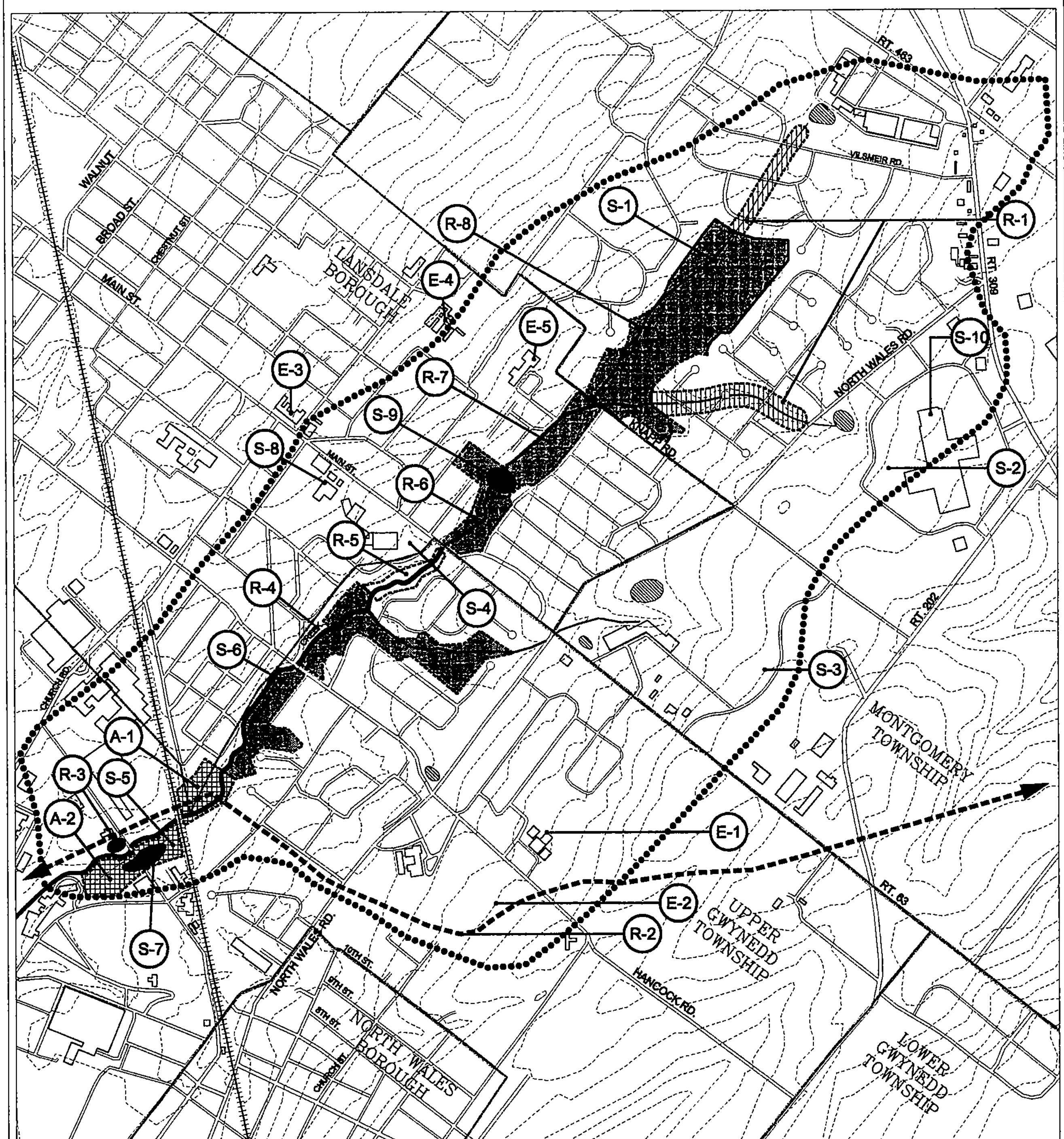
Although stormwater runoff controls are required within the Borough of Lansdale, there are no fixed criteria. Measures required by the Borough engineer are typically related to site drainage. No stormwater detention facilities are known to exist within the Borough.

HEADWATERS OF THE WISSAHICKON
PROJECT IDENTIFICATION LIST

#	MUNIC	TYPE	SIZE	COST	REMARKS
STORMWATER MANAGEMENT / BMP'S					
S-1	MT.	Regrade Floodplain	600 LF	$110,000	
S-2	MT.	Retrofit Parking	32,500 SF	$63,600	
S-3	MT.	High Density Retrofit		$10,000	50 Rainbarrels, 50 Trees
S-4	LB.	Retrofit Parking	32,500 SF	$63,600	
S-5	UG.	Floodplain Regrading	600 LF	$110,000	
S-6	UG.	Outfall		$10 - 15,000	
S-7	UG.	Floodplain Pond	160,000 SF	$400,000	
S-8	LB.	Retrofit Parking	32,500 SF	$63,600	100 Cars
S-9	LB.	Dam / Pond Reconstruction	80,000 SF	$480,000	SWM / Wildlife / Recreation Use
S-10	MT.	Roofscape Demonstration	10,000SF	$80,000	
RESTORATION OF WATER & HABITAT QUALITY					
R-1	MT.	Private Buffer	3,400 LF	$132,600	
R-2	UG.	Power Line Trail	11,500 LF	$287,500	
R-3	UG.	Pond Construction	60,000 SF	$360,000	
R-4	UG.	Restore Stream Buffer	1,100 LF	$99,000	
R-5	UG.	Restore Stream Buffer	1,000 LF	$90,000	
R-6	LB.	Restore Stream Buffer	1,000 LF	$75,000	
R-7	LB.	Regrade Channel	1,400 LF	$112,000	
R-8	LB.	Restore Stream Buffer	2,800 LF	$112,000	
PUBLIC EDUCATION					
E-1	UG.	Education Project		$10,000	Pennbrook School
E-2	UG.	Education Project		$10,000	Pennbrook Middle School
E-3	LB.	Education Project		$10,000	St. Stanislaus Elementary School
E-4	LB.	Education Project		$10,000	Lansdale Catholic High School
E-5	LB.	Education Project		$10,000	Knapp Elementary School
MANAGEMENT TOOLS / ORGANIZATION					
WM-1,2,3	LB.	Develop New Ordinances, Project Manager, Nursery		$20,000	
WM-1,2,3	MT.	Develop New Ordinances, Project Manager, Nursery		$20,000	
WM-1,2,3	UG.	Develop New Ordinances, Project Manager, Nursery		$20,000	
ACQUISITION					
A-1	UG.	Acquisition Site	42,000 SF±	$240,000	PECO R.O.W. (Easement)
A-2	UG.	Acquisition Site	42,000 SF±	$240,000	

LB = Lansdale Borough
MT = Montgomery Township
UG = Upper Gwynedd Township

The Map on the following page, indicates the location, category and number of the projects recommended for implementation. They are also listed on this page with budget estimates for each project.



POTENTIAL PROJECTS LOCATION DIAGRAM

PROPOSED LAND ACQUISITION	R-3 PROJECT CATEGORIES KEY	STREAM
PUBLIC OPEN SPACE	SUBWATERSHED BOUNDARY	MUNICIPAL BOUNDARY
PROPOSED PRIVATE RIPARIAN CORRIDOR	PROPOSED TRAIL	ROADS
PROPOSED STORMWATER BASINS / PONDS	EXISTING STORMWATER BASIN / PONDS	CONTOUR INTERVAL 10 FEET

WISSAHICKON CREEK · RIVER CONSERVATION PLAN **HEADWATERS OF THE WISSAHICKON**

FAIRMOUNT PARK COMMISSION, PHILADELPHIA, PA · MONTGOMERY COUNTY PLANNING COMMISSION · WISSAHICKON VALLEY WATERSHED ASSOCIATION · FRIENDS OF THE WISSAHICKON · WISSAHICKON RESTORATION VOLUNTEERS
PENNSYLVANIA DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

NORTH

The Delta Group · C. Miller, PE · Steven Hammell · PAQ, Inc · S. Edgar David · Temple University Department of Landscape Architecture and Horticulture · Date: · Scale: 1" = 400'

Floodplain zoning districts were adopted by Upper Gwynedd Township, Montgomery Township, and the Borough of Lansdale. However, none of these municipal authorities impose strict limits on the landscaping, regrading or filling of floodplains, provided the capacity of the streams to convey stormwater flow is not impeded. Furthermore, the Lansdale ordinance permits building construction within the flood fringe by special exception. These ordinances have not prevented the extensive modification of the floodplain in the upper segments. It is common to encounter vertical-walled revetments and floodplains filled for the purpose of extending lawns. In Lansdale, outbuildings frequently extend to the edge of the Creek. These modifications have not necessarily produced increases in the flood elevations for large storms. It is clear, however, that high water conditions are much more frequent, and that flow velocities have increased substantially for most storms.

All three municipalities have enacted provisions in their ordinances which pose certain impediments to developers and homeowners who wish to install advanced on-lot BMPs. In addition, alternative approaches to *centralized* stormwater management practices are not encouraged. Considerations when amending, land development or stormwater ordinances may include:

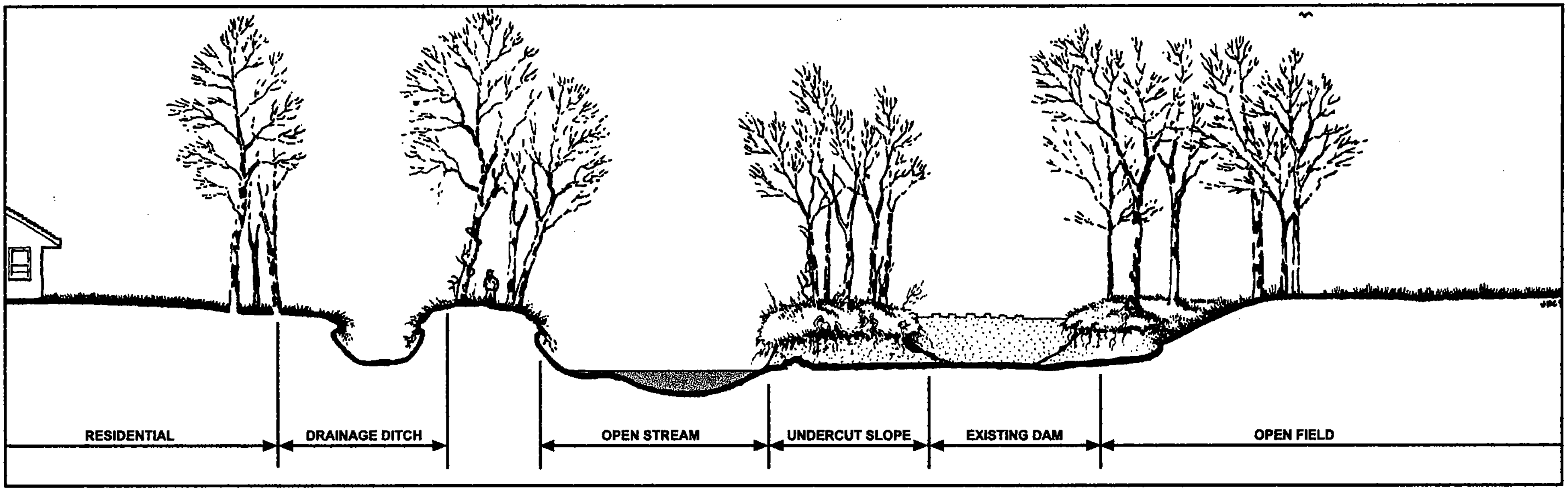
- Development of a comprehensive stream corridor protection ordinance
- Formulation of runoff peak rate control requirements that are consistent across the subwatershed and insure control of small storms
- Provision of incentives to the residents of established neighborhoods, that are not served by runoff control, to install on-lot BMPs that will slow the concentration of runoff.
- Revision of landscape requirements to emphasize the use of native wetland species in detention ponds and other stormwater management facilities
- Revision of landscape requirements to enable the construction of bio-retention facilities in commercial and institutional parking lots (Both the Upper Gwynedd and Montgomery Township, ordinances requires landscaped parking islands. However, the tree selection, grading and spacing requirements are not conducive to the installation of bio-retention facilities)
- Development of stormwater management provisions specific to the redevelopment of commercial properties

Effect of Transportation and Utility Corridors

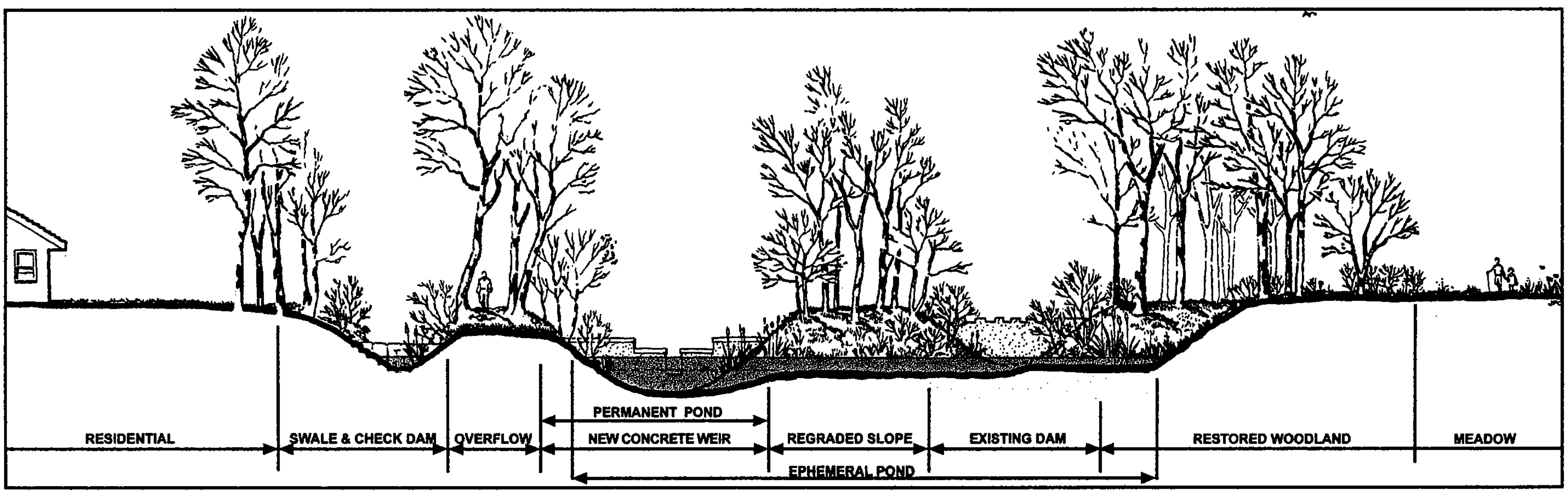
Four roads cross the Creek within this subwatershed. These have become convenient locations to install interceptor sewers which deliver runoff directly to the Creek at or near the crossings. These interceptors are important factors in increasing the runoff peak rate in the Creek.

Downstream of Wissahickon Ave., flow toward the Creek from the northwest is interrupted by a PECO corridor. By impounding runoff, the utility corridor provides effective flood control for runoff from the Pennbrook Industrial Center.

On page VI-15, comparative cross-sections show the existing and proposed conditions of the pond / dam complex north of Mainstreet.



EXISTING CONDITIONS
PROJECT SITE SECTION HEADWATERS OF THE WISSAHICKON
Severe erosion, dilapidated dam structure and a deep, dangerous drainage ditch are the basic problem with this area.



PROPOSED IMPROVEMENTS
STORMWATER MANAGEMENT BMP'S HEADWATERS OF THE WISSAHICKON
A new concrete dam to contain runoff, check dams in the drainage ditch, regrading the banks and planting with native species are shown in this section.

B. Trewellyn Subwatershed

The Trewellyn Creek, also in the Triassic Basin, is the largest of the three subwatersheds at 3.6 square miles. The three municipalities that occupy land within this watershed boundaries are Montgomery, Horsham and Lower Gwynedd Townships.

This is one of the most undeveloped subwatersheds with most acreage devoted to single family residential development, mainly medium to low density. Gwynedd Mercy College is the largest single property, and is located in the center of the watershed. Folkeways, a retirement community, is situated near the west central watershed boundary. Eight intermittent tributary streams drain into the Trewellyn Creek.

1. <u>Assessment</u>

The continued preservation of the second-order tributaries, their use as recipients of storm sewer discharge and preservation of the floodplain and riparian corridor of the main Trewellyn channel, are significant features of this watershed. These factors have enabled the Trewellyn to absorb the impacts from development without significant damage. The prevalence of runoff peak rate controls, principally dry detention basins in the upper reaches of the watershed, are also important. Most of the observed impacts are associated with localized erosion and undermining of streambanks and associated silting caused by redeposition of eroded material. In compliance with subdivision and stormwater ordinances enacted circa 1978, much of the recently developed low density areas are served by some type of stormwater control. The stability of the main channel will depend on how two critical sites are developed: The Jackson property and the Moore Products Inc. tract. They both occupy critical locations on the Creek and are currently providing essential flood control functions.

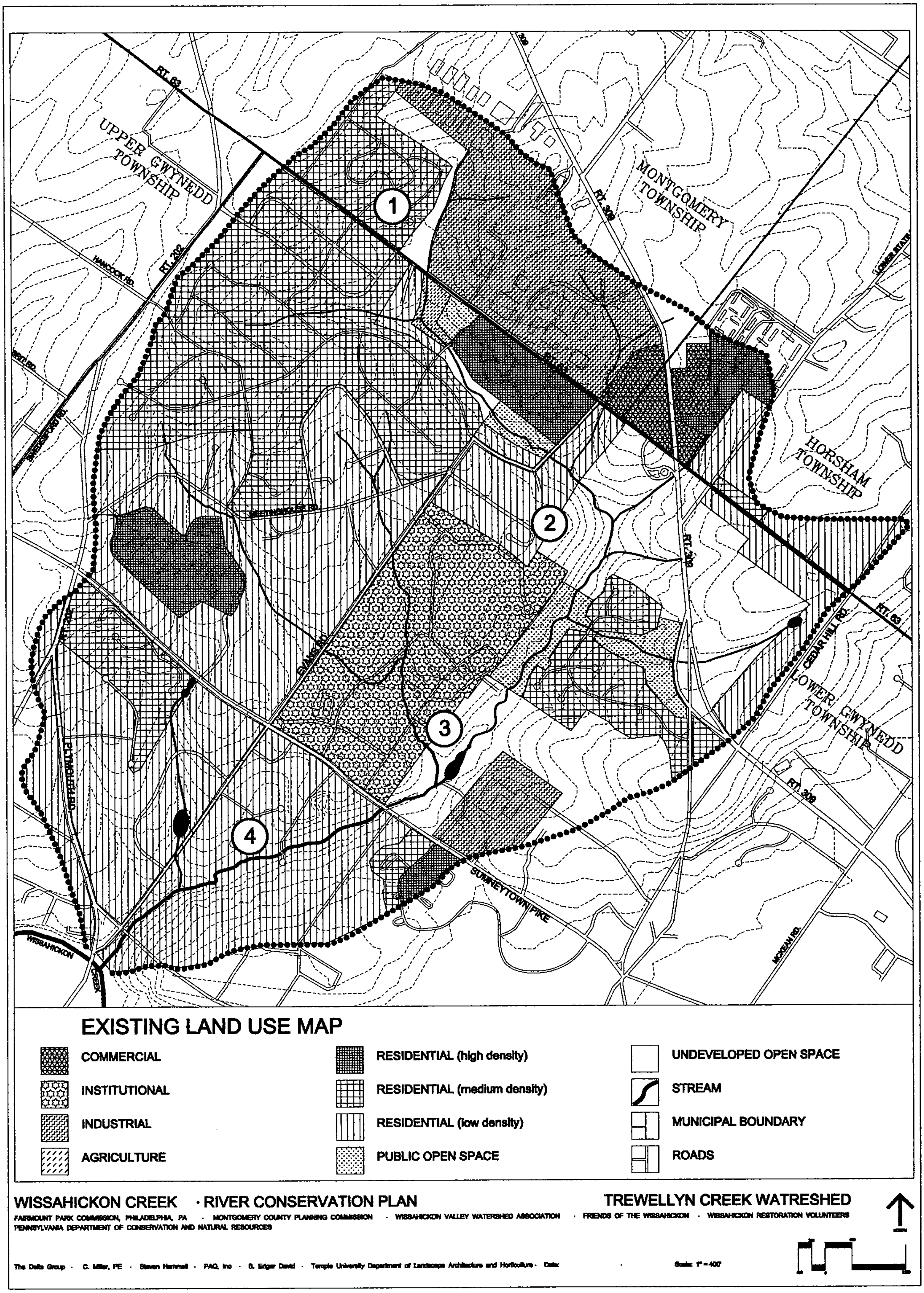
Most of this subwatershed is underlain by shale of the Lockatong Formation. The natural tendency of this terrain to produce rapid runoff has been aggravated by development in the watershed. Present ordinances are directed at achieving the control of large storm water events (i.e., storms with return frequencies greater than ten years). However, most of the present problems can be traced to smaller, frequently occurring storms which are not effectively controlled by existing stormwater facilities.

The Gill limestone quarry is located near the upper boundary of the subwatershed at Bethlehem Pike. Pumping from this deep quarry creates a water table depression that contributes to a reduction of base flow in the vicinity.

The treatment of tributary drainage has been left up to developers and homeowners, and varies greatly from reach to reach. Intermittently, a wooded buffer of varying width may be preserved next to the stream bank. However, adjoining reaches immediately upstream or downstream may experience a variety of development-related impacts including:

- Filling of the floodplain
- Removal of native vegetation and establishment of turf grass lawns.
- Straightening, diversion or channelization of streams

In particular, it is common for residents with homes in close proximity to stream to clear wooded wetlands and replace them with “manicured” landscapes dominated by turf grass. These changes inevitably increase runoff rates and destabilize stream banks. Channel modifications like these are often considered by many property owners to be landscape amenities. A reversal of these trends will require education of home owners concerning the value of preserving natural stream corridors and the landscape potential of native plants installed along riparian buffers. The greatest opportunity for stabilizing the Trewellyn Creek against further damage and to enhance water and habitat quality lie in implementing a consistent approach to managing the tributary system.


RT. 63
UPPER GWYNEDD TOWNSHIP
MONTGOMERY TOWNSHIP
RT. 309
HANCOCK RD.
RT. 202
HORSHAM TOWNSHIP
CEDAR HILL RD.
LOWER GWYNEDD TOWNSHIP
SUMNEYTOWN PIKE
WISSAHICKON CREEK
1
2
3
4
EXISTING LAND USE MAP
COMMERCIAL
INSTITUTIONAL
INDUSTRIAL
AGRICULTURE
RESIDENTIAL (high density)
RESIDENTIAL (medium density)
RESIDENTIAL (low density)
PUBLIC OPEN SPACE
UNDEVELOPED OPEN SPACE
STREAM
MUNICIPAL BOUNDARY
ROADS
WISSAHICKON CREEK · RIVER CONSERVATION PLAN
TREWELLYN CREEK WATRESHED
FAIRMOUNT PARK COMMISSION, PHILADELPHIA, PA · MONTGOMERY COUNTY PLANNING COMMISSION · WISSAHICKON VALLEY WATERSHED ASSOCIATION · FRIENDS OF THE WISSAHICKON · WISSAHICKON RESTORATION VOLUNTEERS
PENNSYLVANIA DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES
The Delta Group · C. Miller, PE · Steven Hammell · PAQ, Inc · S. Edgar David · Temple University Department of Landscape Architecture and Horticulture · Date:
Scale: 1" = 400'

The Trewellyn Creek can be considered in four segments:

1. *Headwater tributaries to Cambridge St. bridge*

   This segment consists of two tributaries, one draining the area north of Bethlehem Pike and one draining the recently developed areas located northwest of Meetinghouse Road. In both tributaries, the riparian buffers have been encroached on or eliminated, and the channels have been blocked to create large "in-line" dry detention ponds.
   The northern tributary includes an 800-foot long reach that traverses a pasture on the Kolb farm tract. In its present form this channel is unstable and eroding. However, the rehabilitation of this floodplain to provide a range of hydrologic and water quality benefits is possible.

2. *Cambridge St. Bridge to footbridge*

   The riparian corridor is preserved along the entire length of this segment. Furthermore, approximately 400 yards of this reach are protected from encroachments by municipally owned open space. The bed of the Creek frequently flows directly over outcroppings of Lockatong shale. For this reason, the creek tends to flow clear and swift through much of this segment. Periodically, erosion and undercutting of stream banks is evident.

   A grade control structure at Evans Road protects the upstream floodplain from the advance of channel erosion. It also provides important flood control functions by accentuating overbank flooding of the protected floodplain of the John Parry Bird Sanctuary. Flow is discharged directly to the floodplain of the Creek from several large stormwater control facilities. These include extended-detention impoundments which serve the Trewellyn Estates and the Hunt Club Apartments. Impacts at these outfalls are negligible.

   The most important source of concentrated stormwater discharging to the Creek is the second-order tributary system. The area north of Bethlehem Pike is dominated by a large commercial and industrial district with a very high percent impervious surface. Stormwater controls are absent in approximately half of this district, including all of the Bethlehem Pike Industrial Park, Gwynedd Crossing and English Village shopping centers. The remainder of this district is served by "on-lot" and community dry detention ponds. The English Village Center is in redevelopment design and may be a possible candidate for BMP techniques.

   South of Bethlehem Pike, the riparian corridors of the tributaries have been encroached on by development, but are largely intact. Remarkably, they have withstood the increase in runoff with only minor erosion impacts.

   Acting to mitigate the conditions of rapid runoff in the tributaries, is the undeveloped Goodman parcel located downstream of Evans Road. Through most of this reach the channel is densely overgrown, contributing resistance to flow and enhancing the flood control properties of the floodplain. Lower Gwynedd Township intends to maintain a wide riparian corridor through this reach.

3. *Footbridge to Sumneytown Pike*

This segment has been identified as a priority location for open space preservation in the 1996 Lower Gwynedd Township Open Space Plan. It extends from the footbridge that is located immediately north the Moore Products, Inc. property to the bridge at Sumneytown Rd. This segment is dominated by terrain modifications constructed by Moore Products, Inc. These include channelization of the Creek and the creation of two large "off-line" recreational ponds. The water level in the ponds is controlled by weirs located on the Creek. These ponds, one of the few examples of regional stormwater facilities on the Wissahickon Creek watershed, provide significant flood control benefits by impounding water during large storms. However, due to the channelization of the Creek, control of runoff from small storms may not be as effective. This is also indicated by severe sedimentation problems immediately downstream of the ponds.

This segment is served by two second-order and two third-order tributaries. Most of these sustain some perennial flow. Characteristically, broad, wooded buffers have been preserved for the second-order tributaries. However, the treatment of the third-order tributaries includes a discordant patchwork of wooded buffers, channelized stream banks, filled floodplains, and "manicured" reaches. Furthermore, the direct discharge of stormwater from large impervious areas to tributaries via stream-side inlets is a prevalent practice.

In general, the liberal preservation of open-space adjacent to the Creek by Moore Products, Inc. and Gwynedd-Mercy College, is a great benefit in slowing and filtering runoff. In addition, recently developed areas located northwest of Meetinghouse Road incorporate stormwater extended-detention ponds.

4. *Summneytown Pike to confluence with the Wissahickon Creek*

Since much of this area developed prior to 1980, this segment has few runoff controls. Typically, runoff is conveyed by gutter flow to inlets that discharge directly to tributaries of Trewellyn Creek.

In the lower reaches of this segment, alteration of the floodplain is common. Changes include the partial filling of the floodplain and replacement of native vegetation with turf grasses. However, progressing upstream, it is common for a wooded buffer of 25 feet, or greater, to be preserved adjacent to the Creek. Construction within the floodplain of the main channel stream is negligible, and many opportunities to restore or enhance floodplain functions in this segment remain. These might include better use of the existing floodplain to disperse and attenuate flow derived from the tributary drainages.

This segment is served by three second-order tributaries. Two of these are perennial. Inconsistent approaches to drainage management in the tributaries are causing problems, including nuisance flooding and localized incidences of acute stream bank erosion. A large wet pond located between Lorien Drive and Evans Road provides runoff peak rate control for one of the tributaries. However, baseflow to this pond is not sufficient to prevent eutrification.

In general, areas of the watershed developed prior to 1960 are not storm sewered. It is common in these areas to see *extensive* management practices implemented, in which runoff is conveyed by gutter flow to inlets adjacent to tributaries of the Trewellyn Creek. The impact of these direct discharges is mitigated in some locations by the preservation of wooded drainage-ways that connect the sewer outfalls to the tributaries.

Sewered developments employing both the *distributed* and *centralized* management practices are represented in this subwatershed. The distributed approach has been utilized at the Stonebridge development, where detention is provided by depression storage. However, these controls have been determined to be largely ineffective. In areas developed since 1980, centralized stormwater control facilities, typically a dry detention pond, is provided at a downstream location. Notable exceptions to dry detention ponds, include a large extended-detention pond, a dual extended-detention pond system that serves the Gwynedd Hill development, and a large wet pond located between Lorien Drive and Evans Road. However, the wet pond at Lorien Drive will require some improvements in order to provide effective stormwater runoff control.

There are several examples of *integrated* approaches to stormwater management in this subwatershed. These include installations at Moore Products, Inc., the Foulkeways retirement village, and the Hunt Club Apartments.

2. Proposed Projects for Trewellyn Subwatershed

The following map and list of proposed projects have been developed in response to the analysis of the conditions on-site, discussion with the municipalities involved and comments received at public workshops.

Opportunities for Best Management Practices

Some specific suggestions for BMP implementation include:

- Implement enhancements to the large dry detention ponds Segment 1, in order to better control small, less than 2 year storms. These may include: Outlet modifications to add an extended-detention function, creation of "pocket" wetlands, incorporation of bio-retention areas and planting with native wetland plants.
- Where practical, modify dry detention ponds in the industrial park north of the Bethlehem Pike in order to improve the control of small storms, filter runoff and improve groundwater recharge. This should include outlet modifications and planting with natives.
- Modify channels and outlet weirs associated with the recreational ponds at Moore Products, Inc. to enhance the control of small storms.
- Redirect the outfall from the Stonebridge development storm sewer to disperse this flow onto the broad floodplain that has been preserved immediately south of Stonebridge Road.

Effect of Public Policy (Zoning and Subdivision Ordinances)

Approximately 90 percent of this subwatershed lies within Lower Gwynedd Township, including all areas southwest of Bethlehem Pike. Since the late 1970s, Lower Gwynedd Township has required that new developments control storm runoff. The requirement is for the control of runoff peak rates for "all storms" up to and including the 100-year storm. In practice, developers have been required to provide measures, which will maintain pre-development runoff peak rates for the 5-year storm. A variety of facilities have been proposed and approved by Lower Gwynedd Township, including dry detention ponds, wet ponds, and extended-detention ponds.

The Lower Gwynedd Township stormwater ordinance prescribes the landscape improvement of stormwater facilities. Extended-detention ponds, many of which are planted appropriately, are believed to be providing effective control of small storms. Also, several developers have adopted integrated approaches to stormwater management, using vegetative BMPs.

An ordinance requiring runoff peak rate controls was adopted by Montgomery Township in the late 1970s. The Montgomery Township requirements are unique in the Wissahickon Watershed, since they are intended to reverse flooding problems that have resulted from previous development that has not included controls. Runoff peak rates for the 50-year storm must be controlled to existing 10-year level, and runoff from the 10-year storm must be controlled to the existing 2-year level. The implementation of this ordinance has resulted in the proliferation of large dry detention ponds that are planted in lawn. In their present configuration, these designs are not ideal for the control of small storms. They could, however, be readily modified to conform to revised performance criteria.

The Industrial area north of Bethlehem Pike offers an opportunity to reduce stormwater impacts through the implementation of a redevelopment ordinance. Adequate open space has been preserved in this area to allow BMPs to be "retrofitted". Furthermore, existing dry ponds can be easily optimized to control small storms (e.g., modifiy outlets and vegetate).

Floodplain zoning districts were adopted by Lower Gwynedd Township and Montgomery Township. These prohibit building construction within the 100-year floodplain of the Creek. Also, cluster development provisions of the current zoning ordinances have contributed to the voluntary preservation of wooded buffers to the Creek and its tributaries. In 1997 Lower Gwynedd Township passed a zoning ordinance that imposes a 25-foot construction set back from wetlands. This ordinance also prohibits grading or filling of floodplains within wetland buffers. This will help to preserve the corridors of some tributaries.

Both townships have enacted ordinances that pose potential impediments to developers and homeowners who wish to install advanced on-lot BMPs. In addition, alternative approaches to centralized stormwater management practices are not encouraged.

Effect of Policies for the Management of Sanitary Wastewater

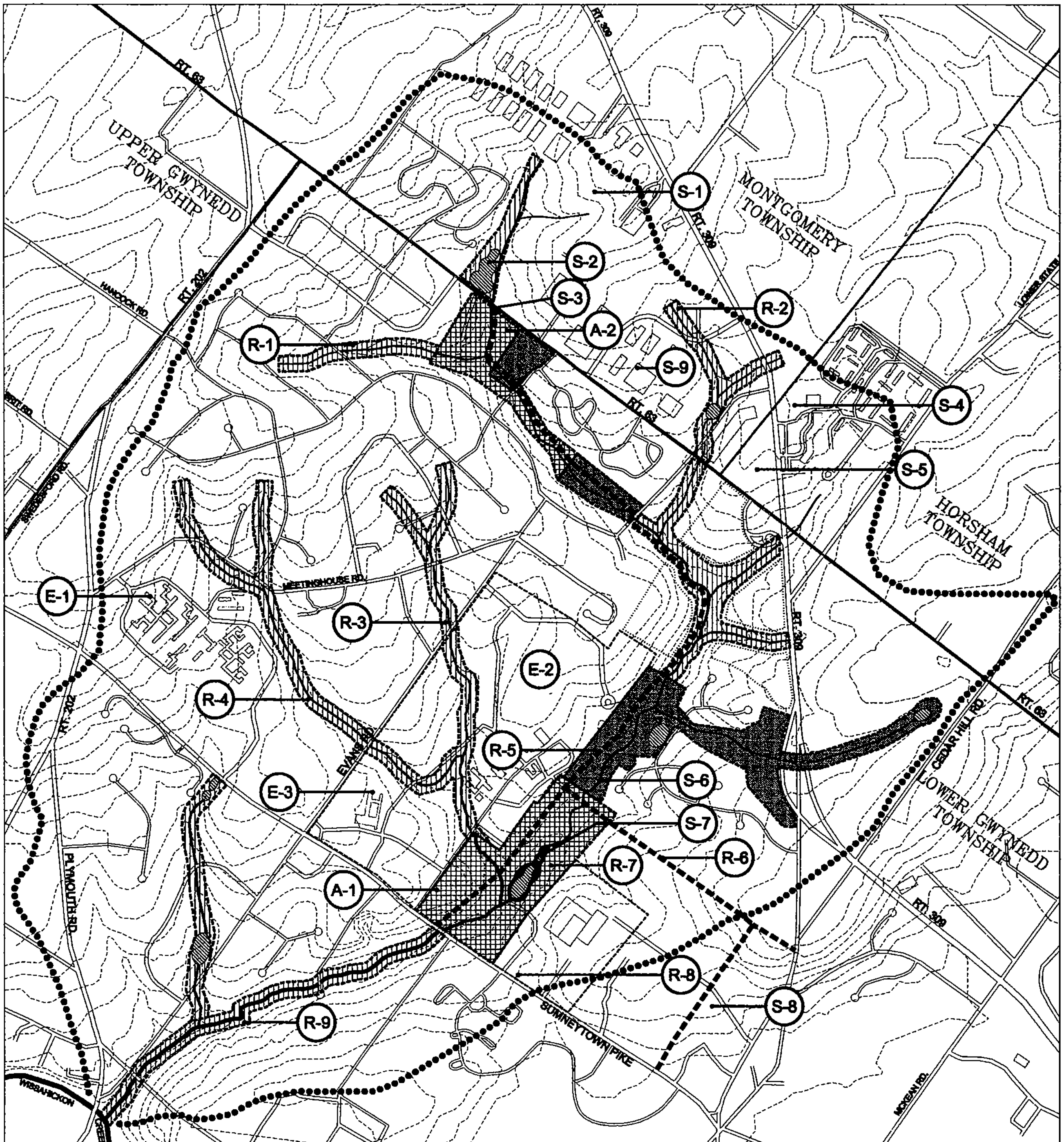
All of the Trewellyn Creek subwatershed is served by municipal sanitary sewer systems. However, sanitary rights-of-way parallel the Creek throughout its length, and sewer lines have been laid within the floodplain. The maintenance of the rights-of-way has been associated with partial filling of the floodplain, destruction of wooded buffer and invasion by exotic plant species.

TREWELLYN CREEK SUBWATERSHED
PROJECT IDENTIFICATION LIST

#	MUNIC	TYPE	SIZE	COST	REMARKS
STORMWATER MANAGEMENT / BMP'S					
S-1	MT.	Retroscape Parking	32,500 SF	$63,600	Recharge Groundwater
S-2	MT.	Landscape Existing Basin	120,000 SF	$20-30,000	Wetland (Low # with Volunteers)
S-3	LG.	Culvert Improvements	LS	$10,000	
S-4	HT.	Retroscape Parking	32,500 SF	$63,600	100 Cars
S-5	MT.	Retroscape Parking	32,500 SF	$63,600	100 Cars
S-6	LG.	Streambank Repair	1,600 LF	$144,000	
S-7	LG.	Modify Ponds / Repair Banks	2,400 LF	$192,000	Increase Water Storage Capacity
S-8	LG.	Retroscape Parking	32,500 SF	$63,600	100 Cars
S-9	MT.	Roofscape Demonstration	10,000 SF	$80,000	Reduce Rate / Volume of Runoff
RESTORATION OF WATER & HABITAT QUALITY					
R-1	LG.	Private Riparian Buffer	2,000 LF	$78,000	
R-2	LG/MT	Private Riparian Buffer	1,200 LF	$46,800	
R-3	LG.	Private Riparian Buffer	2,000 LF	$78,000	
R-4	LG.	Private Riparian Buffer	4,000 LF	$156,000	
R-5	LG.	Trail Development	9,800 LF	$382,200	
R-6	LG.	Trail Development	5,600 LF	$218,400	
R-7	LG.	Reforestation	3.4 AC	$33,000	
R-8	LG.	Reforestation	4.6 AC	$44,545	
R-9	LG.	Private Riparian Buffer	4,800 LF	$187,200	
PUBLIC EDUCATION					
E-1	LG.	Education Project		$10,000	Folkeways
E-2	LG.	Education Project		$10,000	Gwynedd Mercy College
E-3	LG.	Education Project		$10,000	Gwynedd Mercy High School
MANAGEMENT TOOLS / ORGANIZATION					
WM-1,2,3	LG.	Develop New Ordinances, Project Manager, Nursery		$20,000	
WM-1,2,3	HT.	Develop New Ordinances, Project Manager, Nursery		$20,000	
ACQUISITION					
A-1	LG.	Acquisition Site	57.8 AC	$2,520,000	Parkland / Bio-engineering
A-2	LG.	Acquisition Site	23.24 AC	$581,095	Parkland Use

HT = Horsham Township
LG = Lower Gwynedd Township
MT = Montgomery Township

The potential project map on the facing page shows the location, number and types of project.



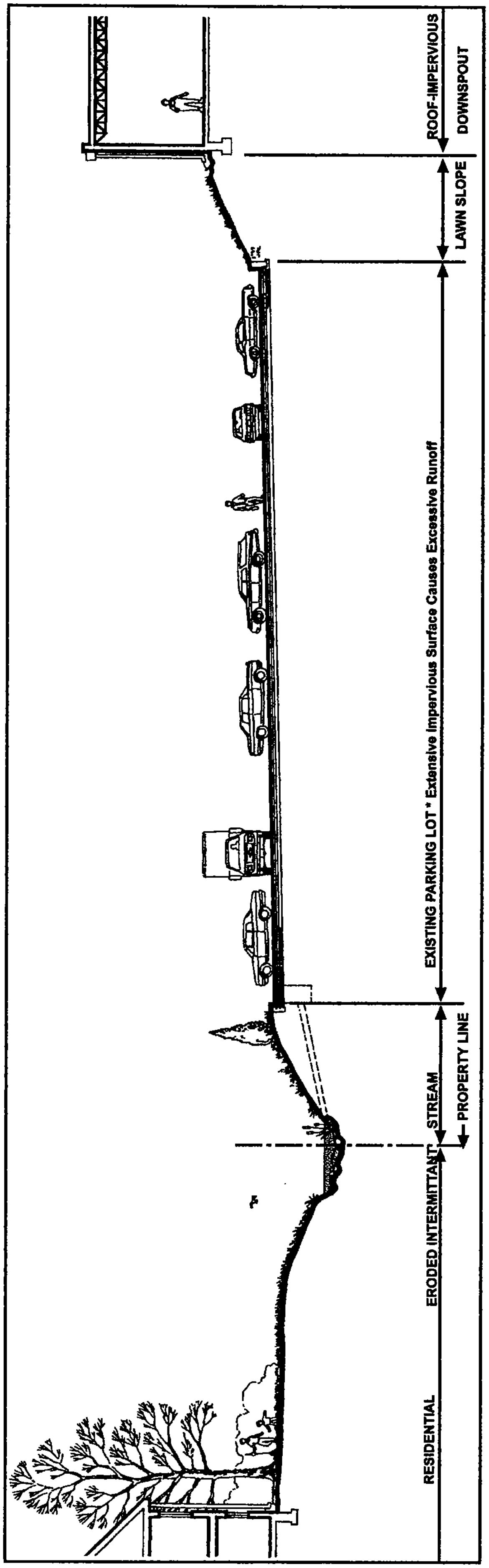
POTENTIAL PROJECTS LOCATION DIAGRAM

PROPOSED LAND ACQUISITION
PUBLIC OPEN SPACE
PROPOSED PRIVATE RIPARIAN CORRIDOR
PROPOSED STORMWATER BASINS / PONDS
R-3 PROJECT CATEGORIES KEY
SUBWATERSHED BOUNDARY
PROPOSED TRAIL
EXISTING STORMWATER BASIN / PONDS
STREAM
MUNICIPAL BOUNDARY
ROADS
CONTOUR INTERVAL 10 FEET

WISSAHICKON CREEK · RIVER CONSERVATION PLAN **TREWELLYN CREEK WATERSHED**

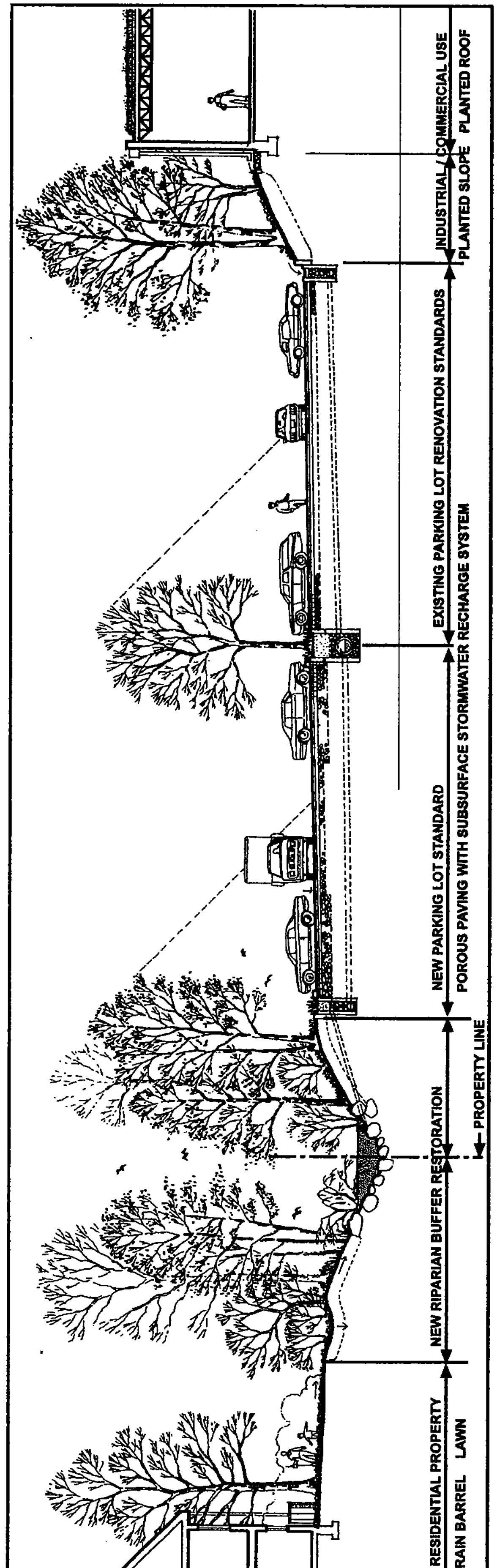
FAIRMOUNT PARK COMMISSION, PHILADELPHIA, PA · MONTGOMERY COUNTY PLANNING COMMISSION · WISSAHICKON VALLEY WATERSHED ASSOCIATION · FRIENDS OF THE WISSAHICKON · WISSAHICKON RESTORATION VOLUNTEERS
PENNSYLVANIA DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

The Delta Group · C. Miller, PE · Steven Hornell · PAQ, Inc · S. Edgar David · Temple University Department of Landscape Architecture and Horticulture · Date: · Scale: 1" = 400'



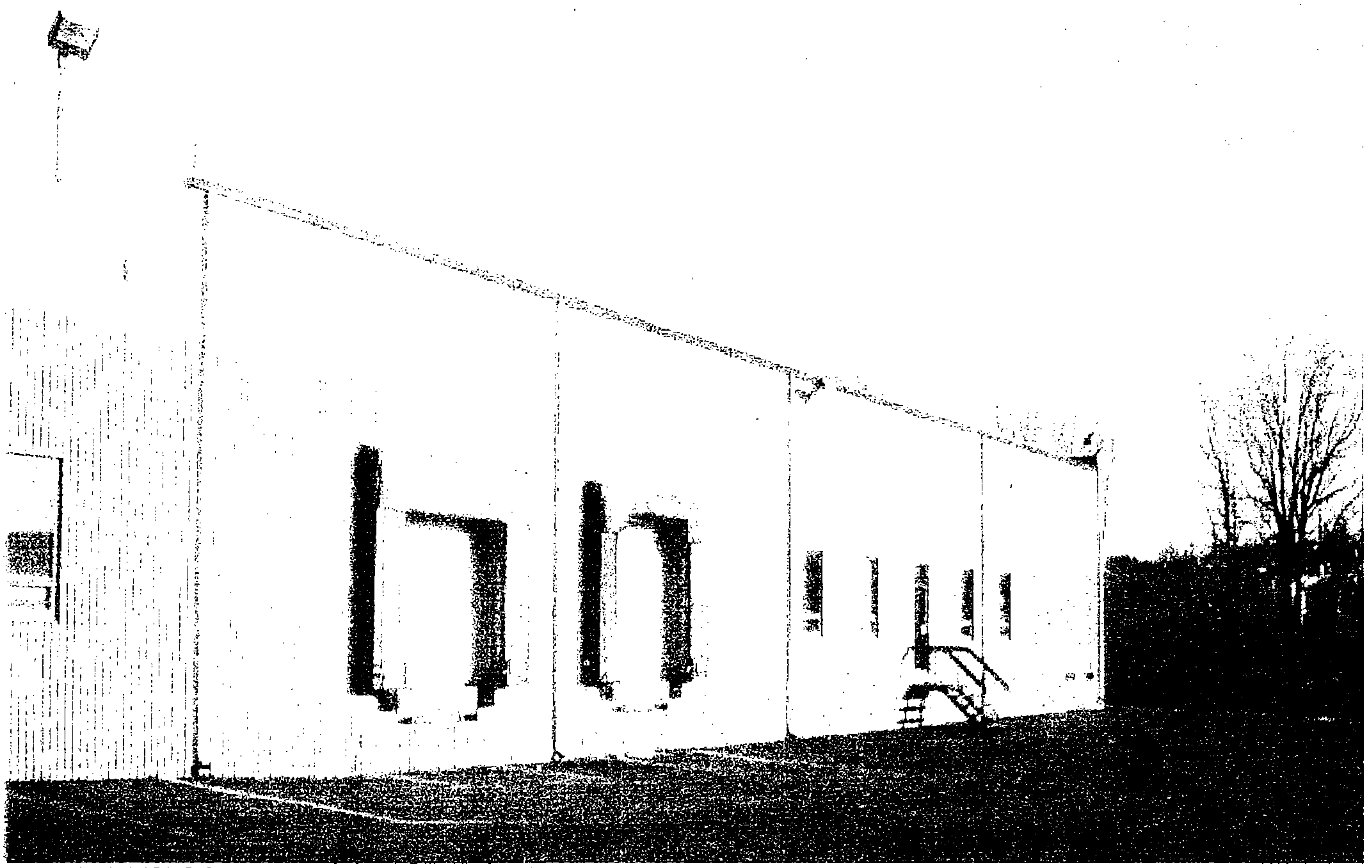
EXISTING CONDITIONS
PROJECT SITE SECTION

TREWELLYN CREEK SUBWATERSHED



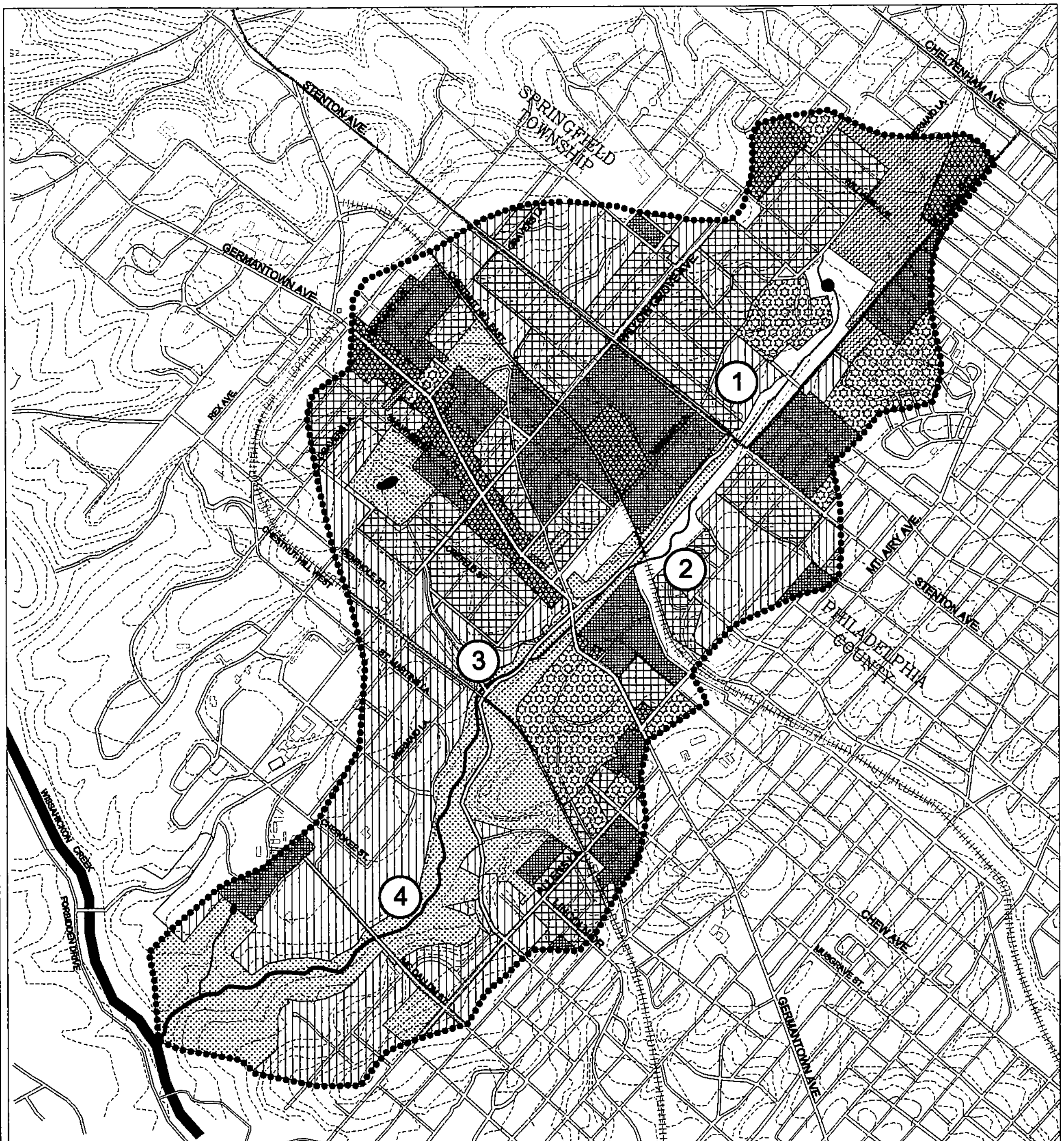
PROPOSED IMPROVEMENTS
STORMWATER MANAGEMENT BMP'S

TREWELLYN CREEK SUBWATERSHED



100% IMPERVIOUS SURFACES (ROOF AND PAVING)

The two cross Sections on the facing page compare an existing parking lot for an industrial site without storm water management, with the same site after installation of BMPs which increase bio-infiltration, reduction of roof runoff, and the restoration of a drainage swale and residential property. The proposed improvements would produce an environment with a cooler microclimate.



EXISTING LAND USE MAP

COMMERCIAL	RESIDENTIAL (high density)	UNDEVELOPED OPEN SPACE
INSTITUTIONAL	RESIDENTIAL (medium density)	STREAM
INDUSTRIAL	RESIDENTIAL (low density)	MUNICIPAL BOUNDARY
AGRICULTURE	PUBLIC OPEN SPACE	ROADS

WISSAHICKON CREEK · RIVER CONSERVATION PLAN **CRESHEIM VALLEY WATERSHED**

FAIRMOUNT PARK COMMISSION, PHILADELPHIA, PA · MONTGOMERY COUNTY PLANNING COMMISSION · WISSAHICKON VALLEY WATERSHED ASSOCIATION · FRIENDS OF THE WISSAHICKON · WISSAHICKON RESTORATION VOLUNTEERS
PENNSYLVANIA DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

The Delta Group · C. Miller, PE · Steven Hammell · PAQ, Inc · S. Edgar David · Temple University Department of Landscape Architecture and Horticulture · Date: · Scale: 1" = 400'

C. The Cresheim Creek Watershed

The most urbanized of the three selected subwatersheds, the 2.7 square mile watershed of the Cresheim Creek is situated within the City of Philadelphia and Springfield Township. Historical resources include the Germantown Avenue Historical District, which includes a great diversity of important buildings and sites.

Chestnut Hill, East and West Mount Airy are considered uniquely desirable neighborhoods of historical, architectural and ethnically diverse significance.

Several institutions with large open space resources are located in the Cresheim watershed. The New Covenant Church, the Lutheran Theological Seminary and the United States Department of Agriculture Research Campus in Wyndmoor are examples.

Proximity to the Wissahickon Park area of Fairmount Park is considered one of the major benefit of living in these neighborhoods.

The communities in the Cresheim Valley are well served by two S.E.P.T.A. commuter rail lines linking all three neighborhoods to Center City Philadelphia and several bus/trolley routes run on Germantown Avenue, and other major roadways.

Distinguishing features of this subwatershed

- Absence of tributary drainage to the main Creek channel
- Encroachment by transportation and utility corridors into the floodplain in the upper segments of the Creek
- Nearly 100 percent development, (A few elite homes are still being constructed in the lower reaches of the Creek)
- Absence of effective runoff controls
- High rate of intensive storm sewer facilities within the developed City portion of the subwatershed
- Preservation of the Creek in its "wild" state in the lowermost segment in Fairmount Park.
- The geologic and soil conditions are favorable for sustaining stream baseflow through the infiltration of runoff in upland areas, depending on protection of soil.
- Extremely steep topography in the Fairmount Park area of the Cresheim Creek Subwatershed is susceptible to considerable erosion where compaction or tree canopy gaps occur in the forest areas.

1. <u>Assessment</u>

This subwatershed was completely developed prior to the enactment of ordinances, which might have preserved more of the floodplain riparian corridors associated with its perennial tributaries. Furthermore, the watershed has been developed without the implementation of measures to control runoff peak rates and preservation of groundwater recharge. Property loss due to acute flooding has been avoided only because the lowermost segment of the Creek has been preserved by the Fairmount Park Commission. However, this segment is being severely degraded by a combination of excessively high runoff peak rates and heavy silt loads contributed by the upstream drainage areas. Furthermore, due to the reduction in baseflow, the summer months are characterized by low flows with high temperature and low dissolved oxygen content.

The Cresheim Creek, as it has been modified during development of the watershed, is essentially a linear feature. With few exceptions its tributaries have been eliminated and replaced by urban storm sewer systems. There are no remaining perennial tributaries to the Cresheim Creek. Although a few small tributary corridors have been preserved within the Park, these have been robbed of their baseflow by upstream development. Flow in the Creek is derived primarily from storm sewers that outfall directly into the Creek.

Opportunities for runoff to infiltrate to the shallow groundwater system have been severely curtailed by the high rate of imperviousness and the prevalence of storm sewers. Measures directed at dispersing runoff across open space, infiltrating runoff in on-lot measures (e.g., dry wells), or retaining runoff in depressions and bio-retention areas, can be very effective in restoring or sustaining baseflow in the Creek.

The pond at Pastorius Park is one of two hydrologic features of any significance, which is not on the main channel of the Creek. This pond occupies the headwaters of what was originally the Pastorius Creek tributary, which is now completely sewered and outfalls to Cresheim Creek at the bridge. In its present configuration, the pond provides minimal flood control and water quality functions. The other pond is in Mermaid Park in Wyndmoor.

The Cresheim Creek can be considered in four segments:

1. *Queen Street to Anderson Street*

   This segment of the Creek has been mostly channelized to reduce the width of the floodplain. Reaches which parallel the abandoned Germantown and Chestnut Hill Railroad grade, tend to be straight with steep, unstable banks. Throughout most of this segment, the Creek is eroded and choked with vegetation. The dumping of wood chips, construction rubble and other refuse continues. With the abandonment of the railroad, opportunities may exist to construct flood control and water quality measures in this long-ignored segment.

   Near the headwaters of the Creek, Mermaid Park, a 100-yard reach of the floodplain remains. However, the natural wooded buffer has been replaced by turf grass and the stream channel is cut by erosion, thus compromising the value of the floodplain for runoff control.

   The lower part of this segment includes two reaches where the Creek flows below ground in pipe culverts: 1) one where the Creek passes for about 75 yards beneath Stenton Ave., and 2) the second where the Creek has been routed beneath residential lots along Woodbrook Lane for a distance of 120 yards. The acceleration of flow associated with these sections creates erosion impacts downstream. At the outlet to the Stenton Avenue culvert this condition has prompted the placement of riprap.

2. *Anderson Street to abandoned railroad overpass tunnel*

   The first natural stream section occurs downstream of Anderson Street where the Creek emerges from a 120 yard-long pipe. In this segment portions of the original floodplain are preserved. A small gorge prevents encroachment of residential properties onto the floodplain from the southeast and dense forest shields it from Cresheim Valley Drive. The relative inaccessibility of this segment has probably contributed to its state of preservation.
   Although this segment is experiencing stream bank erosion and sedimentation, these impacts are not severe. Unique opportunities exist to construct flood control and sedimentation control measures, especially in locations immediately upstream of the Devon Street and R-7 railroad overpass tunnels.
   This segment is immediately downstream from the outfalls for the storm sewers which serve the Market Square, Hill Tower, and Chestnut Hill Village developments. This area includes intensively developed land with no on-lot or community runoff controls. It is interesting to observe that the preservation of a floodplain for the Creek in this segment has allowed the Creek to absorb shock runoff loads from this development with comparatively little disruption to downstream areas.

3. *Abandoned railroad overpass tunnel to R-8 railroad trestle (and the Lincoln Drive bridge)*

   This segment has been mostly channelized to provide space to construct Cresheim Valley Drive. The channelized sections include concrete retaining walls. Elsewhere, steep eroded clay banks contain the stream. Bank erosion is aggravated by direct runoff from the Drive. Crowding of the Creek between the Drive and residential properties along Woodbrook Lane provide few opportunities for restoring the hydrologic function to this segment. Where space allows, measures should be implemented to disperse direct runoff from Cresheim Valley Drive on the floodplain. For the most part, however, improvements in this segment will depend upon measures being implemented in Segments 1 and 2.

4. *R-8 railroad trestle to the confluence with Wissahickon Creek*

This segment lies within Fairmount Park and is characterized by more natural stream cross sections. It has excellent hydraulic features that contribute both flood control and water quality benefits. However, flash stormwater runoff from upstream segments has accelerated erosion of the stream banks, and silting of the stream bed is serious and constant. This has produced a stream cross-section that is much wider and shallower than is ideal.

The Cresheim Valley Park Meadow occupies the former backwater pool of an old dry-masonry mill dam that is completely filled by silt. In its present condition the dam and meadow operate effectively as a large grade-control structure.

Below the McCallum Street bridge the floodplain narrows as the Creek enters the gorge of the Wissahickon Creek. Locally, the Creek has cut deeply into its natural floodplain. Undermining of stream banks is severe and is resulting in the loss of many large trees. In the last century the reach between the McCallum Street bridge and the "bridle path" bridge was channelized. The old dry-masonry retaining walls, undermined by increased storm-related flow, are now collapsing into the Creek. The filled earth embankments are sloughing into the stream and undergoing severe erosion and gullying. The jumble of masonry blocks may be performing a beneficial function in increasing resistance to flow and dissipating energy during high water events. Reconstruction of the walls is not advisable, since this will only accelerate flow. Rather, consideration should be given to restoring the natural stream cross-section and stabilizing the stream banks using bio-engineering techniques. Re-use of the wall-ruins material should be investigated.

Damage to stream banks is being accelerated by the pedestrian access to the Creek. However, the most severe impacts tend to be localized at points of interest, such as bridges and rock outcroppings. Therefore, discrete measures could be constructed to provide erosion resistant access to stream banks in these locations.

Excluding Fairmount Park, the drainage area within the City limits is served by an *intensive* system of storm sewers. This management practice is equally characteristic of 19th and early 20th century residences in Chestnut Hill and modern multi-family developments in Ivy Hill. It contributes to the diminution of groundwater recharge and aggravates storm runoff peak rates in the Creek.

In Wyndmoor, Springfield Township, most neighborhoods are not served by storm sewers. An exception is the Mermaid tributary drainage that has been replaced by an intensive storm sewer district. However, in this district, downspouts are not interconnected to the storm sewer.

There are approximately 14 storm sewer outfalls to the Creek. Twelve of these are maintained by the City of Philadelphia. Five outfalls have been constructed inside bridge abutments or concrete channels to eliminate scour caused by the discharge jet. Localized scour and bank erosion is characteristic of the remaining outfalls. It is readily apparent that storm sewer outfalls are contributing large quantities of silt and sediment to the Creek. In the reaches immediately downstream of outfalls, sediment accumulation is excessive. Depths of loose sediment of 6 inches or more are common. The weathering of road surfaces and the wash-off of de-icing salt and sand appear to be the principal source of sediment. However, erosion caused by landscape maintenance activities and minor construction may also be a significant source of sediment from developed drainage basins.

There are no significant runoff controls within the Cresheim Creek Subwatershed. This fact, combined with the high rate of imperviousness, interconnection of roof downspouts, intensive storm sewering, and the elimination of tributary drainages, result in extreme variation in stream discharge. This can be observed in unstable banks, active erosion, and excessive silting throughout the Creek. However, several features in the watershed provide some control, these include Mermaid Park, Pastorius Park, and Cresheim Valley Park adjacent to Cresheim Valley Drive, downstream from the R-8 railroad trestle. None of these facilities presently have sufficient detention storage to provide significant flood control benefits. Improvement of the stormwater management functions of these facilities is still possible.

2. **Proposed Projects for Cresheim Valley Subwatershed**

The following map on page VI-34 and a proposed list of projects have been developed in response to the analysis of the conditions on-site, discussion with the municipalities involved and comments received at public workshops.

Opportunities for Best Management Practices

There is great potential for creating a new greenway park, by combining the efforts of Fairmount Park, Springfield Township and possibly Cheltemham Township. Incorporating several stormwater management improvements into the design is also a great opportunity.

New and reconstructed trails could be developed, totaling 3.5 miles of new biking / hiking / nature study opportunities. This land is presently an unsafe, refuse-filled, invasive plant-covered wasteland. It is a prime candidate for restoration as parkland.

Due to the intense development of this subwatershed, most opportunities to implement BMPs will be limited to the main channel. Exceptions may include Pastorius Park and New Covenant campus. Also, on-lot measures can be applied throughout the watershed. Some BMPs suggestions include:

- Install check dams in the uppermost segment of the Creek and broaden the floodplain where practical by encroaching into the abandoned railroad right-of-way. Runoff peak rate attenuation and water quality benefits can be obtained through proper landscape restoration of these areas.
- Institute landscape modifications at Mermaid Park which will accentuate overbank flooding and ponding of water on the floodplain during storm events. These may include the installation of check dams and the establishment of appropriate vegetation along stream banks.
- Create a bio-retention facility at the present outfall of drainage district W-086-7, which serves part of the Hill Tower and part of the Chestnut Hill Village development. Suitable unused open space is available between Cresheim Valley Drive and the abandoned railroad right-of-way.
- Create flood control impoundments (possibly wet ponds), in segment 2, where the Creek enters tunnels at the R-7 railroad and Devon Street overpasses. These impoundments can be optimized to remove entrained silt prior to the Creek entering Fairmount Park.
- Stabilize eroded creek banks using bio-engineering techniques.
- Introduce bio-engineered silt dams, sediment-trapping wetlands or terraced check dams, to transition flow from storm sewer outfalls to the Creek (A good example of this approach can be observed at the outfalls for storm sewer drainage districts W-077-1 and W-076-8 inside Fairmount Park.).
- Using bio-engineering techniques, restore and stabilize unstable stream banks between the McCallum Street Bridge and the "bridle path" bridge.

- Construct erosion-resistant pedestrian access to stream banks at discrete locations along the Creek.
- Require that roof downspouts be disconnected from storm sewers where practical. Introduce incentives for the installation of on-lot roof runoff control measures (e.g., bio-retention terraces, dry wells and rain barrels).

Effect of Public Policy (Zoning and Subdivision Ordinances)

The Wissahickon Ordinance (Bill 1569; *Environmental controls for Wissahickon Watershed,* 1975) restricts further development of the watershed within the City boundary. The provisions of the ordinance require preparation of earth disturbance plans, limit the extend of impervious ground cover, prevent construction of slopes steeper than 25%, and require a 200 foot setback from bank of surface water body. This ordinance pertains to land in the Wissahickon watershed that is both inside and outside the boundaries of Fairmount Park. Within Fairmount Park, a more comprehensive program of watershed and riparian corridor management is possible.

The lower Wissahickon Creek has been protected from wholesale development as a result of:

- Protection of lands within the Fairmount Park system
- Prevalence of large private estates that have historically resisted subdivision and development
- Steep, unbuildable slopes associated with the Wissahickon gorge

The Wissahickon ordinance has been effective in preserving the status quo. However, the rehabilitation and long term preservation of the lower Wissahickon Creek will require a more pro-active approach. The upper portion of the subwatershed falls within Springfield Township, which has enacted a stormwater management ordinance that requires control of runoff peak rates for the 5-, 10-, 25-, and 50-year storm. The requirement is to prevent increases in runoff peak rates from existing conditions. This requirement applies equally to new construction and redevelopment. However, it stops short of requiring redevelopment projects to restore pre-development runoff peaks. Given the advanced state of development within the Cresheim Creek subwatershed, this ordinance is not likely to produce much improvement in runoff control. The only approach to runoff detention that is viable on this watershed is to require redevelopment projects to achieve control of small storms (e.g., 6-month or 1-year return frequency storm).

The Springfield Township Subdivision and Land Development Ordinance protects all natural perennial and intermittent water courses from significant alterations. In practice, this ordinance is not useful on this subwatershed, since the only remaining watercourses flow in highly modified channels. Extensive remedial grading will be required to restore hydraulic functions to these channels. In short, present Springfield Township ordinances, developed for a suburban watershed in the early stages of development, fall short of the needs of a predominantly fully developed watershed.

The long-range preservation of the Cresheim Creek will require the adoption of new measures. These may include:

- Revision of ordinances to include initiatives to reduce sediment loads to the urban storm sewer inlets caused by weathering of road surfaces and resurfacing activities. Also, ordinance provisions are required to limit the release of sediment, debris and chemical pollutants that are the by-product of routine residential landscaping activities such as mulch, grass clippings, fertilizer, lime, herbicides, insecticides and fungicides.
- Introduction of incentives to encourage the installation of on-lot BMPs to retain and infiltrate precipitation, and slow the concentrated runoff. The geology of the Cresheim Creek subwatershed makes it an ideal setting for the introduction of on-lot retrofit BMPs.

- Revision of landscape requirements to enable the construction of bio-retention facilities in commercial and institutional parking lots (The present Springfield Township ordinance requires landscaped parking islands. Tree selection and grading requirements are not conducive to the installation of bio-retention facilities)

- Development of a comprehensive stream corridor protection ordinance

- Development of stormwater management provisions specific to the redevelopment of existing properties

Effect of Transportation and Utility Corridors

Modifications to the Cresheim Creek are primarily the result of the historic development of the transportation corridors along the Creek. Chief among these are the abandoned railroad and Cresheim Valley Drive. The construction of these facilities has resulted in the filling of much of the original floodplain of the Creek and the subsequent channelization in attempt to restore the flow capacity of the Creek. The result is excessively high flow velocities during storm events. Restoration of the Creek in these areas will not be practical, unless runoff velocities can be reduced by either widening the floodplain or introducing detention measures. Opportunities to one or both may now exist in segment 1 as part of an open-space plan for the abandoned railroad grade.

Effect of Policies for the Management of Sanitary Wastewater

All of the Cresheim Creek subwatershed is served by municipal sanitary sewers. The Creek, however, is crossed multiple times by sanitary sewer interceptors. Furthermore, a trunk sewer has been laid within the floodplain of the lower reaches (segment 4) of the Creek. There is indirect evidence that some of these sewers may be interfering with the Creek, either by leaking septic fluids to the Creek during high flow periods or by robbing baseflow via infiltration and inflow (I&I) in dry periods (*Technical Elements of the Fairmount Park Master Plan*, Academy of Natural Sciences, 1983).

CRESHEIM VALLEY CREEK SUBWATERSHED
PROJECT IDENTIFICATION LIST

#	MUNIC	TYPE	SIZE	COST	REMARKS
STORMWATER MANAGEMENT / BMP'S					
S-1	SP.	Stormwater Ponds	125,000 SF	$700,000	$600,000 - $800,000
S-2	PH.	Parking Lot Retroscape Demo.	12,400 SF	$25,459	Sample Area 40 Cars
S-3	PH.	Stormwater Mgt. Ponds	70,000 SF	$611,820	$500,000 - $700,000
S-4	PH.	High Density Retrofit		$10,000	50 Rainbarrels, 50 Trees
S-5	PH.	High Density Retrofit		$10,000	50 Rainbarrels, 50 Trees
S-6	PH.	High Density Retrofit		$10,000	50 Rainbarrels, 50 Trees
S-7	PH.	High Density Retrofit		$10,000	50 Rainbarrels, 50 Trees
S-8	PH.	High Density Retrofit		$10,000	50 Rainbarrels, 50 Trees
S-9	PH.	Roofscape Demonstration	10,000 SF	$80,000	
RESTORATION OF WATER & HABITAT QUALITY					
R-1	SP.	New Trail Construction	220,000 SF	$540,000	Springfield Greenway
R-2	SP.	Streetscape on Ivy Hill Rd.	320,000 SF	$136,857	
R-3	SP.	Alternative Trail Location Study		$25,000	
R-4	SP.	Rehabilitate Mermaid Park Landscape	200,000 SF	$300,000	
R-5	PH.	Plant Canopy Trees in Cemetery	120,000 SF	$96,000	4 Trees Per 1000 SF
R-6	PH.	New Trail	136,000 SF	$406,771	
R-7	PH.	Restore Butter Cup Cottage Site		$25,000	CHA Class
R-8	PH.	Restore Trail	40,200 SF	$120,600	
R-9	PH.	Reforestation of Canopy Gaps Throughout Park		$25,000	500 Trees / Shrubs Per Year
R-10	PH.	Devil's Pool Restoration	87,000 SF	$100,267	Volunteer Labor
PUBLIC EDUCATION					
E-1	PH.	Education Project		$10,000	Lutheran Seminary
E-2	SP.	Education Project		$10,000	Holy Cross School
E-3	PH.	Education Project		$10,000	Church of the New Covenant
E-4	PH.	Education Project		$10,000	Hari Krishna
E-5	PH.	Education Project		$10,000	Houston School
E-6	PH.	Education Project		$10,000	Jenks School
E-7	PH.	Education Project		$10,000	Springside School
E-8	PH.	Education Project		$10,000	Chestnut Hill Academy
MANAGEMENT TOOLS / ORGANIZATION					
WM-1,2,3	SP.	Develop New Ordinances, Project Manager, Nursery		$20,000	
WM-1,2,3	PH.	Develop New Ordinances, Project Manager, Nursery		$20,000	
ACQUISITION					
A-1	SP.	Acquisition Site	300,000 SF (6.8 AC)	$172,000	R.O.W. (PECO) for Greenway & SWM
A-2	PH.	Acquisition Site	81,858 SF (2 AC)	$120,000	Vacant Prop. For SWM

SP = Springfield Township
PH = Philadelphia County

The potential project map on the facing page shows the location, number and type of project.

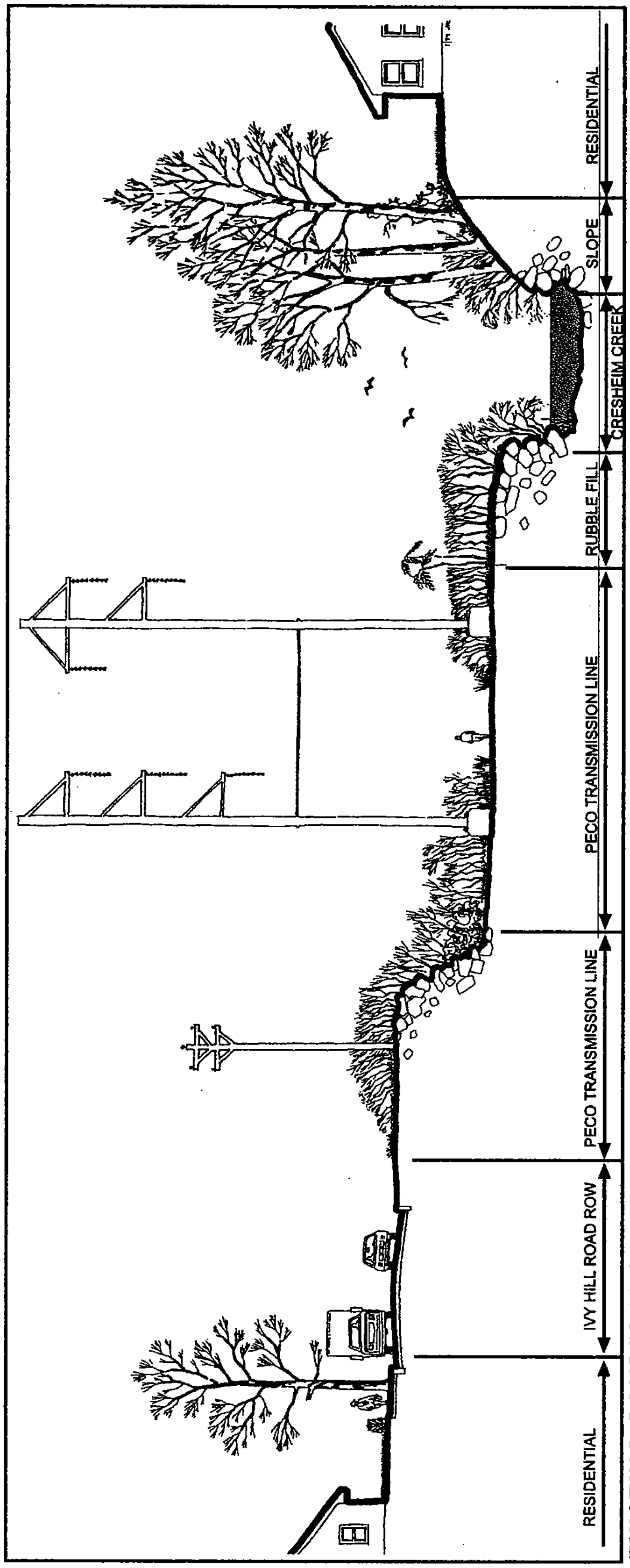
POTENTIAL PROJECTS LOCATION DIAGRAM

PROPOSED LAND ACQUISITION
PUBLIC OPEN SPACE
PROJECT CATEGORIES KEY
PROPOSED STORMWATER BASINS / PONDS
POSSIBLE TRAIL LINKS
SUBWATERSHED BOUNDARY
PROPOSED / RESTORED TRAIL
EXISTING STORMWATER BASIN / PONDS
STREAM
MUNICIPAL BOUNDARY
ROADS
CONTOUR INTERVAL 10 FEET

WISSAHICKON CREEK · RIVER CONSERVATION PLAN **CRESHEIM VALLEY WATERSHED**

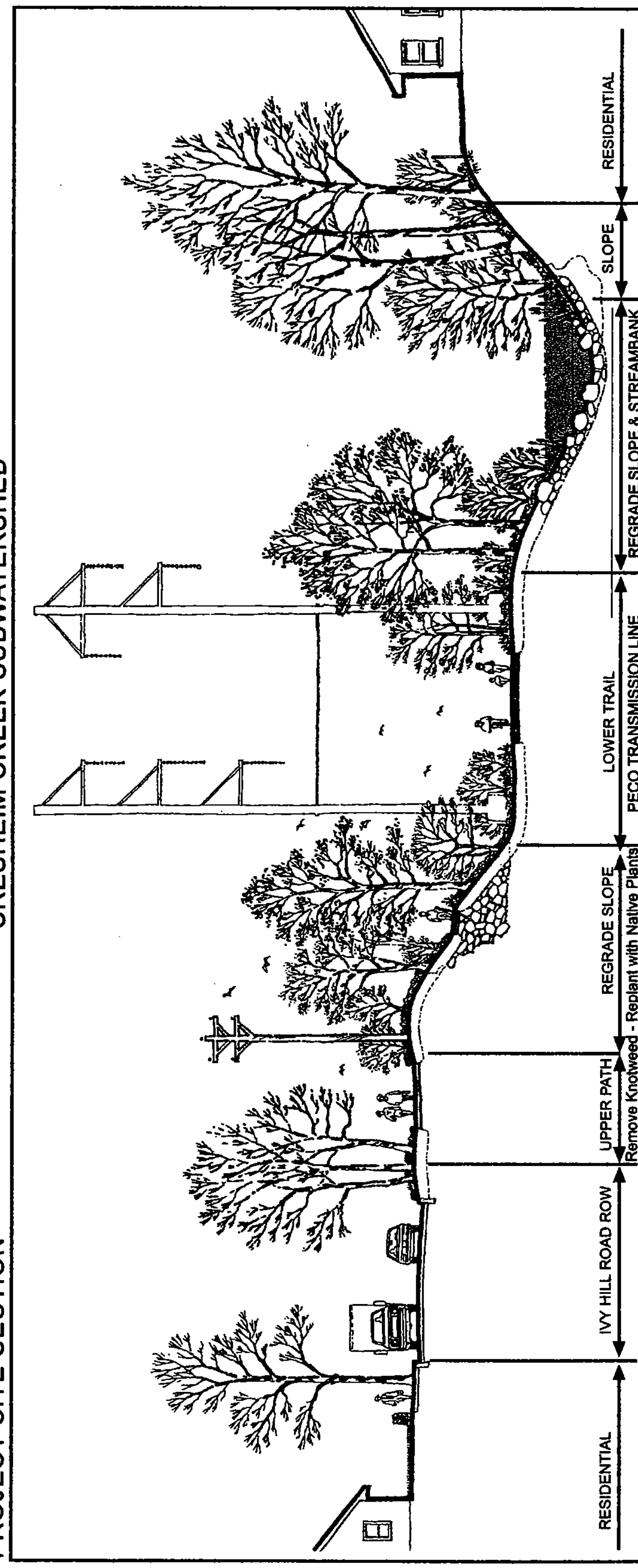
FAIRMOUNT PARK COMMISSION, PHILADELPHIA, PA · MONTGOMERY COUNTY PLANNING COMMISSION · WISSAHICKON VALLEY WATERSHED ASSOCIATION · FRIENDS OF THE WISSAHICKON · WISSAHICKON RESTORATION VOLUNTEERS
PENNSYLVANIA DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

The Delta Group · C. Miller, PE · Steven Hanmell · PAQ, Inc · S. Edgar David · Temple University Department of Landscape Architecture and Horticulture · Date: · Scale: 1" = 400'



EXISTING CONDITIONS
PROJECT SITE SECTION

CRESHEIM CREEK SUBWATERSHED



PROPOSED IMPROVEMENTS
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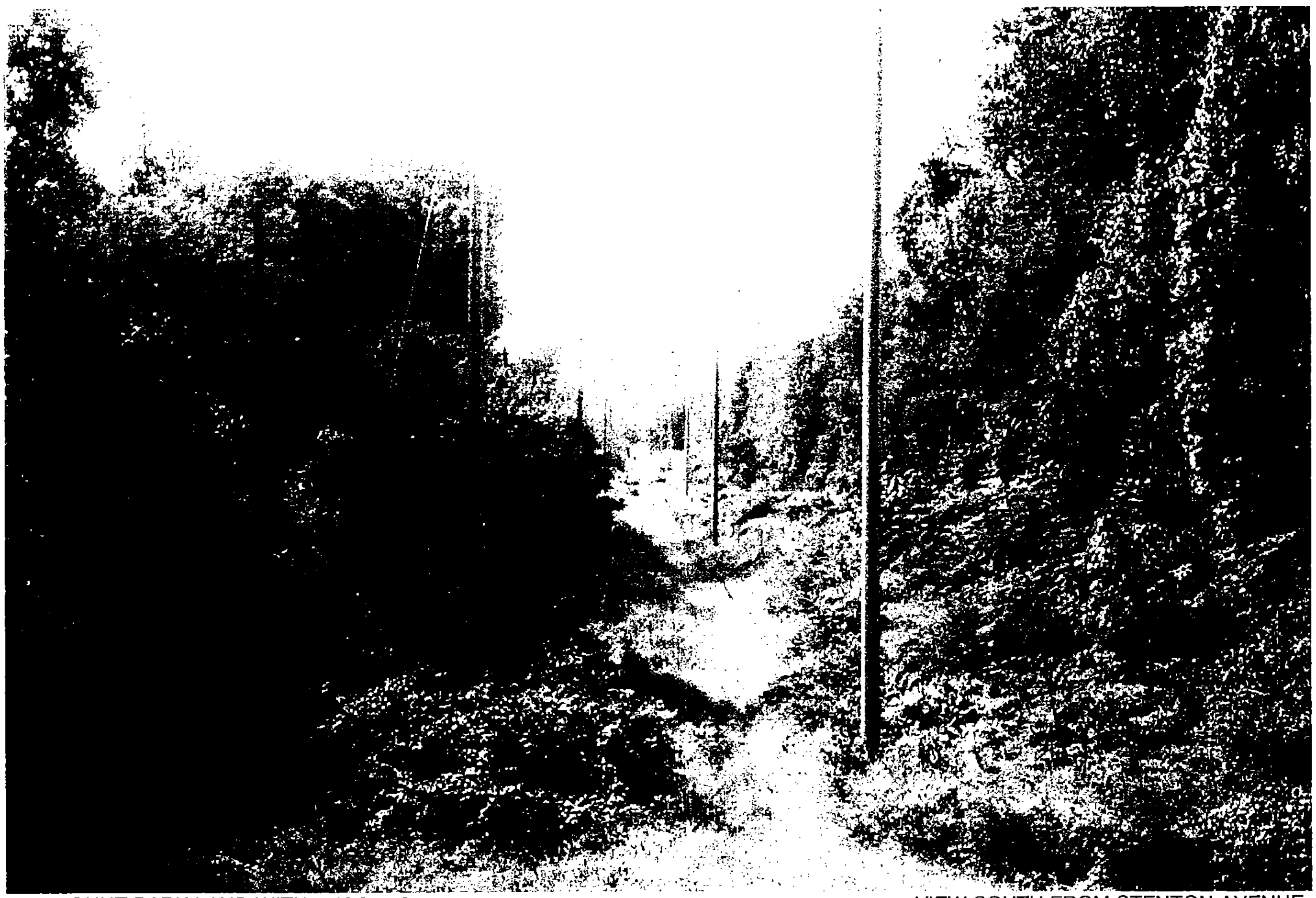


FAIRMOUNT PARK LAND WITH PECO R.O.W. VIEW SOUTH FROM STENTON AVENUE

The comparative Before and After Cross Sections on the previous page indicate the poor existing conditions, which are virtually unmanageable in their present state.

The proposed improvements show new trails, stream reconstruction and re-grading and planting to create a combined public park and stormwater management facility.

The area shown in the Cross Sections is in Springfield Township, north of Stenton Avenue, facing south.

D. Subwatershed Review Meetings

In order to clarify and coordinate the proposals for projects within the three subwatershed, meetings were held with major participants from involved municipalities, public agencies and private groups, to discuss the various potential projects and the willingness to form partnerships where needed.

- *Cresheim Creek Subwatershed Meeting*

  February 19, 1999 at the Springfield Township Building
  Representatives: Springfield Township, Michael Taylor, Richard Lesniak; Fairmount Park, Stephanie Craighead; Friends of The Wissahickon, Ed Stainton; and Wissahickon Valley Watershed Association, David Froehlich
  John F. Collins & Joseph M. McDonnell, The Delta Group

  Both Springfield Township and the Philadelphia Fairmount Park Commission thought that the 3.5 mile trail in the PECO Right of Way was a desirable project but that the cost and complexity were considerable and will take a major investment in energy and money.

  Springfield Township generally supported the landscape restoration of the Mermaid Park, streetscape improvements on Ivy Hill Road and the high density neighborhood rainbarrel / tree planting program.

- *Headwaters Subwatershed Meeting*

  February 25,1999 at the Upper Gwynedd Township Building
  Representatives: Upper Gwynedd Township, Leonard Perrone; Montgomery Township, David Paulson; Lansdale Borough, not represented; Montgomery County Planning Commission, Drew Shaw
  John F. Collins & Joseph M. McDonnell, The Delta Group

  The major projects that were discussed were the dam / pond reconstruction project in Lansdale Borough, the power line trail and restoration of the stream corridor south of Main Street. As Lansdale Borough was not present, the first project was not discussed in any depth. Most of this discussion dealt with problems of private property restoration proposal efforts.

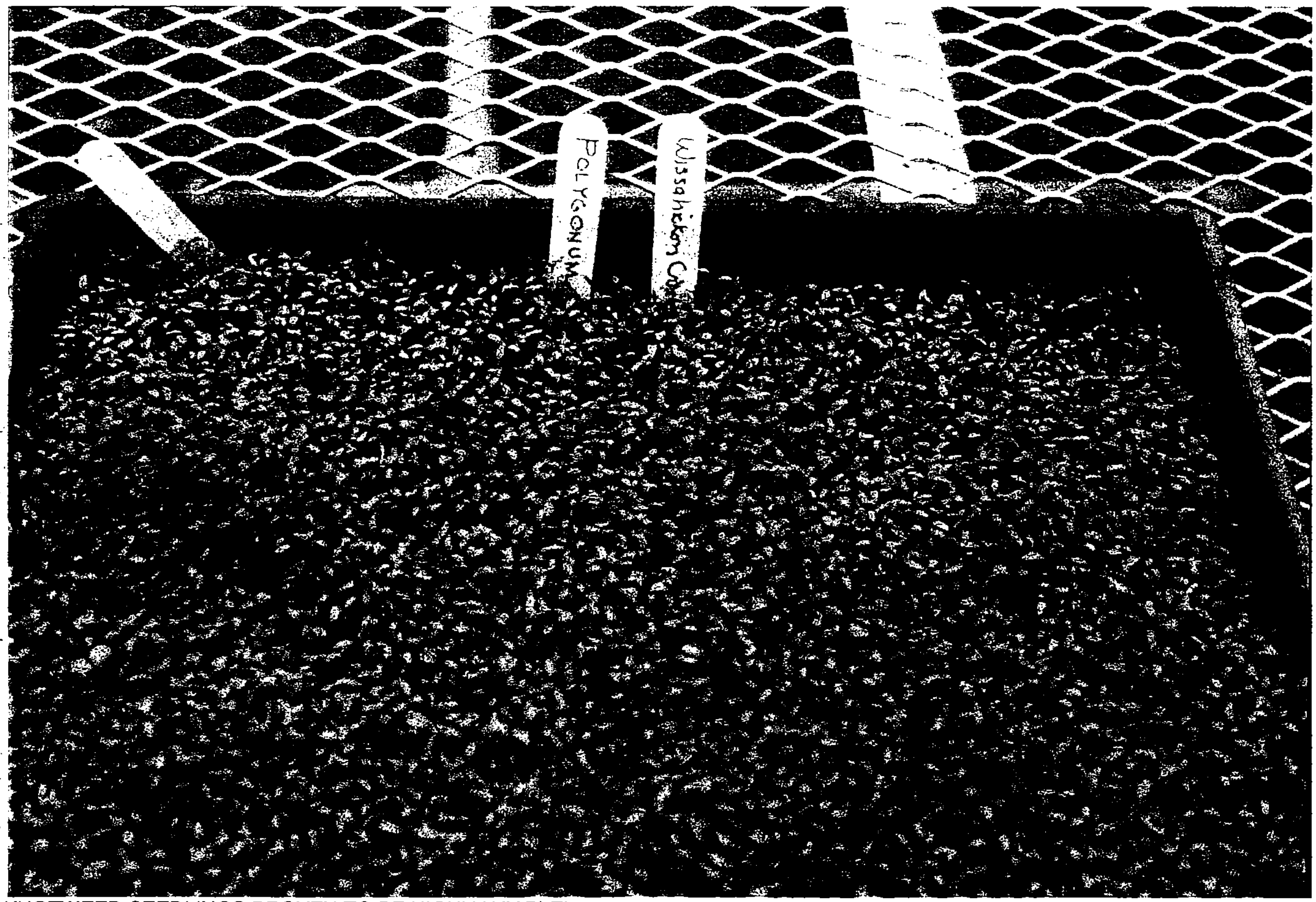
  In general, the comments were supportive as to the value of these proposed projects, but questioned the willingness of the public to support them.

- *Trewellyn Subwatershed Meeting*

  March 8, 1999 at the Lower Gwynedd Township Building
  Representatives: Lower Gwynedd Township, Chris Canavan; Horsham Township, Michael McGee; Montgomery Township, David Paulson; Montgomery County Planning Commission, Beth Pilling
  John F. Collins & Joseph M. McDonnell, The Delta Group

  Major projects in this subwatershed include landscape restoration of privately owned, intermittent stream corridors, acquisition of parkland and the reconstruction and repair of existing ponds. Lower Gwynedd Township is very interested and moving ahead on several projects. The other townships were generally positive.

VII. WATERSHED – WIDE MANAGEMENT



KNOTWEED SEEDLINGS PROVEN TO BE HIGHLY VIABLE!
TEMPLE UNIVERSITY AMBLER CAMPUS LANDSCAPE ARCHITECTURE AND HORTICULTURE

VI. WISSAHICKON-WIDE MANAGEMENT ALTERNATIVES

The need for designating coordination responsibility for the Wissahickon Watershed restoration-related activities must be one of the first steps in the implementation process.

Maintaining existing municipality independence while promoting teamwork between the fourteen in the watershed will also be important. Creating another new layer of regulatory or bureaucratic authority should be avoided.

Retaining the active involvement of the numerous subwatershed groups and the three major watershed support groups, the Wissahickon Valley Watershed Association, the Friends of the Wissahickon and the Wissahickon Restoration Volunteers, is also of great importance.

The tasks that the coordinating agency/organization/person might assume include the following:

1. Planning and Coordination

The realization of the goals of the River Conservation Plan will require strong coordination among the many stakeholders in the watershed. In particular, the following tasks are critical to success:

- Coordination between local municipalities, state and county agencies, including ordinance revisions to support the planning goals.
- Assistance in preparing funding applications, construction / implementation contracts, grant proposals, etc.
- Long-range watershed planning liaison.
- Prioritization of restoration and remediation projects.
- Administration of restoration contracts, inspections, review of invoices.
- Public education and outreach to community and schools.
- Coordination of applied research activities on wildlife, water quality improvement, plant disease/insect control and invasive plant management.

Fortunately a watershed coalition is already forming. Known as the Wissahickon Watershed Partnership (Partnership), its members include government agencies, non-profit groups, volunteer organizations, landowners, industries, and concerned citizens. Over 30 local, state and regional organizations and all municipalities within the watershed are represented. The Partnership was formed in 1997 because of a strong interest in the creek, and a need to coordinate many on-going and proposed studies. Since its formation the scope of the organization has widened to embrace all aspects of stream management, including water quality and open-space preservation, recreational development, stream bank and floodplain restoration, habitat restoration, and flood control. The Partnership continues to benefit from the active support of the Pennsylvania Department of Environmental Protection (PADEP) Watershed Coordinator.

2. Policy Implementation

Implementation of the Partnership's recommendations will depend upon the participation of its member organizations. There are numerous groups in the watershed that have the experience and expertise to implement critical programs. The Partnership can further empower these groups by:

- Coordinating activities among the municipalities within the watershed.
- Functioning as a recognized authority for policy-making within the watershed.
- Ensuring a reliable level of funding for on-going programs.
- Subsidizing new staff members who will be dedicated full- or half-time to the Wissahickon Creek watershed.
- Building relationships and alliances that are better equipped to take on long-term or difficult projects.

Some specific recommendations include:

a. Establish a new position for Restoration Project Coordinator. This professional could be conveniently added to the four full-time staff of the Wissahickon Valley Watershed Association.

b. Fund a half-time position at a regional Watershed Technical Center, to be hosted at the Academy of Natural Sciences. The role of this person would be to: 1) collect and disseminate monitoring data and other technical information about the watershed, 2) develop guidelines and educational programs, 3) coordinate on-going monitoring efforts.

c. Fund a field consultant for the Montgomery County Conservation District (MCCD). This person's role would be to meet with developers and municipal engineers during site plan development, inspect construction, and monitor conditions in the watershed.

d. Municipalities would be encouraged to incorporate review by the MCCD in site plan approval.

If existing organizations are not able or willing to shoulder the increased responsibilities for watershed management, then it may become necessary to establish a new central watershed planning office with a full time director and staff with restoration and educational credentials.

The cost of salaries for watershed professionals would be shared among the participating municipalities.

The Wissahickon Valley Watershed Association would seem to be the most logical organization to provide day to day coordination of watershed implementation policies. This established organization is currently acquiring and managing an effective stream corridor open space system. They are also well respected by organizations and municipalities within the watershed and are already involved in fund-raising, planning and public education activities.

VIII. ACTION PLAN

COMMUNITY WORKSHOP AT LOWER GWYNEDD TOWNSHIP BUILDING

VIII. ACTION PLAN

It is most important that the Wissahickon Creek River Conservation Plan conclude with observations, recommendations and implementation strategies for the entire watershed, so that all areas and municipal entities have equal opportunity to participate in implementation programs and be eligible for funding. With this goal in mind, a series of documents have been prepared which address the overall watershed. These include the following:

- *Conclusions And Recommendations*

  The following list describes ten "Conclusions and Recommendations" concerning watershed wide issues, based on the findings of the Planning process. These general conclusions are followed by recommendations for each problem / conclusion implementation strategies in:

- *Project Category - Examples*

  Derived from the individual prototype subwatershed studies, these categories of project implementation programs have been developed to apply to the overall watershed, and to cover a broad range of physical and management approaches.

- *Project Descriptions*

  This chart lists a series of general implementation projects that would be applicable to any municipality in the watershed, and which a municipality could utilize as a first round implementation program whether or not a more detailed subwatershed study had been done within that municipality. This would enable each municipality to seek implementation grant monies immediately, and to make significant progress in restoration efforts.

  Three municipalities or private organizations have requested projects that are not in the subwatersheds that were given detailed attention. They are North Wales, Friends of Hillcrest Pond and Philadelphia (Fairmount Park).

  North Wales - Restoration of a wetland / pond in the northwest part of the Borough. ($50,000)

  Friends of Hillcrest Pond – Cisco Park, Paper mill Run
  Restoration of streambank and pond ($200,000)

  Fairmount Park – Several sites identified by the Academy of Natural Sciences requiring restoration (no budget available).

- *Municipality Project Assignment Chart (Page VIII-7)*

  The final chart keys implementation projects with estimated costs to each participating municipality in the Wissahickon watershed. The Project Descriptions chart on Page VIII-5, describes the demonstration projects that would be included on the list for all watershed municipalities.

- *Action Plan Preliminary Outline*

  A list of steps that should be included in the development of an action-based detailed work Plan, to accomplish the goals of this effort.

CONCLUSIONS / PROBLEMS	RECOMMENDATIONS
1. Most land in the Wissahickon watershed was developed prior to storm water management regulations.	Requires concentration on remedial restoration / water quality projects. Ordinances must also be revised to deal with retro-restoration throughout the entire watershed.
2. Most land in the Wissahickon watershed is in private ownership, primarily residential.	Develop projects to restore riparian buffers in residential / institutional / corporate and open space areas.
3. Main Wissahickon Creek corridor is mostly in public ownership.	Complete "Green Ribbon" park along entire creek. Direct main focus on restoring subwatersheds.
4. Subwatersheds are the appropriate scale to deal with physical planning and restoration efforts.	Select three subwatersheds per year for next 9 years as part of on-going planning program for restoration
5. Education must be a high priority for all age groups.	Develop classroom and outdoor programs for each school. Sponsor creek stewardship workshops and demonstration projects.
6. There is strong need for both long range, broadly based watershed-wide policy leadership and day-to-day project implementation / management responsibility.	Establish Wissahickon Watershed Partnership as the comprehensive policy / coordinating group and the Wissahickon Valley Watershed Association responsible for project management / implementation, and local Montgomery County municipal coordinator.
7. Incentives are needed to encourage private property project owners.	Grants, awards programs, hands-on workshops, a how-to handbook, subsidized plant sales and tax relief incentives should be developed.
8. Existing ordinances are not sufficient. They don't deal with retro-restoration or appropriate storm frequency.	Develop a watershed wide ordinance revision / update program, which permits adoption of relevant controls and guidelines tailored to the needs of each municipality.
9. Project funding will require combined Federal, State and local resources. In-kind local match can include volunteer labor as well as municipal staff, equipment and labor cost.	Develop aggressive grant application program. Establish volunteer team or committee for each subwatershed.
10. There is a need for native plant and bio-engineering material for restoration efforts. These materials are not available from most nurseries.	Establish a watershed native plant and bio-engineering materials nursery. (Could be several sites.)

PROJECT DESCRIPTIONS

Overall Wissahickon Watershed Projects. (W)

For each municipality in the watershed, the following implementation projects are recommended to be included in the list developed for fund raising efforts.

Demonstration Projects

Stormwater Management	WS-1	Parking Lot Stormwater Bio-Infiltration.	$26,000
	WS-2	Neighborhood Rainbarrels Program.	$12,000
Restoration	WR-1	Riparian Buffer Restoration Maintenance (150 L.F.)	$16,000
	WR-2	Reforestation and (1acre) Invasives Control	$14,000
Education	WE-1	Education Projects (Elem. School)	$10,000
	WE-2	Education Projects (High School)	$10,000
	WE-3	Education Projects (Junior High School)	$10,000
Project Coordination & Management	WM-1	Ordinance Redrafting	* $5,000
	WM-2	Watershed Project Manager	* $5,000
	WM-3	Bioengineering Nursery	* $10,000
		Minimum recommended annual implementation grant / contribution total for each municipality	$118,000

* The municipalities may wish to make a contribution to ordinance revisions, the new management person's salary, and the nursery project. In municipalities involved in first year Subwatershed planning (Headwaters, Trewellyn and Cresheim) the Municipality Project Assignment Chart has been adjusted to reflect site specific projects.

Subwatershed Projects

The project identification lists for the three subwatersheds include a comprehensive approach to stormwater, restoration, educational, management and acquisition which can be accomplished over several years. The Municipality Project Assignment Chart indicates an attempt to establish a first, second and third order of priority, which could be implemented within the first year of active project management, perhaps starting in the year 2000. Subsequent priorities should be established by the Wissahickon Watershed Partners in cooperation with the municipalities.

The projects are grouped under letter designations as follows:

S - Stormwater Management Projects BMP's (including bio-infiltration, streambank repair, parking lot renovation to reduce runoff, roofscape, planting stormwater basins, filter strips and culvert improvements).

R - Restoration of Water and Habitat Quality (privately and publicly owned riparian buffer planting, trail development, reforestation, meadow development).

E - Education Projects (school grounds forest and meadow projects, creek stewardship, coursework and workshop outlines).

M - Management Projects (share salary of watershed project manager, ordinance review / redrafting, cost of bioengineering materials nursery).

A - Acquisition Projects (purchase, easement, cluster or gift of property with priority on main stream of the Wissahickon and major subwatershed tributaries, emphasize opportunities for multiple use, i.e.: trails, nature study and fishing activities as well as environmental benefits).

WISSAHICKON CREEK - RIVER CONSERVATION PLAN
PROJECT CATEGORY - EXAMPLES

"S" - Stormwater Management / BMP's
- Enhancements to existing dry basins.
- Hydraulic modifications to pond systems (control small storm runoff).
- Outfall modifications to mitigate impacts.
- Threatened tributaries - require restoration of buffers, floodplain regrading, controls at sewer outfalls, etc.
- Urban retrofit - large scale (parking lots) / small scale (residential BMP's).

"R" - Restoration / Water Quality / Habitat
- Reforestation - riparian buffers / upland infiltration program.
- Invasive species management.
- Wetland creation / enhancement.
- Floodplain protection.
- Residential landscaping opportunities.
- Restoration as education.

"E" - Public Education
- Demonstration handbook / video.
- Design guidelines.
- Private property BMP's handbook.
- Schools: on-site woodland / meadow demonstration.
- Schools: environmental education outreach.

"M" - Management Tools
- Ordinance review / modifications.
  Stormwater management incorporating BMP's.
  Redevelopment requirements.
  Riparian corridor preservation.
  Landscape treatment
- Organizations.
- Planning and design guidelines.
- Develop Native Plant / Bio-engineering Nursery.

"A" - Acquisition
- Conservation / preservation - habitat, buffers, open space.
- Public access / trails / linkages.
- Purchase / easement options.

"SP" - SPECIAL PROJECTS (Generally watershed wide)
- Establish Advisory Management Organization for entire watershed.
- Research re: invasives, wildlife, reforestation, etc.
- Water quality testing / monitoring.
- Teaching - meadow / forest development on school property.
- Volunteer involvement in restoration.
- Develop restoration and management team (permanent).
- Clean-up days.
- Trail Planning / design.
- Establish watershed management agency.
- On-going sub-watershed studies, 3 per year for 9 years.
- Invasive Plant Eradication.

Location H = Headwaters, T = Trewellyn, C = Cresheim
Type S = Stormwater Mgt., R = Restoration, E = Education, M = Management, A= Acquisition
Number W = Watershed-wide, not site specific
TS-1
♦ Additional projects identified in other studies

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MUNICIPALITY PROJECT ASSIGNMENT CHART
PHASE 1

MUNICIPALITY	S	R	E	M	A	
Montgomery (MT)	TS-2 TS-1 HS-1 $156,000	TR-2 HR-1 HR-3 $466,900		WM-1 WM-2 WM-3 $20,000		$643,000
Lansdale (LB)	HS-10 HS-4 $143,600	HR-7 HR-8 $224,000	HE-3 HE-4 HE-5 $30,000	WM-1 WM-2 WM-3 $20,000		$417,500
North Wales (NW)	WS-1 WS-2 $38,000	R-1 R-2 $50,000	E-1 E-2 E-3 $30,000	WM-1 WM-2 WM-3 $20,000		$138,000
Upper Gwynedd (UG)	HS-1 HS-6 HS-7 $495,000	HR-2 HR-4 HR-5 $476,500	HE-1 HE-2 $20,000	WM-1 WM-2 WM-3 $20,000	HA-1 $240,000	$1,251,500
Lower Gwynedd (LG)	TS-3 TS-6 TS-7 $346,000	TR-3 TR-8 TR-9 $310,000	TE-1 TE-2 TE-3 $30,000	TM-1 WM-2 WM-3 $20,000	TA-2 $691,000	$1,397,000
Horsham (HT)	TS-4 WS-2 $75,600	WR-1 WR-2 $30,000		WM-1 WM-2 WM-3 $20,000		$125,600
Whitpain (WT)	WS-1 WS-2 $38,000	WR-1 WR-2 $30,000	WE-1 WE-2 WE-3 $30,000	WM-1 WM-2 WM-3 $20,000		$118,000
Upper Dublin (UD) ♦	WS-1 WS-2 $38,000	WR-1 WR-2 $30,000	WE-1 WE-2 WE-3 $30,000	WM-1 WM-2 WM-3 $20,000		$118,000
Ambler (AB)	WS-1 WS-2 $38,000	WR-1 WR-2 $30,000	WE-1 WE-2 WE-3 $30,000	WM-1 WM-2 WM-3 $20,000		$118,000
Whitemarsh (WM)	WS-1 WS-2 $38,000	WR-1 WR-2 $30,000	WE-1 WE-2 WE-3 $30,000	WM-1 WM-2 WM-3 $20,000		$118,000
Springfield (SP) ♦	CS-1 $700,000	PR-1 CR-4 CR-1 $1,040,000	CE-9 $10,000	WM-1 WM-2 WM-3 $20,000	CA-1 $172,000	$1,942,000
Abington (AT) ♦	* WS-1 WS-2 $38,000	* WR-1 WR-2 $30,000	WE-1 WE-2 WE-3 $30,000	WM-1 WM-2 WM-3 $20,000		$118,000
Cheltenham (CT)	WS-1 WS-2 $38,000	WR-1 WR-2 $30,000	WE-1 WE-2 WE-3 $30,000	WM-1 WM-2 WM-3 $20,000		$118,000
Philadelphia (PC) ♦	CS-2 CS-4 CS-9 $115,459	CR-6 CR-8 CR-10 $627,638	CE-1 CE-2 CE-3 $30,000	WM-1 WM-2 WM-3 $20,000	CA-2 $120,000	$863,000
SUB TOTAL						$7,485,600
RESEARCH, PLANNING, EDUCATION, RESTORATION HANDBOOK						$200,000
CONTINGENCY 10%						$768,560
TOTAL						$8,454,160

Action Plan Preliminary Outline

The following outline assumes the recommendations be adopted that the Wissahickon Partnership and the Wissahickon Valley Watershed Association assume ongoing responsibility for establishing policy, coordination, priorities, fund raising, planning and project implementation for the entire basin. As all municipalities are members of the Partnership, all have a voice in these issues. The WVWA role is to provide day to day overview of restoration efforts, in close contact with all municipalities.

A committee of Partnership member WVWA, Montgomery County Planning Commission and Fairmount Park Commission should be established to develop a realistic, fair and action-oriented program for continuing the process that this Plan has started.

Some of the elements of this program may include the following ten steps:

1. <u>Complete the River Conservation Plan</u>, send to DCNR for approval and registry, which will permit application for funding from State and Federal programs. Select year 2 subwatersheds for planning.

2. <u>Develop Detailed Action Plan Program</u>, A committee as described above, should prepare a detailed work / Action Plan to guide the process.

3. <u>Add a Fulltime Restoration Project Manager</u>, to the WVWA staff who will coordinate project grant applications, municipal joint ventures, design, bidding and contract administration. On-site inspections would also be this persons responsibilities.

4. <u>Select Phase 1 Projects and Submit Grant Applications</u>,

5. <u>Implement Bio-Engineering Nursery</u>, prepare plans for year 2, involve all municipalities to assist.

6. <u>Begin Ordinance Update Process</u>, Attempt to include all municipalities in developing a watershed-wide set of ordinances.

7. <u>Develop a Watershed Restoration Handbook</u>, to guide the projects, describe the techniques, materials and equipment required.

8. <u>Begin Educational Projects</u>, throughout the watershed. Involve students in hands on projects. Coordinate Volunteer involvement.

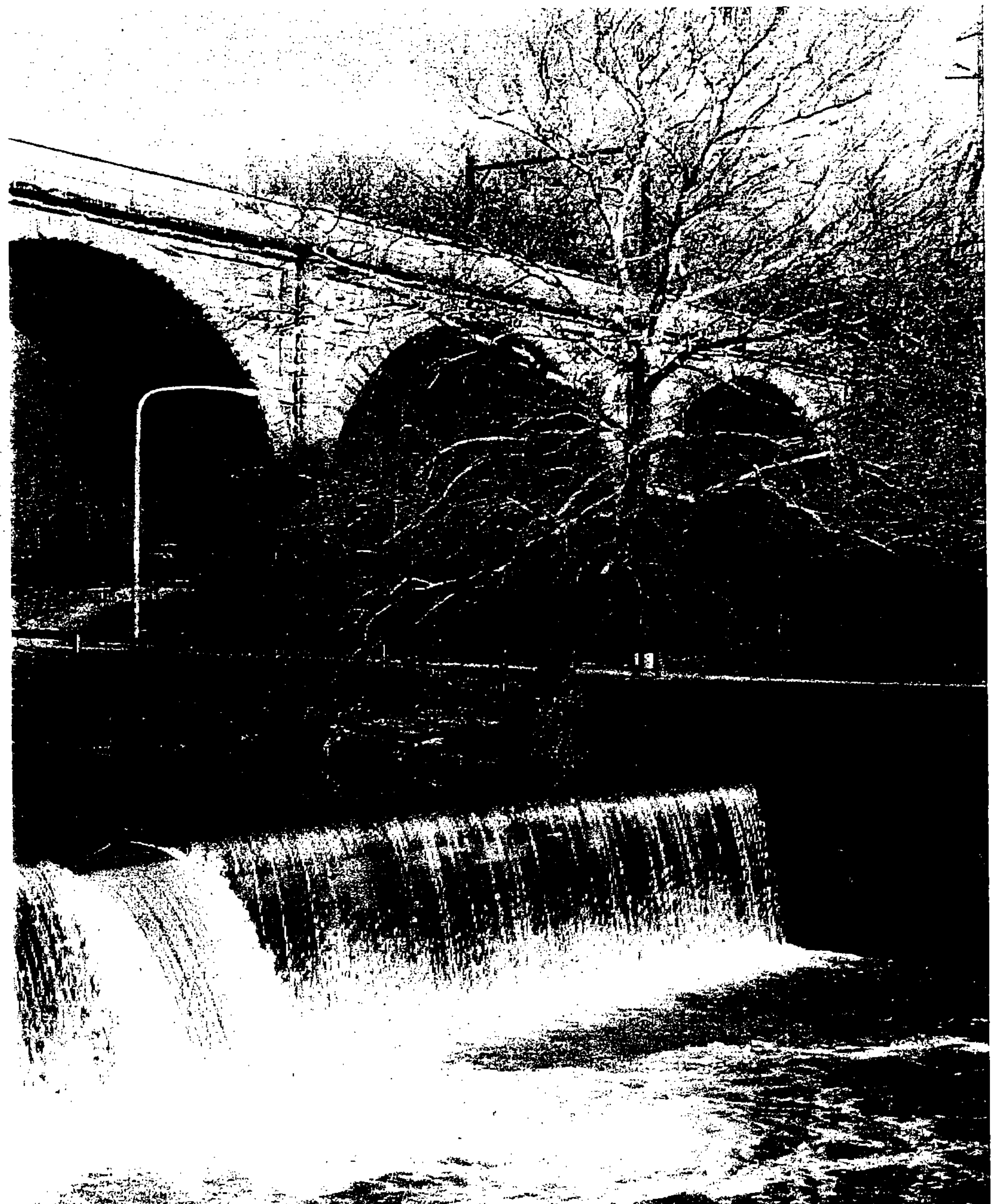
9. <u>Continue to Hold Public Workshops</u>, to develop support for the process. Establish committee for each Subwatershed.

10. <u>Complete Phase I Projects</u>, apply for year 2 funds at the appropriate time.

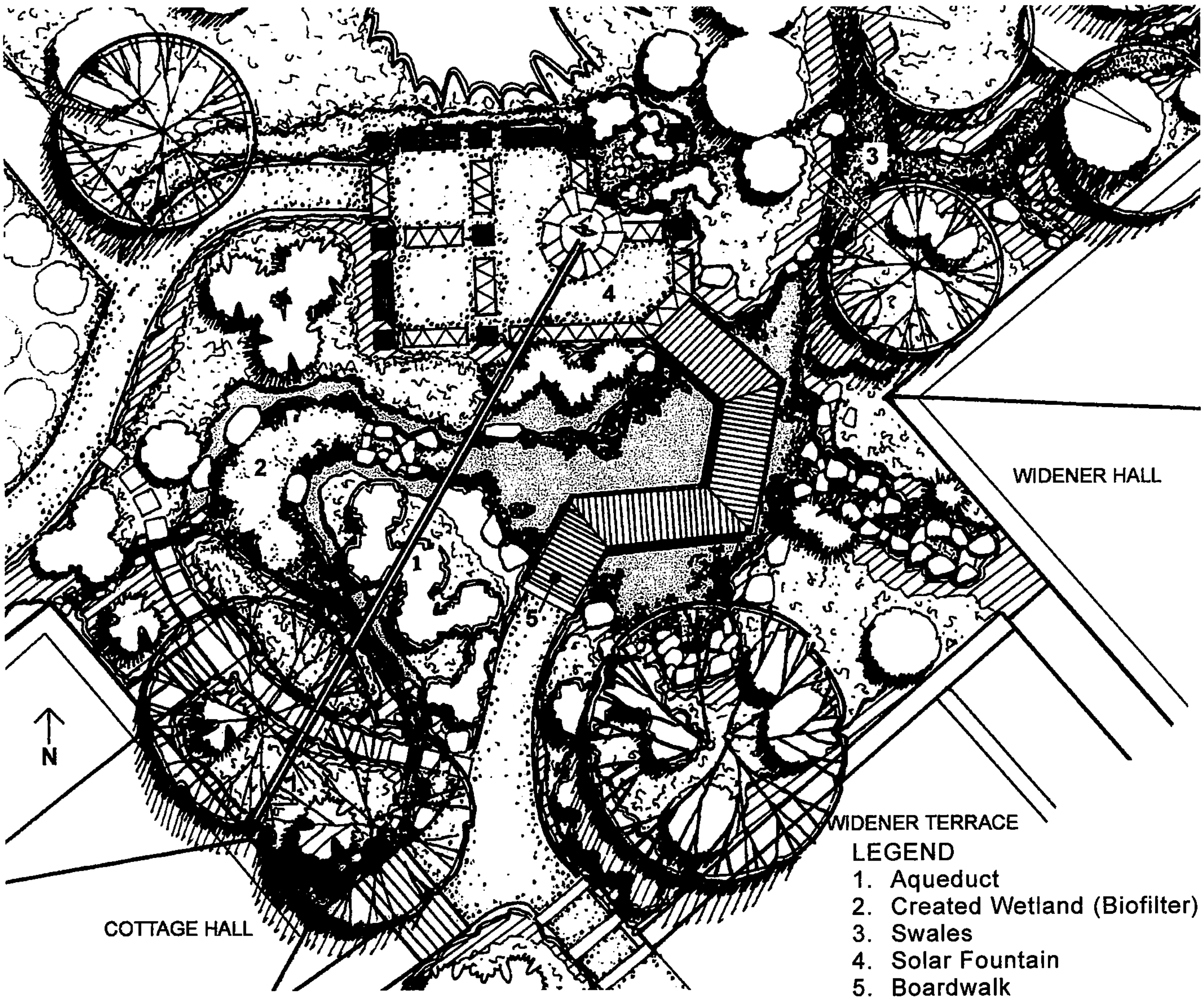
11. <u>Complete year 2 subwatershed plans</u>. (3)

The schedule for this Action Plan will depend on many factors. The major ingredients for a successful program will be teamwork and a sense of urgency. If this action Plan is not begun in the very near future it may be very difficult to rekindle the enthusiasm and momentum that has been developed over the past two years.

IX. CONCLUSION



SPILLWAY NEAR THE CONFLUENCE WITH THE SCHUYLKILL RIVER PHILADELPHIA, PA



SUSTAINABLE WETLAND GARDEN

Temple University Department of Landscape Architecture and Horticulture Spring 1999

IX. CONCLUSION

The work incorporated in this report is the result of a strong team effort involving the 14 municipalities of the Wissahickon Watershed, The Fairmount Park Commission, Montgomery County Planning Commission and the Pennsylvania Department of Conservation and Natural Resources, Department of Environmental Protection, Friends of the Wissahickon, Wissahickon Valley Watershed Association and The Wissahickon Restoration Volunteers and the professional consultant team. The forming of the Wissahickon Partnership during the duration of this effort was very fortuitous, and should continue to provide a clear, unified voice for the watershed community.

The Delta Group and their Sub-consultants wish to thank all involved for their hospitality, interest, input and advice in developing the plan, during a time when numerous other studies and planning efforts were also underway in the Watershed, each requiring involvement of the municipalities and organizations listed above. It has been a privilege to be involved in this important effort.

A good deal of criticism of many of our most cherished landscape traditions can be found in this report. We hope that the text and illustrations are successful in making a case for the somewhat unusual concepts, and the recommendations that have been made.

These long held values include the extensive lush green lawn, large paved areas, filling and clearing "brush" in the floodplain and residential plantings that require irrigation have always been symbolic of a quality, high class community. Rare plants from Asia and Europe have also become signs of a prestigious landscape, while often they require intensive chemical maintenance that native plants can live without.

The concept of "Beauty" should extend to the native landscape, the subtle colors of a warm season grass or wildflower meadow, the mature upland forest in winter or summer and the fall color of a wetland corridor all have their special visual quality. The interests of the outdoor athlete, avid gardener, or plant collector can co-exist with an ecological approach to upland and riparian landscape management. Some of the solutions include sizing lawn areas to fit the intended uses, using garden products that are not toxic and purchasing native plants that will not "escape" and become invasive.

A recently built innovative wetland garden on the Temple Ambler Campus is a valuable example of how creative handling of roof and site stormwater runoff can be incorporated into a residential-scale landscape. Bio-filtration, groundwater recharge, wildlife habitat and visual enjoyment are all accomplished in this unique project which is open to the public. A plan drawing is shown on the facing page, IX-2.

A formal native plant display garden is also open to visitors. It demonstrates the versatility of our native flora.

We hope that this conservation plan will be the first step in developing an energetic, cooperative program to restore the Watershed to a state of improved health so that the future visual, economic and environmental quality will lead to greater enjoyment and well-being for the Wissahickon Watershed communities, and for the many that visit this unique resource.

X. APPENDIX

- List of Philadelphia Projects
- DEP Fact Sheet - Potential Funding Sources
- WRAP / NPS Grants
- Watershed Municipalities Contact List
- Watershed Organizations Contact List
- Public Meetings Minutes / Announcements
- Letters of Support

INITIAL LIST/OF POTENTIAL RESTORATION SITES

IN WISSAHICKON PARK

March 31, 1999

The Academy of Natural Sciences of Philadelphia

The Academy of Natural Sciences of Philadelphia (ANSP) is developing master plans for restoration activities for NLREEP of Fairmount Park Commission. These plans will be based on compilation of existing information on the park and Academy assessments of existing conditions. The master plan for Wissahickon Park will be presented to NLREEP on 1 January, 2001. Prior to this date, lists of potential restoration sites will be developed. It is anticipated that a final list of recommended restorations will be developed by 1 November, 2000.

The primary field assessments were conducted in 1998. These consisted of three types of surveys: vegetation and flora, fauna, and stream channel conditions. Analysis of the faunal surveys is nearly complete. Analysis and interpretation of the vegetation and stream surveys which have been done has not been completed for Wissahickon Park, and additional field work is anticipated.

We are enclosing an initial list of potential restoration sites. This list is based mainly on results of the faunal surveys and preliminary findings of the vegetation surveys. The primary use of the list is to assist in directing subsequent analyses and any necessary site visits. Based on the analogous process which has been completed for Cobbs and Tacony Parks, it is expected that a number of additional sites will be proposed and there will be greater elaboration of restoration options at each site. After a comprehensive list is developed, the proposed sites will be evaluated. Additional visits to many of the sites is likely. Based on this evaluation, the proposed restoration list will be refined, and restoration options will be prioritized. Community input is sought during this evaluation period, and community information will be used in evaluating the restoration options and selecting restoration projects.

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Fairmount Park Restoration Sites

The Wissahickon

No General Location

Site #	Site Name	Location	Restoration Category	Restoration Type	Constraints	Disturbance	Map Coordinates	Priority
S1	Robertson Van Doren		Stream	Channel		Dam		
	Acreage:							
S5		Walnut Lane Golf Course	Stream	Channel				
	Acreage:							
S9			Stream	Channel				
	Acreage:							
S18		Below Mt. Airy Bridge		Channel				
	Acreage:							
S20		Gorgas Lane		Channel				
	Acreage:							
S29		Gorgas Lane		Channel				
	Acreage:							
S36	Valley Green		Stormwater	Channel				
	Acreage:							
V74			Vegetation	Non-Forested Uplands				
	Acreage:							
V76			Vegetation	Non-Forested Uplands				
	Acreage:							
V76.1				Non-Forested Uplands				
	Acreage:							
V77		Near Andorra.	Vegetation	Non-Forested Uplands				
	Acreage:							

Site #	Site Name	Location	Restoration Category	Restoration Type	Constraints	Disturbance	Map Coordinates	Priority
V78			Vegetation	Forested Uplands				
	Acreage:							
V79	Bells Mill Marsh	Off Bells Mill Road		Wetlands				
	Acreage:							
V80	Andorra Natural Lands		Vegetation	Forested Uplands				
	Acreage:							
V81			Vegetation	Forested Uplands				
	Acreage:							
V82			Vegetation	Slope		Erosion/Scour		
	Acreage:							
V83	Gully South of Manatawna Rd.	Manatawna Rd.	Vegetation	Forested Uplands				
	Acreage:							
V84	Bell's Mill Forest	South of Bell's Mill Road	Vegetation	Slope				
	Acreage:							
V85	Cathedral Woods							
	Acreage:							
V85.1			Vegetation	Non-Forested Uplands				
	Acreage:							
V86			Vegetation	Non-Forested Uplands				
	Acreage:							
V88	Rex Ave Evergreen Forest	S.W. of Rex Ave.	Vegetation	Slope				
	Acreage:							
V89		N. of Forbideen Dr., W. of Rex Ave.	Vegetation	Forested Uplands				
	Acreage:							
V89.1			Vegetation	Slope				
	Acreage:							

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Site #	Site Name	Location	Restoration Category	Restoration Type	Constraints	Disturbance	Map Coordinates	Priority
V90		On Forbidden Drive	Vegetation	Forested Uplands				
	Acreage:							
V91		Rockelle Ave. off curve	Vegetation			Invasive/Exotic Vegetation		
	Acreage:							
V92		East of Henry Ave.	Vegetation	Forested Uplands				
	Acreage:							
V93		Henry and Livezey	Vegetation	Forested Uplands				
	Acreage:							
V94			Vegetation	Forested Uplands				
	Acreage:							
V94.1		Cresheim Creek above Devil's Pool	Vegetation	Riparian Zone				
	Acreage:							
V95			Vegetation	Forested Uplands				
	Acreage:							
V96		West of McCallum St.	Vegetation	Forested Uplands				
	Acreage:							
V97			Vegetation	Riparian Zone				
	Acreage:							
V97.1		Emlin and Gate		Wetlands				
	Acreage:							
V97.2		Off St. Martin's, opposite side of Woodward Meadow	Vegetation	Wetlands				
	Acreage:							
V98			Vegetation	Riparian Zone				
	Acreage:							
V98.1								
	Acreage:							

Site #	Site Name	Location	Restoration Category	Restoration Type	Constraints	Disturbance	Map Coordinates	Priority
V98.2			Vegetation	Riparian Zone				
	Acreage:							
V98.3			Vegetation	Non-Forested Uplands				
	Acreage:							
V98.4			Vegetation	Non-Forested Uplands				
	Acreage:							
V98.5	Saul Fields		Vegetation	Non-Forested Uplands				
	Acreage:							
V99		Southwest of Johnson		Forested Uplands				
	Acreage:							

Restoration Options

Option	Action	Low Cost	High Cost	Priority
A	Replant Natives/Forest			

Site #	Site Name	Location	Restoration Category	Restoration Type	Constraints	Disturbance	Map Coordinates	Priority
V100	Carpenter's Woods Floodplain	Carpenter's Woods	Vegetation	Wetlands				
	Acreage:							

Restoration Options

Option	Action	Low Cost	High Cost	Priority
A	Wetland creation			

Site #	Site Name	Location	Restoration Category	Restoration Type	Constraints	Disturbance	Map Coordinates	Priority
V101	Carpenter's Woods Wetland	Carpenter's Woods	Vegetation	Wetlands				
	Acreage:							
V101.1	Carpenter's Woods		Vegetation	Forested Uplands				
	Acreage:							
V102			Vegetation	Forested Uplands				
	Acreage:							
V103	Monastery Stables Woods		Vegetation	Slope				
	Acreage:							

Site #	Site Name	Location	Restoration Category	Restoration Type	Constraints	Disturbance	Map Coordinates	Priority
V103.1			Vegetation	Non-Forested Uplands				
	Acreage:							
V104	Far Country Arboretum	North of Monastery Stables	Vegetation	Forested Uplands				
	Acreage:							
V104.1		Scotforth Road		Riparian Zone				
	Acreage:							
V105			Vegetation	Slope				
	Acreage:							
V106			Vegetation	Forested Uplands		Erosion/Scour		
	Acreage:							
V107				Deer monitoring				
	Acreage:							
V108	Blue Bell Forest		Vegetation	Forested Uplands				
	Acreage:							
V109.			Vegetation	Slope				
	Acreage:							
V110		North of Walnut Lane Bridge	Vegetation	Slope				
	Acreage:							
V110.1	Walnut Lane Golf Course	Btwn Wissahickon Creek & Magdalena St.	Vegatation	Wetlands				
	Acreage:							
V110.2			Vegetation	Slope				
	Acreage:							
V111	Harvey St. Wetland	North of Harvey Street	Vegetation	Wetlands				
	Acreage:							
V111.1	Radium Springs	South side of Wissahickon and Forbidden Drive	Vegetation	Wetlands				
	Acreage:							

Site #	Site Name	Location	Restoration Category	Restoration Type	Constraints	Disturbance	Map Coordinates	Priority
V112	Harvey St. Forest		Vegetation	Slope				
	Acreage:							
V113	Ridge Ave. Forest	North of Ridge Ave.	Vegetation	Forested Uplands				
	Acreage:							
V114		S. of Wissahickon Bridge	Vegetation	Forested Uplands				
	Acreage:							
V114.1			Vegetation	Slope				
	Acreage:							
V114.2			Vegetation	Forested Uplands		Erosion/Scour		
	Acreage:							
V115	Clifford Park	South side of Lincoln & Johnson Sts.	Vegetation	Wetlands				
	Acreage:							
V116			Vegetation	Forested Uplands				
	Acreage:							
V500	Wisahichon	wissahickon	Vegetation	Forested Uplands		Maintained Lawn/Mowed Field		
	Acreage:							

Restoration Options

Option	Action	Low Cost	High Cost	Priority
A	Replant Native trees			

Total Sites: 68

Pennsylvania Department of Environmental Protection

Rachel Carson State Office Building
P.O. Box 8555
Harrisburg, PA 17105-8555
March 1,1999

Bureau of Watershed Conservation 717-787-5259

Dear Conservationist:

The Pennsylvania Department of Environmental Protection announces the opportunity for interested parties to apply for grants to restore and protect watersheds within the Commonwealth. Specifically, project applications are requested for funding under the Commonwealth's Watershed Restoration and Assistance Program (WRAP) and the Section 319, Nonpoint Source Management (NPS) Program grant. Project funding is subject to both Pennsylvania and federal budget approval. For FY99, approximately $4.0 million in federal 319 funds and $575,000 in state WRAP funds were allocated for watershed and nonpoint source pollution control projects.

Pennsylvania's WRAP Program provides short-term funding for smaller or new watershed initiatives. In FY98, 37 projects were funded to restore streamside habitat, conduct watershed planning, demonstrate best management practices and conduct educational programs. The Section 319 NPS Program provides funding for a two-year time period, focusing on restoration, protection and assessment activities conducted on a watershed basis.

For the first time, a consolidated application process will be used to streamline application procedures and clarify and reduce the work for prospective applicants. Tentative timelines for both programs are enclosed for your review. Guidance is also included as tips for preparing applications and tables that compare elements of the two grant programs. The deadline for submitting project proposals is **April 30, 1999**. Submission procedures are explained in the enclosed materials.

For more information on these grant programs please contact the Division of Watershed Support at 717-787-5259.

Thank you for your interest in these programs. We look forward to working with you.

Sincerely,

Michael D. Sherman

Michael D. Sherman
Chief
Division of Watershed Support

Enclosures

Which Grant is Right for Your Project?

Both the 319 Nonpoint Source Management and WRAP grants focus on nonpoint source pollution and watersheds. Each supports somewhat different types of projects, allowing us to consider funding for a wider variety of project proposals. The following table will help you decide which program better matches your needs. If you still aren't sure, please call the Watershed Support Division or your Regional DEP Watershed Coordinator. (Contact information is in the appendices.)

The grant project proposals for both programs follow the same general format, which is described on pages 4 to 6. Each program also has specific instructions for proposals. Specific instructions for WRAP proposals are on pages 7 to 16. Specific instructions for the 319 Nonpoint Source Management proposals are on pages 17 to 23.

Characteristic	319	WRAP
Eligible Applicants	Incorporated nonprofit organizations, conservation districts, government agencies (local, state and federal)	Incorporated nonprofit organizations, conservation districts, local governments
Project Duration	Up to 2 years	Less than 1 year
Amount Granted	Generally over $30,000	$100 - $30,000, in two categories
Types of Projects:	Support and coordinate well-established local watershed efforts	Initiate or strengthen local watershed efforts
	Implement a project based on a watershed restoration or protection plan on a larger scale	Implement a small part of a watershed plan
	Assessment leading to a comprehensive watershed restoration plan	Assessment with development of a preliminary watershed plan (broad goals and objectives)
Matching Funds	25% match required for construction projects on private property	Match is not required, but the amount of local match is considered in the scoring process.
Application	More detailed. No page limit, but under 20 pages is preferred for main text	Less detailed. Limited to 4 pages (seed grants) or 6 pages (small projects), plus cover sheet, map and budget
Budget	See detailed budget instructions for each program for allowable costs.	

TIMELINES

Date	319 NPS	WRAP
April 30, 1999	Applications due to Regional Offices.	Applications due to Bureau of Watershed Conservation.
Week of July 4, 1999		Project sponsors notified whether their project proposals were selected for funding. Grant agreements will be sent to sponsors for signature.
Mid-July, 1999	Project sponsors notified whether their project proposals were forwarded to EPA for funding.	
September 1-30, 1999	For selected projects, grant agreements will be sent to sponsors for signature.	
September 1, 1999		Earliest likely date for grant agreements to be fully processed. Projects begin after this date.
October 1, 1999	Grant start date.	
June 30, 2000		Projects must be completed.
September 30, 2001	Grant end date.	

Specific Instructions for *WRAP* Grants

Key Facts

- Projects must have a watershed perspective and address at least one nonpoint source pollution issue.
- Maximum possible funding is $30,000 per project and regardless of the amount requested, partial awards may be offered.
- Incorporated non-profit watershed associations and conservation organizations, local governments and conservation districts are eligible to apply.
- Individuals, businesses, state and federal government units and for-profit organizations are **not** eligible to apply.
- Applications must follow the guidelines included in this package.

Pre-application assistance is available from PADEP Bureau of Watershed Conservation Watershed Support Division Staff. Contact: **PADEP, Division of Watershed Support, Rachel Carson State Office Building, P.O. Box 8555, Harrisburg, PA 17105**

Phone: 717-787-5259

Timeline

- Applications will be available until the deadline for receipt of proposals -- **April 30, 1999**
- Funding decisions are expected to be made and announced the week of **July 4, 1999**
- Projects should be ready to start after **September 1, 1999**
- All project goals must be completed no later than **June 30, 2000**

POTENTIAL FUNDING SOURCES FOR WATERSHED GROUPS

Many watershed groups have volunteers to work on numerous projects within their watershed boundaries. They try to resolve or remediate current problems by giving many hours of service, and they may help in the prevention of future water quality problems as well.

However, to perform these services, groups need money for the purchase of equipment and supplies. This funding is not always easy to find. The following is a list of potential funding sources and references for use by watershed groups. This is not all inclusive, and you may find other sources not currently on the list. Make sure you are aware of the administrative requirements for any grant you pursue. The Department of Environmental Protection does not endorse the use of any specific group from the list and is supplying names for informational purposes only.

SOURCE OF ASSISTANCE	CONTACT PHONE NUMBER	BRIEF DESCRIPTION OF PROGRAM	PLANNING	IMPLEMENTATION	OTHER
DEP Nonpoint Source Management Program, Harrisburg, PA	717-787-5259	Grants for planning and nonpoint source pollution control projects.	X	X	X
DEP Stormwater Management Program, Harrisburg, PA	717-772-4048	Watershed planning for stormwater control (counties) and implementation of programs at local levels (municipalities).	X	X	
DEP Coastal Zone Management Program, Harrisburg, PA	717-787-5259	Grants for planning and construction in the Lake Erie and the Delaware Estuary Coastal Zones.	X	X	
NRCS, PL 83-566, The Watershed Protection and Flood Prevention Act, Harrisburg, PA	717-782-4429	Plan development for natural resource concerns within a watershed area; cost-sharing available to carry out plan.		X	
DCNR Rivers Conservation Program, Harrisburg, PA	717-787-2316	Conserve and enhance river resources by offering planning grants, technical assistance, implementation grants, development grants, and acquisition grants.	X	X	
Canaan Valley Institute, West Virginia	304-866-4739 800-922-3601	Promotes the development and growth of local associations committed to improving or maintaining the natural resources of their watersheds, in the Mid-Atlantic Highlands portions of PA, MD, VA and all of WV.	X	X	X
Great Lakes Protection Fund, Pennsylvania Office - Meadville, PA	312-201-0660	Occasional small planning grants and natural resource grants for regional efforts in the Great Lakes area. For information specific to Pennsylvania call 814-332-6816.	X	X	
EPA National Estuary Grant Program	202-260-6502	Supports the development of programs to protect coastal watersheds in estuaries of national significance, which includes the Delaware Estuary in Pennsylvania.	X		

SOURCE OF ASSISTANCE	CONTACT PHONE NUMBER	BRIEF DESCRIPTION OF PROGRAM	PLANNING	IMPLE-MENTA-TION	OTHER
Vira I. Heinz Endowment, Pittsburgh, PA	814-669-4847 John Dawes	Provides funds to the Western Pennsylvania Watershed Protection Program to implement comprehensive ecosystem management programs in selected western Pennsylvania watersheds. In addition, small matching grants are provided to DCNR for the Coldwater Heritage Program.	X	X	X
Western Pennsylvania Watershed Protection Program sponsored by the Howard Heinz Endowments	814-669-4847 John Dawes, Grant Administrator	Provides funding to grassroots organizations and watershed associations for site specific watershed remediation in western Pennsylvania.	X	X	
The Leo Model Foundation, Inc., Philadelphia, PA	215-546-8058	Grants for habitat conservation, watershed conservation, and species preservation in the USA and other countries.	X	X	
The William Penn Foundation, Philadelphia, PA	215-988-1830	Grants to preserve natural areas, including environmental education and planning, within the Foundation's geographic area (primarily southeastern Pennsylvania).	X	X	X
Educational Mini-Projects Program, Harrisburg, PA	717-236-1006	Small grants for Pennsylvania-based, grassroots educational projects that address nonpoint source watershed concepts.			X
EPA Environmental Education Grants, Region III, Philadelphia, PA	215-566-5546	Grants awarded to small nonprofit groups for various projects in Region III.	X	X	
Harrisburg Foundation, Harrisburg, PA	717-236-5040	Grants awarded to groups for environmental projects. They also administer special foundation grants set up for specific environmental projects by specific donors. The Foundation serves Cumberland, Dauphin, Perry, Lebanon and Franklin Counties in southcentral Pennsylvania.	X	X	
Charles A. and Anne Morrow Lindburgh Foundation, Minneapolis, MN	612-338-1703	Grants awarded for the conservation of natural resources and water resource management.	X		X
Fish American Foundation, Alexandria, VA	703-548-6338	Grants awarded for: streambank stabilization materials, instream habitat improvements, contracted heavy equipment, and stream morphology work.		X	
Coldwater Heritage Partnership, Partnership between Department of Conservation and Natural Resources, PA Fish and Boat Commission and Trout Unlimited, Harrisburg, PA	717-787-2316	Grants for prioritizing watersheds in need of protection, for assessment of coldwater ecosystems and for the development of watershed conservation plans.	X	X	X
American Canoe Association, Springfield, VA	703-451-0141 Contact: David Jenkins	May provide funding for various watershed-related projects including starting groups and lobbying.	X		X

SOURCE OF ASSISTANCE	CONTACT PHONE NUMBER	BRIEF DESCRIPTION OF PROGRAM	PLANNING	IMPLEMENTATION	OTHER
Dirt and Gravel Road Maintenance, Harrisburg, PA	State Conservation Commission at 717-787-8821 or local County Conservation District	This is available to local municipalities and state agencies who have jurisdiction over dirt and gravel roads. Groups may be able to work with their local municipality regarding projects dealing with best management practices for erosion and sedimentation control problems and fugitive dust in watersheds.	X	X	
National Park Service, Rivers, Trails and Conservation Assistance Program, Philadelphia, PA	215-597-1581 Joseph DiBello, Chief	The National Park Service works with communities to conserve land and river resources and provides funding for various projects dealing with the conservation of these resources including the development of trails and greenways.	X	X	

Further references:

1. A Guidebook of Financial Tools. In draft. Being produced by the EPA Environmental Financial Advisory Board and the Environmental Finance Center. Web address: http://www.epa.gov/efinpage/guidebk/guindex.htm
2. Catalog of Federal Domestic Assistance. U.S. General Services Administration. Web address: http://www.gsa.gov/fdac.htm
3. Wetland and Riparian Stewardship in PA - A Guide to Voluntary Options for Landowners, Local Governments and Organizations. The guide lists various technical and financial assistance programs available to reduce impacts from nonpoint source pollution. Contact the Alliance for the Chesapeake Bay at 717-236-8825.
4. 1997 Directory of Funding Sources for Grassroots River and Watershed Groups. This is a directory of foundations and others that fund watershed efforts. Available for $35 from River Network at 800-423-6747 or e-mail rivernet2@aol.com
5. Consideration of performance of a Community Environmental Project (CEP) instead of civil penalties in certain cases where the alleged violator has suggested a CEP. The Department of Environmental Protection will coordinate with local government and groups to identify appropriate projects. Contact local DEP regional office for more information.
6. For information about training regarding grant proposal writing and winning grants contact the Nonprofit Management Development Center at LaSalle University in Philadelphia. There is a cost associated with the training. 215-951-1701.
7. Your local library has information about grants including the Environmental Grant Making Foundations Book. Some libraries, including the Dauphin County Library in Harrisburg, have a computer database that can be searched by subject for funding sources pertaining to watersheds or streams.
8. The United Environment Fund fosters growth of environmental organizations throughout the United States by helping them develop a stronger, more diversified funding base. Web address: http://www.uef.org
9. The Foundation Center is an independent, nonprofit information clearinghouse that collects, organizes, analyzes and disseminates information about foundations, corporate giving, etc. They maintain five foundation libraries throughout the United States, and they have cooperating collections of information located in public libraries including libraries in Pennsylvania. Besides publications and supplementary materials, some libraries provide other services for grant seekers. For information about these cooperating collections call 1-800-424-9836. Foundation web address: http://www.fdncenter.org
10. Catalog of Federal Funding Sources for Watershed Protection. USEPA. 1997. Provides information on federal funding programs for watershed protection and local-level watershed projects. Call the National Center for Environmental Publications and Information at 513-489-8190 or 800-490-9198, ask for EPA Document 841-B-97-008.

This fact sheet and related environmental information are available electronically via Internet. Access the DEP website at http://www.dep.state.pa.us) choose Information by Subject/Water Management/Watershed Conservation/Watershed Support).

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Ambler Borough, President
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Ms. Stephanie Craighead
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Philadelphia, PA 19131
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Dr. Joseph Dlugach, VDM
Wissahickon Restoration
Volunteers, Chairman
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Philadelphia, PA 19120
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Mr. Don Gephardt
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Recreation Planner
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Swede & Airy Streets
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Mr. Drew Shaw
Montgomery County Planning
Commission
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Ms. Beth Pilling
Open Space Administrator
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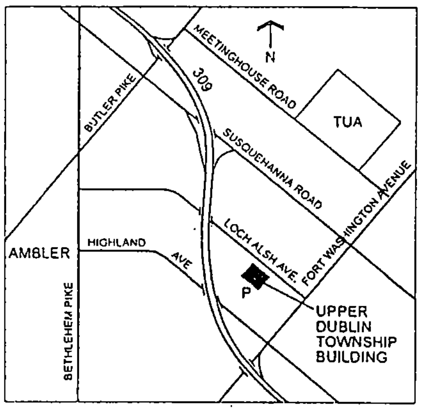
Mayfield, PA 18433
717-282-0302

Mr. Martin Soffer
Philadelphia City Planning
Commission
1515 Market Street
17th Floor
Philadelphia, PA 19102
215-686-2945

Mr. Howard Neukrug
Philadelphia Water Department
1101 Market Street, 4th Floor
Philadelphia, PA 19107
215-685-6200

MEETING LOCATION:

Commissioners Meeting Room
Upper Dublin Township Building
801 Loch Alsh Avenue
Fort Washington, PA 19034



For information about the meeting, contact:

The Delta Group	215.567.5252
W.V.W.A.	215.646.8866

THE PROGRAM:

The River Conservation Plan program is a state-wide planning initiative funded through the Pennsylvania Department of Conservation and Natural Resources. The plan for the Wissahickon watershed is sponsored by:

- Fairmount Park Commission
- Montgomery County Planning Commission

THE AGENDA

- Introductions: the Team / the Organizations
- The Scope of the Planning Effort
- The Major Issues: Pollution, Open Space, Development
- Goals of the Plan
- Progress to-date
- How you can help
- Questions / Answers / Discussion
- Conclusion - Spring 1998 "Wissahickon Day"

THE PLANNING TEAM

- The Delta Group - Environmental Planners, Landscape Architects, Engineers, Architects
- Patricia Ann Quigley - Ecologist
- Stephen Hammell - Planner
- Charlie Miller, P.E. - Civil Engineer
- S. Edgar David, Environmental Planner
- Temple University - Department of Landscape Architecture & Horticulture
- Fairmount Park Commission
- Montgomery County Planning Commission

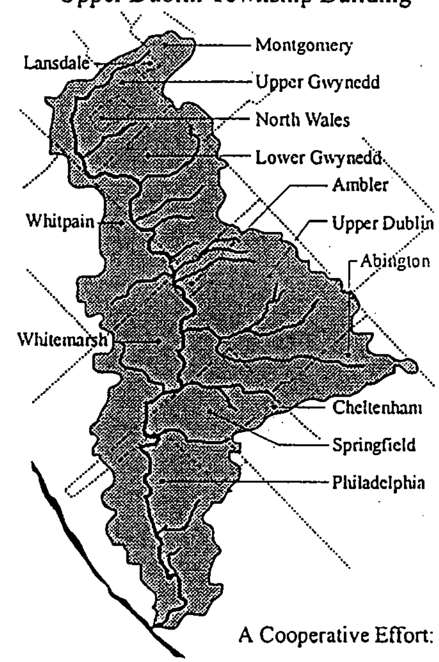
YOUR ROLE

You can assist this effort as an active participant, an advocate, a critic, a volunteer in restoration projects and by supporting elected officials who have a strong commitment to environmental issues.

Wissahickon Valley Watershed Association
12 Morris Road
Ambler, PA 19002

Join us at the first public meeting for the WISSAHICKON CREEK Conservation Plan

Thursday March 5th 1998 7pm
Upper Dublin Township Building



A Cooperative Effort:

Fairmount Park Commission / City of Philadelphia
Montgomery County Planning Commission
Friends of the Wissahickon
Wissahickon Valley Watershed Association
Wissahickon Restoration Volunteers

IT IS OUR CHOICE - THE 21ST CENTURY WISSAHICKON ENVIRONMENT

A UNIQUE OPPORTUNITY - A CONSERVATION PLAN

The 64 square mile Wissahickon watershed includes portions of 13 municipalities. There are three boroughs, nine townships, and the City of Philadelphia. This is the first time that an overall planning effort has addressed the entire watershed, with all the municipalities involved.

The watershed is fortunate to have had strong support from the Fairmount Park Commission, the Montgomery County Planning Commission, the Friends of the Wissahickon, the Wissahickon Valley Watershed Association and the Wissahickon Restoration Volunteers. Most of the primary creek corridor is now in public ownership.

The 31 sub-watersheds which flow into the Wissahickon are, in many cases, under severe environmental stress. They also contribute to the increasing degradation of the main creek and flood plain. Pollution, deteriorating habitats and existing and future development pressures are the major issues.

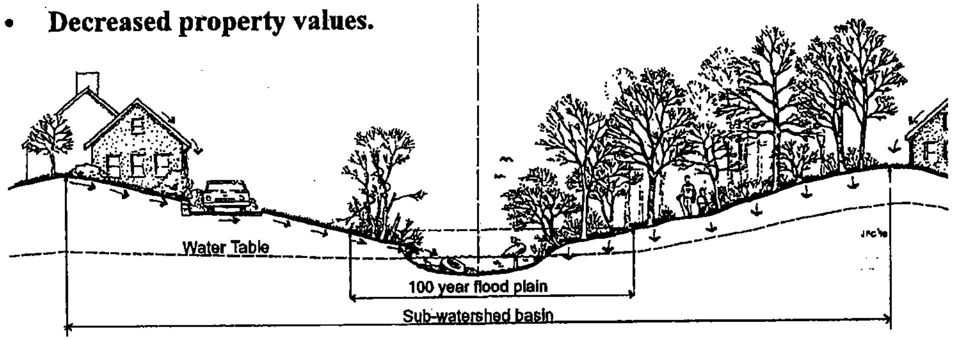
While evaluating the overall conditions in the watershed, a more detailed case study of three sub-watersheds will be used to identify typical problems and solutions.

A Lost Opportunity or

- **Water pollution and trash caused by unmanaged runoff from development.**
- **Unchecked invasive plant colonies displace native forests and reduce native biodiversity.**
- **Erosion, siltation, turbidity and flooding damage.**
- **Poor aquatic diversity.**
- **Degraded wildlife habitat.**
- **Decreased property values.**

A Restored Ecosystem?

- **A healthy native forest.**
- **Stream bank protection.**
- **Improved air and water quality.**
- **High quality recreation.**
- **Improved visual quality.**
- **Increased property value.**
- **Improved environmental education opportunity.**



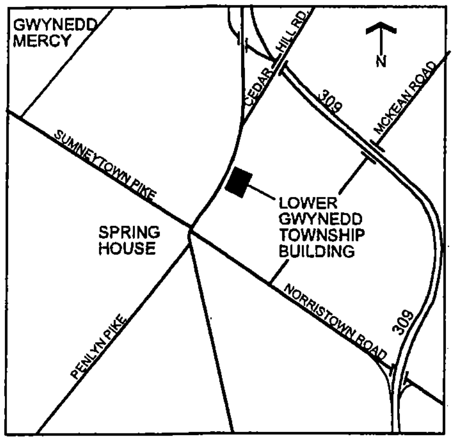
Let's Restore The Wissahickon Together

THE PRODUCTS OF THE CONSERVATION PLAN:

- Identify unique natural resources and existing environmental problems.
- Develop prototypical preservation / restoration solutions.
- Establish a prioritized project list for funding and implementation.
- Identify potential acquisition sites for stream corridor buffers.
- Assist in the adoption of appropriate regulations and management strategies.
- Improve public awareness and elicit support.

MEETING LOCATION:

Lower Gwynedd Township Building
1130 N. Bethlehem Pike
Spring House, PA 19477
215-646-5303



For information about the meeting, contact:

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Fax 215.567.2354
Email deltagroup@juno.com

THE PROGRAM:

The River Conservation Plan program is a state-wide planning initiative funded through the Pennsylvania Department of Conservation and Natural Resources. The plan for the Wissahickon watershed is sponsored by:

- Fairmount Park Commission
- Montgomery County Planning Commission

THE AGENDA

- The Major Issues and Opportunities
- The Sub-watershed Approach
- Progress to-date
- Projects for Restoring the Wissahickon
- Need for a Community-based Program
- Next Steps
- How You Can Help!
- Questions / Answers

THE PLANNING TEAM

- The Delta Group - Environmental Planners, Landscape Architects, Engineers, Architects
- Patricia Ann Quigley - Ecologist
- Stephen Hammell - Planner
- Charlie Miller, P.E. - Civil Engineer
- S. Edgar David, Environmental Planner
- Temple University - Department of Landscape Architecture & Horticulture
- Fairmount Park Commission
- Montgomery County Planning Commission

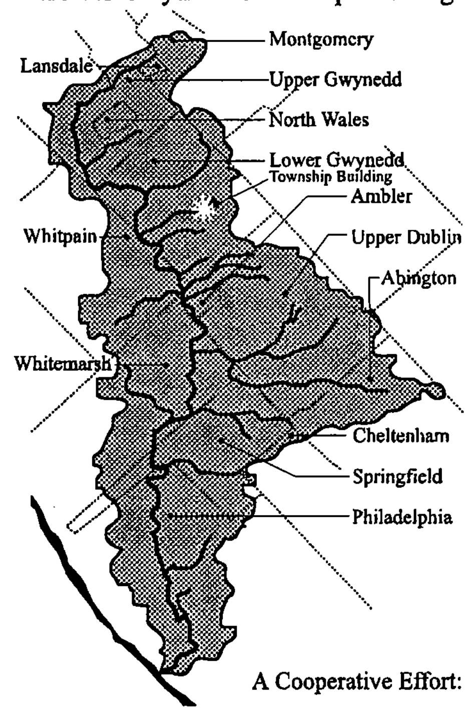
YOUR ROLE

You can assist this effort as an active participant, an advocate, a critic, a volunteer in restoration projects and by supporting elected officials who have a strong commitment to environmental issues.

Join us at the second public meeting for the

WISSAHICKON CREEK Conservation Plan

Tuesday January 12th 1999 7:30pm
Lower Gwynedd Township Building



A Cooperative Effort:

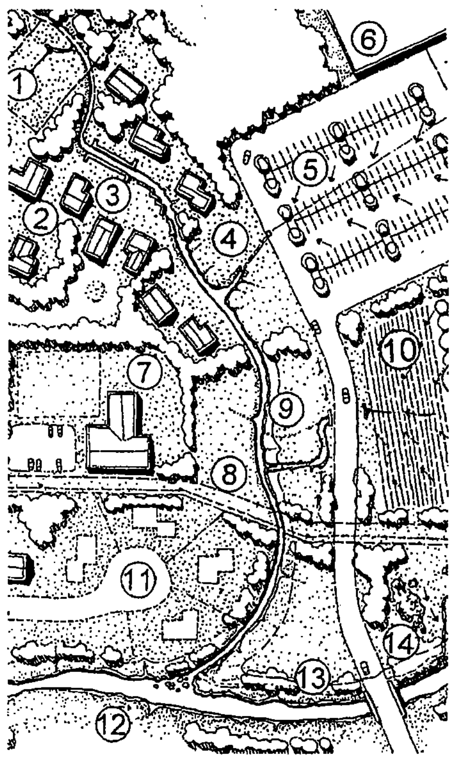
Fairmount Park Commission / City of Philadelphia
Montgomery County Planning Commission
Friends of the Wissahickon
Wissahickon Valley Watershed Association
Wissahickon Restoration Volunteers

- **START THE NEW YEAR RIGHT !**
- **JOIN YOUR UPSTREAM AND DOWNSTREAM NEIGHBORS ON JANUARY 12, 1999 AT THE LOWER GWYNEDD TOWNSHIP BUILDING!**
- **GAIN AN INCREASED UNDERSTANDING OF THE PROBLEMS AND OPPORTUNITIES IN THE WISSAHICKON WATERSHED**
- **BE PART OF PLANNING AND IMPLEMENTING YOUR 21ST CENTURY ENVIRONMENT!**

BEFORE....

Subwatershed Problems and Opportunities Identified

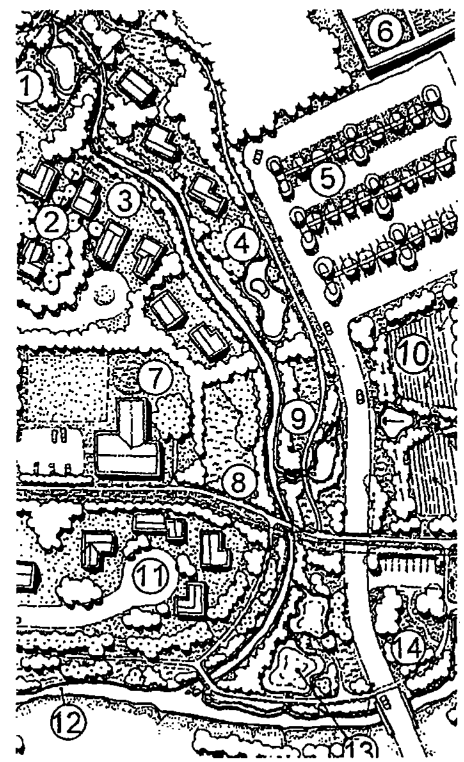
1. Unprotected Natural Spring
2. Intense Development - High Volume Runoff
3. Built Channel Increases Damage Downstream
4. Discharge from Pipe Increases Erosion
5. Extensive Impervious Paving
6. Large Roofed Areas
7. Excessive Lawn Area
8. Existing Powerline Trail Opportunity
9. Culvert Increases Velocity of Runoff
10. Agriculture Causes Serious Pollution
11. Planned Subdivision will Prevent Buffer
12. Main Creek Channel Receives Damage
13. Public Open Space Unused
14. Historic Site in Poor Condition



AFTER....

Acquisition, Restoration, Stormwater Management, Education & Watershed Management Projects

1. Off-line Spring-Fed Wetland on Acquired Site
2. Upland "Canopy" Landscape Improvements
3. Restore Streambank to "Natural" Condition
4. Detention Wetland in Restored Buffer
5. Bio-retention Retro Landscape Improvements
6. Vegetated Roof Cover
7. On-site Education Projects at School
8. Trail and Meadow Development
9. In-line Riparian Buffer Wetland
10. Vegetated Swale and Check Dams
11. Resource-Based Cluster Retains Buffer
12. Main Creek Buffer Improved
13. Educational / Wildlife Habitat Wetland
14. Restore Historic Site



The Delta Group | Urban Design • Environmental Planning • Landscape Architecture • Architecture • Engineering

2400 Chestnut Street Philadelphia PA 19103-4316 | tel 215.567.5252 | fax 215.567.2354

Date: March 6, 1998

Re: Wissahickon Creek - River Conservation Plan
DG 7-97

MINUTES OF PUBLIC MEETING #1
March 5th, 1998
Wissahickon Valley Watershed Association office, Ambler, PA.

The purpose of the initial public meeting was to present to the public the general process by which the proposed plan will be developed, and to discuss project participants and to review some of the major issues to be investigated. Items discussed included the following:

1. The composition of the project Steering Committee and the importance of the role of the 14 participating municipalities was discussed by John Collins, project director for The Delta Group. He also introduced the members of the professional team that will work with The Delta Group.

2. Tom Schraudenbach, Project Manager for The Delta Group, outlined the general components of a typical River Conservation Plan as prepared under the guidelines of the sponsoring agency, the Pennsylvania Department of Conservation and Natural Resources. He discussed the major components of the proposed plan and outlined a proposed schedule.

3. Water quality issues in the watershed were reviewed by Pat Quigley. Pat stressed the need for public participation in the identification of problem areas and in learning about community-based land use controls and "best management practices" that lead to improved water quality in the watershed.

4. Charlie Miller, P.E., discussed storm water issues and the importance of storm water management in the health of the watershed.

5. The impacts and need for development guidelines and ordinances was reviewed by Steve Hammell.

6. Environmental restoration and management issues were outlined by Edgar David, who showed examples of small watershed studies within the Wissahickon watershed completed by his Restoration Management class at Temple University Ambler.

7. Following these individual presentations, the team led a discussion of opportunities for public participation and involvement in watershed issues.

8. The meeting concluded with public discussion and exhibition of progress mapping of selected components of the inventory, including a diagram of existing public open space, that was available for public review and revision.

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The Delta Group | Urban Design • Environmental Planning • Landscape Architecture • Architecture • Engineering

2400 Chestnut Street Philadelphia PA 19103-4316 | tel 215.567.5252 | fax 215.567.2354

Re: Wissahickon Creek - River Conservation Plan
DG 7-97

MINUTES OF PUBLIC MEETING #2
January 12, 1999
Lower Gwynedd Township Building, Springhouse, PA.

The purpose of the second public meeting was to report preliminary findings and initiate discussion of possible watershed management options. John Collins made introductions and presented slides of problems and opportunities throughout the Wissahickon watershed, illustrating the extraordinary value of this resource, as well as many of the ways that development has impacted the health of the watershed. Items discussed included the following:

1. The planning process being used to develop the River Conservation Plan for the Wissahickon was described by Tom Schraudenbach. The Plan will serve as an overview document for the Wissahickon, referencing a number of other related studies that are in progress. The Plan will address the goals of the sponsoring agency, the Pennsylvania Department of Conservation and Environmental Resources (DCNR), which include:

   - Developing a strategy for conserving and restoring natural resources.
   - Encouraging public participation and interest.
   - Recommending a program of implementation projects, with costs and priorities, that demonstrate what can be done to improve environmental quality in the watershed.

   Acceptance of the Plan by the PA River Conservation Registry will make the project eligible for planning, acquisition and implementation grant money.

2. The team presented a planning methodology that includes data collection, analysis and conservation recommendations at the overall watershed scale as well as at the sub-watershed scale. In order to study conservation issues and make recommendations at a detailed level, three sub-watersheds, the Wissahickon Headwaters, the Trewellyn and the Cresheim, will be studied as prototypes. These sub-watersheds exhibit conditions that are typical of the range of issues and extent of development found in the larger watershed. Because so much of the Wissahickon watershed is heavily developed, it is hoped that this methodology will provide a more meaningful program of conservation retrofit techniques and public education, and will be better able to address specific acquisition needs.

3. Pat Quigley summarized significant natural resource characteristics, discussing the importance of linkages to create a physically related environmental "system".

4. Charlie Miller summarized significant stormwater management / hydrologic issues including problems created by stream bank modification through filling, lack of riparian buffers, and opportunities to reactivate flood plain areas.

5. The team presented Information on the overall watershed, including a map of the approximately 33 sub-watersheds with a stream-order classification; related geological organization of the watershed; generalized land use with a corollary diagram indicating areas developed without stormwater management controls; a map of open space (permanently protected, temporarily protected, and proposed for protection); and a diagram of major recreational trail system links as planned by the County.

6. Mr. Collins described the general process for studying prototypical sub-watersheds as a way of examining overall watershed conservation issues in greater detail, providing opportunities for identifying specific conditions or issues that would be appropriate components of a program of conservation projects eligible for implementation funding grants.

7. The Delta Group team outlined a methodology in which project implementation recommendations are to be catagorized by type, with a project scope, estimated costs, and priority level for each. Preliminary categories of projects include the following:

   a) Stormwater Management / BMP's
   b) Restoration / Water Quality / Habitat
   c) Public Education
   d) Management Tools / Organization
   e) Acquisition
   f) Special Projects (generally watershed -wide)

   Mr. Collins demonstrated how this system for identifying issues and categorizing potential implementation projects would be applied to one of the prototype sub-watersheds, the Headwaters of the Wissahickon.

8. Opportunities for developing a network of open space into a greenway system was discussed by Steve Hammell. This system would preserve important areas and might include trails and important links between recreation or conservation areas for trails or wildlife corridors, and could be integrated with the Montgomery County trail system that is in the planning stage.

9. Edgar David outlined a series of possible incentives that would be directed to restoration of privately owned land, and that would encourage greater participation in conservation and restoration programs and concepts by the general public. Many of these strategies could be implemented by the homeowner on individual residential parcels, which is one of the largest land uses in the study area.

10. An extensive question and answer period reviewed a wide range of issues including the degree to which rebuilding the stream corridor is possible; how best to prioritize restoration projects; the cost of projects and the availability of money to support municipal budgets for restoration; requests for listing of projects to be done and assigning responsibility to do the work; what happens after the report is completed; request for information on parking lot retrofit; the need for public outreach education; the need for municipalities to work together to solve problems in sub-watershed areas; request for examples of River Conservation plans that demonstrate results; the desire for educational projects that might include workshops in technical skills.

The meeting concluded with an open discussion of graphic panels used for the presentation between team members and the public.

The Delta Group | Urban Design • Environmental Planning • Landscape Architecture • Architecture • Engineering

2400 Chestnut Street Philadelphia PA 19103-4316 | tel 215.567.5252 | fax 215.567.2354

Re: Wissahickon Creek - River Conservation Plan
DG 7-97

MINUTES OF PUBLIC MEETING #3
May 12, 1999
Whitemarsh Township Municipal Building, Lafayette Hill, PA.

- Purpose of the Meeting:

  The purpose of the third public meeting was review the Draft Report for the Wissahickon River Conservation Plan. Following the Steering Committee meeting in April, 1999, copies of the Draft Plan were sent to all Steering Committee organizations, including the 14 participating municipalities.

- Displays / Handouts:

  To facilitate a review of the most important components of the Plan, large blow-up panels of selected pages of the report were displayed, and a hand-out of these pages, including text, charts and map graphics, were available for all attendees.

- Issues discussed:

  While a number of project related issues were discussed, the meeting concentrated on an explanation of the conclusions and recommendations, as well as a review of estimated costs for a program of restoration implementation projects.

  1. To explain the overall organization of the Plan Report, Tom Schraudenbach the nine-part report outline / table of contents.

  2. John Collins reviewed a graphic entitled Conclusions and Recommendations, which listed ten important study conclusions and a statement of recommended action for each. These are general recommendations that deal with watershed-wide issues, and are the result of more detailed study done at the sub-watershed level. John took the audience through a typical sub-watershed study, using the Cresheim Valley Creek sub-watershed as the example. An Existing Conditions / Land Use map, a Potential Projects Location Diagram, a Project Identification List indicating a series of recommended projects of several types with related implementation costs, and "before and after" cross sections of a potential improvement site were reviewed in detail.

  3. Following the discussion of a typical sub-watershed study, John Collins reviewed two charts, entitled Project Descriptions (which defines the different implementation project categories for both sub-watershed and overall watershed projects), and a Municipality Project Assignment Chart. This chart outlines a series of implementation projects for each of the fourteen municipalities within the watershed, and assigns an estimated value to each category of proposed work. The chart includes projects derived from the detailed sub-watershed studies as well as more universal recommendations that can apply to each of the municipalities, so that every community within the watershed will be eligible for grants and have projects appropriate for funding.

John F. Collins | Elmore J. Boles | David M. DuTot | Mario L. Schack | John Smyth | Neal H. Belanger | John R. Collins | Thomas B. Schraudenbach

4. The important role of ordinances, particularly restoration, landscape and riparian buffer ordinances that can supplement the more traditional township development ordinances, was reviewed by members of the team. The Plan Report will contain an example of how a model ordinance can be structured and organized. The team suggested that development of landscape restoration ordinances should be a priority with municipalities within the watershed. Such an effort will require close cooperation between municipalities.

5. Options for on-going management of watershed issues were discussed, with the focus on working with and utilizing the strengths of existing organizations, avoiding the creation of another layer of regulatory or bureaucratic authority. Discussion centered around taking advantage of the wide range of agency, corporate, municipal and public participation in the Wissahickon Watershed Partnership for on-going, long range policy, planning and coordination, with policy implementation being the primary responsibility of the Wissahickon Valley Watershed Association for areas in Montgomery County. It was further suggested that additional staff be funded to assist with restoration implementation.

6. Representatives of North Wales Borough reiterated the need for inter-municipal cooperation in undertaking implementation projects.

7. Completion of the Final Plan and holding the final public hearing will be scheduled for mid-July, 1999.

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Re: Wissahickon Creek - River Conservation Plan
DG 7-97

MINUTES OF PUBLIC MEETING #4 - PUBLIC HEARING
July 22, 1999
Wissahickon Valley Watershed Association, Ambler, PA.

The purpose of this public meeting was to give interested people the opportunity to make comment on the Wissahickon River Conservation Plan. Although testimony was requested of those people attending the meeting, no testimony was provided, those individuals suggesting that they would submit written comment. The following issues were discussed:

Schedule:

1. John Collins outlined the remaining schedule for the project, which includes a 30-day comment period following the public hearing, approximately one month to complete the report after receiving all comments. Following completion of the Plan Report, copies will be sent to each participating municipality and to the other Steering Committee organizations, with a request that each municipality pass a resolution supporting the Plan or provide a letter of support for the Plan. This support documentation will be sent along with the Petition for Pennsylvania River Conservation Registry to the Pennsylvania Department of Conservation and Natural Resources.

2. It was pointed out by the team that in addition to providing valuable information about the Wissahickon watershed and being a tool for educating the public about the health of the stream and it's environment, a primary focus of the study is to make the study area eligible for on-going planning and implementation grant money. Stephanie Craighead, Deputy Director for Planning, Fairmount Park Commission, stated that completing the River Conservation Plan document and filing the petition for registry is important in providing one of the primary sources of on-going funding for planning and implementation.

3. In response to a question about how the Plan will be made available to the public, the following sources were suggested. Copies of the Plan would be available at each municipality, at the Fairmount Park Commission, and at each of the participating watershed organization offices. In addition, it was suggested that Plans could be located at selected branches of the Free Library of Philadelphia. Further, if arrangements could be made and additional funding provided to convert drawings, it may be possible to have the Plan available through the NIER website on the Internet.

4. In response to the possible impacts of the Wissahickon watershed on the larger region, it was pointed out that this study was not intended to do this, but that other studies on the larger Schuylkill basin were under way.

5. The outline of projected costs for specific implementation projects or categories of projects are to be considered as general guidelines, to be verified by additional study when grant proposals are developed, and not exact amounts to be spent.

6. In response to a question about monitoring of study impacts, it was suggested that this would have to become the subject of a grant proposal. However, it was pointed out that one of the recommendations for funding was to continue the detailed sub-watershed studies, perhaps 3 per year for 10 years, until the entire watershed had been investigated at this detail level.

7. The question was raised about how the study addressed the impacts of deer in the Wissahickon. The team stated that the Report reported on the results of previous studies as part of the analysis phase, but that original research was not part of the study's responsibility. The study pointed out that deer are only one of a number of impacts on the environment in the Wissahickon.

8. A discussion of other plans in the region that will supplement the River Conservation Plan included such projects as the Schuylkill River Greenway, the Schuylkill River Conservation Plan, Montgomery County's bicycle plan, the study for Sandy Run, the study to link Fort Washington State Park with the Morris Arboretum, and the recently completed stream stabilization at the Arboretum.

9. All attending the meeting were asked to submit written testimony in lieu of testifying at the meeting. Dave Froelich and others said they would do this.

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*Public Meeting for the WISSAHICKON CREEK CONSERVATION PLAN Thurs., March 5, 1998, 7:00 PM, Upper Dublin Township Building, 801 Loch Alsh Ave., Fort Washington, PA 19034. The general public is invited to attend this meeting sponsored by the Fairmount Park Commission and the Montgomery County Planning Commission to learn about conservation planning for the Wissahickon watershed.

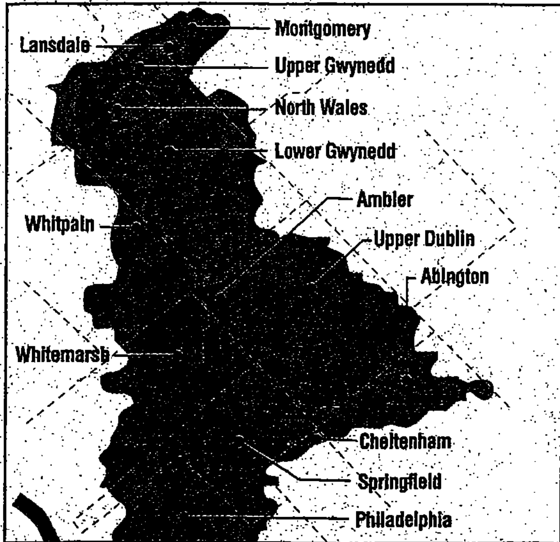
A Public Meeting for the Wissahickon Creek Conservation Plan Tues., January 12, 1999, 7:30 PM, Lower Gwynedd Township Building, 1130 N. Bethlehem Pike, Fort Washington, PA 19034. The general public is invited to attend this meeting sponsored by the Fairmount Park Commission and the Montgomery County Planning Commission to learn about conservation planning for the Wissahickon watershed.

Public Meeting for the
WISSAHICKON RIVER
CONSERVATION PLAN
Wen., May 12, 1999, 7:30 PM, Whitemarsh Township Building, 616 Germantown Pike, Lafayette Hill, PA, 19444. The general public is invited to attend this hearing sponsored by the Fairmount Park Commission and the Montgomery County Planning Commission to review The Draft Wissahickon River Conservation Plan for the watershed.

Legal Notices

Public Hearing for the
WISSAHICKON RIVER
CONSERVATION PLAN
Thur., July 22, 1999, 7:30 PM, Wissahickon Valley Watershed Association, 12 Morris Road, Ambler, PA, 19002. The general public is invited to attend this hearing sponsored by the Fairmount Park Commission and the Montgomery County Planning Commission to review the final Wissahickon River Conservation Plan for the watershed

LEGAL NOTICES FOR PUBLIC MEETINGS ON THE WISSAHICKON RIVER CONSERVATION PLAN AS SUBMITTED TO THE PHILADELPHIA INQUIRER.



The 23-mile Wissahickon Creek flows from Montgomery Township through Philadelphia's Roxborough section.

Joint effort targets environmental restoration of Wissahickon Creek

■ City and county planners hope to turn the tides and return a balance of nature in the watershed.

By Gillian H. Gordon
Ambler Gazette Managing Editor

The 23-mile Wissahickon Creek is in trouble.

But a first-time joint restoration effort between Philadelphia's Fairmount Park Commission and the Montgomery County Planning Commission hopes to turn the tide and return an environmental balance.

Strongly joining the effort is the Wissahickon Valley Watershed Association, the Friends of the Wissahickon and the Wissahickon Restoration Volunteers.

At a first public meeting, held in the middle ground of Upper Dublin Township last week, the principals for the "Wissahickon Creek Conservation Plan" addressed the problems, listed the 18-month projects and called for public and municipal support and participation.

John Collins of Temple University's Department of Landscape Architecture and Horticulture led the program in his role as a member of the Delta Group, a Philadelphia-based environmental firm which is heading the program.

"This is a historic occasion to bring 13 municipalities into one process," said Collins before about 70 residents, environmentalists and watershed representatives.

The 64-square-mile Wissahickon Watershed "has its birthplace beneath the totally impervious parking lot at Montgomeryville Mall in Montgomery Township and tumbles into the Schuylkill [River] just east of Roxborough," according to Collins.

The 13 municipalities — Montgomery, Upper and Lower Gwynedd, Whitpain, Whitemarsh, Upper Dublin, Abington, Cheltenham and Springfield townships; the boroughs of Lansdale, North

See Wissahickon, page 4

Joint effort targets restoration of Wissahickon Creek

■ Wissahickon, from Page 1

Wales and Ambler, and the City of Philadelphia — "all contribute to the problems of the watershed," Collins said.

The problems include pollution from development; invasive plant colonies; soil erosion, siltation and flood damage; and deer ... "but don't blame the deer," Collins said, "it's our fault."

Even manicured lawns and overuse of parks and open space — including trodden trails for horse riding, cycling and walking — are problems, Collins said.

"We can't solve it all at once," he said, "so we have to look at subwatersheds or sub-basins and we have three — the headwaters at Montgomeryville Mall, Trewellyn Creek and Cresheim Creek."

Ecologist Patricia Quigley, also of Delta Group, spoke of water quality testing that began in 1988 at 14 stations which concluded "the entire area is degraded. In 1996 we restudied and did see some improvement in nutrition enrichment, but 13 stations are still degraded. Even so, we have to say the aquatic biology is somewhat improved."

"We encourage people to realize that watershed planning lies with the individual, and we have to have a hands-on approach as well as education and outreach programs..."

S. Edgar David of Temple Ambler, an environmental planner, said the three subwatersheds "represent different situations. There are many healthy areas but some areas have great stress and disturbance."

He noted that "Maryland is much more progressive than we are in Pennsylvania. We have to talk to our townships, make them make changes in their ordinances. This river restoration will be the vehicle to the 20th century...it's healing and restoration."

"You're preaching to the converted here," said Abington resident Robin Eisman. "How are you going to spread the word that everyone must help?"

Heidi North, a Lower Gwynedd resident, suggested "we get involved with the schools and their ecology clubs. We should work with and educate landscapers...the developers are destroying our habitat. This is stupid!"

She also challenged Wissahickon School District to set an examplple as it plans landscaping at the new Lower Gwynedd Elementary School.

Civil Engineer Charlie Miller said the project team "will be looking at ordinances and how they're interpreted by developers to see how they can work together.

Land planner Steve Hammell agreed that "land use control ordinances are needed that encourage green space and clustering."

Explained Bob Schragenbach of Delta: "We want to establish guidelines and encourage public participation to determine and establish a list of projects as well as implementing strategy...We'll be seeking sources of funding from the Pennsylvania Department of Conservation and Natural Resources and submit our findings to the Pennsylvania River Conservation Registry. We're looking at a 16-month scope of time, with additional public workshops in September of this year and January and April of 1999, after which the final plan will go to the state registry."

Anyone interested in volunteering in any capacity in the project may call Delta Group at 567-5252 or the Wissahickon Valley Watershed Association at 646-8866.

NEWSPAPER ARTICLE APPEARING IN THE AMBLER GAZETTE MARCH 11, 1998
WRITTEN BY GILLIAN H. GORDON

Wissahickon lovers invited to a "caretakers" meeting

Lovers of the Wissahickon are invited to come together in a public meeting on Thursday, March 5, at 7 p.m. at the Upper Dublin Township Office to take part in the development of a Conservation plan for the Wissahickon Creek.

The new Wissahickon Creek Conservation Program, sponsored by the Fairmount Park and Montgomery County Planning Commissions, and funded by the Pennsylvania Department of Conservation and Natural Resources, offers watershed residents an opportunity to rediscover and help protect the creek by working together to develop a conservation management plan for the watershed.

The Delta Group, a Philadelphia firm known for its expertise in environmental planning, landscape architecture, architecture and engineers, has been selected to lead a consulting team who are organizing this 18 month long investigation of environmental issues in the watershed.

Participants will be invited to help envision and plan for the restoration of the Wissahickon Creek through stormwater management, the protection and restoration of streams and a natural open space and recreation planning.

"The program is about civic environmentalism, about recognizing that the creek and its watershed landscape are common to us all, about learning how to live more lightly in our watershed area," says Thomas Schrauderback of the Delta Group.

"Continuous urban development

(Continued on page 10)

Wissahickon lovers

(Continued from page 1)

in the Wissahickon watershed since the 1950's has thrown the creek ecosystem out of balance," said Schrauderback. "The relationship that has evolved between the built and the natural environments is one in which economic advantage has not promoted ecological sustainability."

The environmental engineers question whether the development in the watershed, if carried out to its logical extreme, will lead to the ecological collapse of the creek ecosystem. What would that mean in terms of landscape esthetics, passive recreational opportunities, property values and the quality of life for residents of the watershed, they ask.

The site of the meeting, the Upper Dublin Township Building, is 801 Lochalsh Ave., Fort Washington, 19034. Telephone numbers for more information are: Delta, 567-5252; Wissahickon Valley Watershed Association, 646-8866, or Steve Hammell at 387-0370.

NEWSPAPER ARTICLE APPEARING IN THE CHESTNUT HILL LOCAL FEBUARY 26, 1998

EDITORIAL AMBLER GAZETTE

Saving the Wissahickon

The Wissahickon Watershed is waving the white flag.

After more than 40 years of taking a beating from the on-going development in the 13 municipalities spanning the watershed, the Wissahickon Creek and its tributaries have succumbed to pollution, invasive plant colonies, erosion, siltation and flood damage.

Who are the bad guys? All of us who live, work or play in the 64-square-mile watershed falling within the townships of Montgomery, Upper and Lower Gwynedd, Whitpain, Whitemarsh, Upper Dublin, Springfield and Abington; the boroughs of Lansdale, North Wales and Ambler, and the City of Philadelphia.

Malls, industrial parks, housing developments, roads, parking lots and even heavy use of parks and open space are contributing to a degradation of water quality and increase in flooding. Rainfall, unable to penetrate the growing percentage of impervious surfaces, rushes over the fragmented natural landscape transporting sediment and pollutants to the creeks which frequently flood due to high stormwater inputs.

Most residents are probably unaware of any negative effect they may have on the watershed. Additions to homes, increasing blacktop and paved spaces, and treating lawns with chemicals are often weighed more in terms of cost rather than environmental impact. The fact of the matter is the degradation of the watershed has led to property damage from flooding, higher insurance costs, poor stream water quality and lower property values — issues many of us can relate to.

An awareness of the environmental impact of development has been growing and a coalition of conservation groups led by the Philadelphia Fairmount Park and Montgomery County Planning commissions announced last week an 18-month effort to come up with a Wissahickon Creek Conservation Plan. Local governments and their community members are being ask to lend support to restoring the Wissahickon and its watershed.

Since we are part of the problem, it follows that we should be willing to be part of the solution. As we move into the 21st century, we need to adopt and spread a new attitude. A realization that we do not so much own the land as that we are visitors who should take pains not destroy it by our passage.

THE AMBLER GAZETTE

THE AMBLER-WHITEMARSH VALLEY NEWS

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ABOVE ALL WE SHALL BE FAIR AND TRUTHFUL IN OUR PERSPECTIVE

PUBLIC WORKSHOP SCHEDULED FOR THE WISSAHICKON CONSERVATION PLAN

At a public workshop scheduled for Wednesday evening May 12, the public will have the opportunity to hear about and get a good look at proposals for new open space and recreational opportunities in the Wissahickon watershed, spanning both Philadelphia and Montgomery Counties.

The workshop, to be held at the Whitemarsh Township Building in Lafayette Hill starting at 7:30 PM, will showcase for discussion various proposals which are part of the Wissahickon Creek Conservation Plan, a $100,000 study funded several years ago by the Pennsylvania Department of Conservation & Natural Resources and the William Penn Foundation.

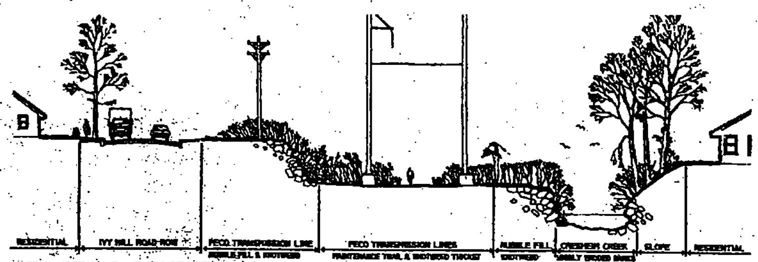
The workshop will provide the opportunity for community discussion of the draft conclusions and recommendations that will be part of the plan which will be completed at the end of June 1999. For further information, call

THE CRESHEIM CREEK GREENWAY

An example of the types of proposals contained in the Conservation Plan that will be discussed at the workshop is the proposed Cresheim Creek Greenway, plans for which have been prepared by John Collins and the Delta Group, landscape architects. A preview of this proposal is presented here, courtesy of the Delta Group.

One of the major proposals in the Wissahickon Creek Conservation Plan is the development of a 3-mile lineal greenway between Forbidden Drive in the Philadelphia Wissahickon Park and Cheltenham Avenue. The land from Stenton Avenue south to Germantown Avenue is in Fairmount Park ownership. North of Stenton, the land in Springfied Township is owned by PECO Energy. Both sections were previously part of the Germantown & Chestnut Hill Railroad right-of-way. Mermaid Park in Wyndmoor would also be connected to the trail system.

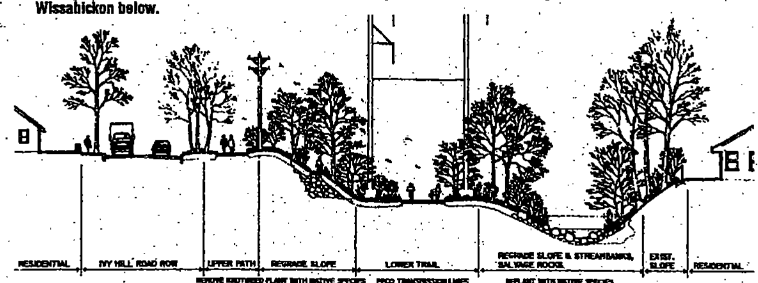
PERSONS WISHING TO LEARN MORE ABOUT THE CRESHEIM CREEK GREENWAY AND OTHER PROPOSALS IN THE WISSAHICKON CREEK CONSERVATION PLAN ARE ENCOURAGED TO ATTEND THE PUBLIC WORKSHOP AT THE WHITEMARSH TOWNSHIP BUILDING AT IN LAFAYETTE HILL, STARTING AT 7:30 PM. FOR FURTHER INFORMATION, CALL 215-567-5252.



EXISTING CONDITIONS

The land along Cresheim Creek in Springfield Township, between Stenton and Cheltenham Avenues, paralleling Ivy Hill road, consists mostly of construction rubble and a serious infestation of Japanese knotweed. The knotweed continues to cause severe damage to the Fairmount Park green space due to dispersal of knotweed seed carried downstream by runoff.

This corridor is unsightly, unmaintainable and dangers in its present state and a detriment to adjacent residences. The creek is piped in several sections of the corridor, causing increased erosion damage to the Cresheim Creek and the Wissahickon below.



PROPOSED IMPROVEMENTS

With a joint effort by the Fairmount Park Commission, Springfield Township, and possibly Cheltenham Township, a new regionally beneficial greenway/trail system can be achieved.

Major improvements in biking, running and walking facilities could be achieved as part of the design and implementation of this project which would include: stormwater management, streambank restoration, removal of invasive plant species and development of healthy native plantings combined with improved visibility, maintenance and security.

NEWS ARTICLE APPEARING IN THE FRIENDS OF THE WISSAHICKON NEWSLETTER SPRING OF 1999

Wissahickon Valley Watershed Association

12 Morris Road, Ambler, PA 19002-5499

PHONE (215) 646-8866
FAX (215) 654-7489
E-MAIL Iinfo@WVWA.org
WEB SITE www.WVWA.org

November 24, 1999

Stephanie Craighead
Fairmount Park Commission
Memorial Hall
Philadelphia, PA 19131

Dear Stephanie,

Wissahickon Valley Watershed Association would like to express its support of and congratulations for the recently completed River Conservation Plan for the Wissahickon Creek. The plan undertook an ambitious project and by approaching the watershed by looking at representative subwatersheds in detail, managed to make a potentially overwhelming task understandable, meaningful, and useful watershed wide. By identifying typical problems and identifying prototypical solutions, the report was able to be detailed enough to be useful and general enough to have broad applicability.

WVWA congratulates the Park Commission and your consultants, the Delta Group, for producing a report which can be the foundation of watershed action for years to come.

Sincerely,

David S. Froehlich
Executive Director

cc: John Collins

Friends of the

TO PRESERVE THE NATURAL BEAUTY AND WILDNESS OF THE WISSAHICKON VALLEY AND STIMULATE PUBLIC INTEREST THEREIN.

Wissahickon

Founded in 1924

Nov. 19, 1999

John Collins, President
Delta Group
2400 Chestnut St.
Philadelphia PA ,19103

Dear John:

Ref: **Wissahickon Watershed Study**

The Friends of the Wissahickon supports the above study by the Delta Group. The Friends have been consulted throughout the development of this report and believe that the report is excellent.

Sincerely,

Ed Stainton
President

WISSAHICKON RESTORATION VOLUNTEERS

a community-based ecosystem management program

5730 Rising Sun Avenue • Philadelphia, PA 19120 • phone 215-342-8394

Nov. 22, 1999

Mr. John F. Collins
The Delta Group
2400 Chestnut St.
Phila. PA 19103

Dear Mr. Collins:

As one of the core groups initiating the Wissahickon Creek River Conservation Plan we wish to congratulate the Delta Group upon the completion of the study. The various public and organizational meetings we attended were well run and of considerable interest to us and, we think, to all the other attendees, leaving us with a feeling of excitement to see the ultimate findings and recommendations. With these now at hand, the core groups will have to resume direct involvement and begin the huge task of adopting and implementing the study's recommendations. We have found it gratifying to work with the Delta Group and look forward to continued collaboration as an action plan evolves.

Sincerely,

Joe Dlugach

Joseph Dlugach, VMD
Chairman