Newtown Creek Watershed Conservation Plan

Newtown Creek

December 2011

Prepared for:

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The following individuals have contributed to the completion of this plan. Newtown Borough would like to thank all of them for their time and expertise.

Newtown Creek Watershed Plan – Steering Committee

Pam Fitzpatrick	-	Newtown Township Environmental Advisory Council
Annamarie Kaminski	-	Newtown Township
Jeffrey Marshall	-	Newtown Township
Meghan Rogalus	-	Bucks County Conservation District
Jerry Schenkman	-	Newtown Township Supervisor
Michael Sellers	-	Newtown Borough Council – Watershed Plan Liaison
Jay Sensibaugh	-	Newtown Township
Jayne Spector	-	Newtown Creek Coalition
Susan Sutton	-	Newtown Township Parks and Recreation Board
Julia Woldorf	-	Newtown Borough Council
Warren Woldorf	-	Newtown Borough Planning Commission

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Michael Sellers, Member
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Newtown Creek in December

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I. Introduction and Purpose

River Conservation Planning

The Pennsylvania Rivers Conservation Program was developed to conserve and enhance river resources through preparation and accomplishment of locally initiated plans. The program, funded through the Community Conservation Partnership Program of the Pennsylvania Department of Conservation and Natural Resources (PA DCNR) provides technical and financial assistance to municipalities and river support groups to carry out planning, implementation, acquisition, and development activities.

Study Area Location

This river conservation plan (RCP) focuses on the Newtown Creek a 6.3 square mile sub-watershed of the Neshaminy Creek situated in southeastern Bucks County, as shown on Figure 1. The creek's watershed encompasses all or portions of four municipalities: Wrightstown Township, Newtown Township, Newtown Borough and Middletown Township.

Figure 1 - Regional Context - Newtown Creek Watershed

The study area includes the main stem Newtown Creek 6 unnamed tributaries and the tributary known as Old Skunky. As shown on Map 1 - Base Map, the headwaters of the Newtown Creek are located in Newtown Township in an area characterized by large lot subdivisions. The creek heads in a southeasterly direction for about 2.26 miles until it reaches Hidden Lake, a flood water impoundment created when the Newtown Dam[1] was completed in 1980 to help mitigate flooding issues downstream in Newtown Borough. After exiting the impoundment the creek flows for 0.6 miles where it enters Newtown Borough and becomes the dividing line between the Borough and Township. The creek then continues past the Borough for approximately 1.2 miles until its confluence with the main stem of the Neshaminy Creek in Middletown Township. In total, the Newtown Creek travels approximately 9.6 miles on its journey to the main stem of the Neshaminy Creek.

Planning History

The Newtown Creek is a sub-watershed of the 232 square-mile Neshaminy Creek Watershed. This plan represents one of several RCPs prepared for sub-basins within the Neshaminy Creek Watershed. Figure 2 shows the Newtown Creek in relation to the surrounding Neshaminy Creek sub-watersheds which have previously been studied under PA DCNR's River Conservation Program. Newtown Creek was previously included in the RCP prepared for the Middle and Upper Neshaminy Creek in 2003 by the Delaware Riverkeeper Network. Although the Newtown Creek subwatershed was included in the area covered in the 2003 plan, it was not studied in depth. With renewed interest in the creek and

[1] Newtown Dam (PA-621) (D09-178)

its effect on the surrounding residents and businesses within Newtown Borough and Newtown Township, an updated and more detailed watershed plan was prepared.

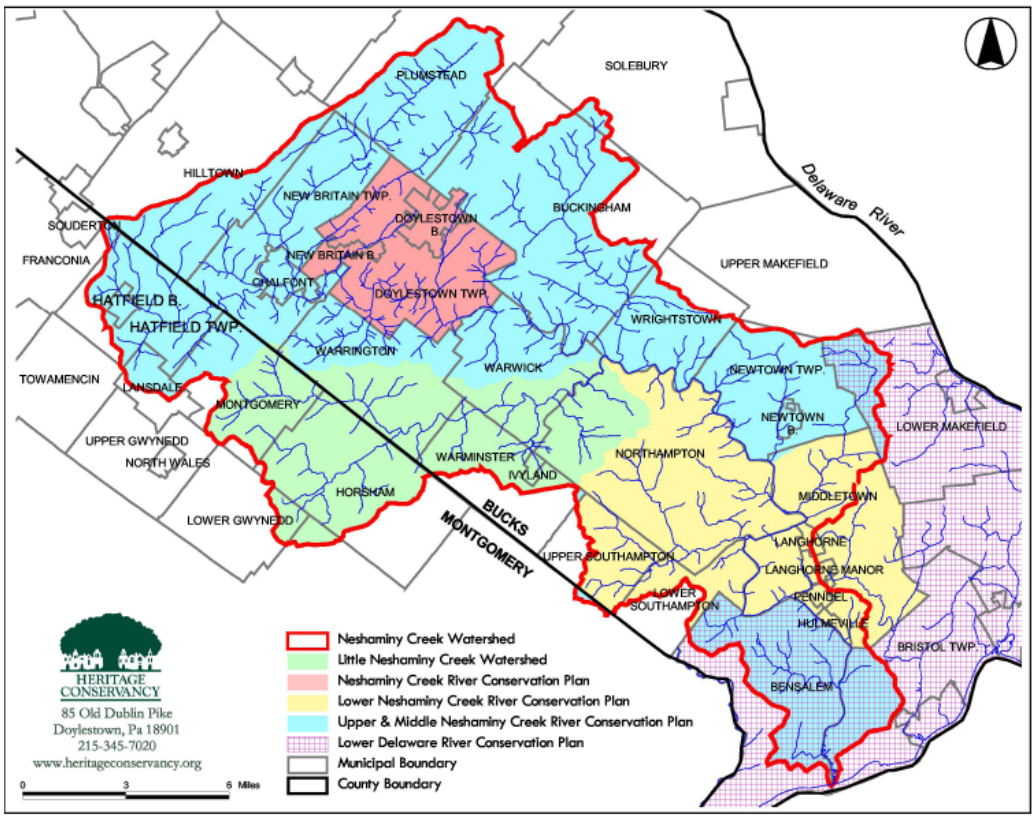

Figure 2 - Watershed Plans within the Neshaminy Creek Basin

The Newtown Creek has been the focus of several regional and local efforts to protect and improve watershed resources. Studies which were reviewed in this RCP include:

- PA DEP, Total Maximum Daily Load (TMDL) Assessment of the Neshaminy Creek Watershed, December 2003.
- PA DEP, *Watershed Restoration Action Strategy (WRAS) State Water Plan Subbasin 02F Neshaminy Creek Watershed Bucks and Montgomery Counties*. Updated May 2004.
- Delaware River Keeper Network, *Newtown Creek, Newtown Township, Bucks County PA - Stream Assessment and Recommendations , January 2006*.
- Delaware RiverKeeper Network, *Upper and Middle Neshaminy Creek Watershed River Conservation Plan*. March 2003.
- Gilmore & Associates, *Olde Skunky Stream Study*, Draft April 7, 2010.
- PA DEP, *Stream Redesignation Evaluation Report Water Quality Standards Review Newtown Creek Bucks County*. April 2004.
- Newtown Creek Coalition, *Newtown Creek Bucks County Pennsylvania Planning Recommendations and Report*. June 2010.

A full listing of studies and plans reviewed as part of this RCP are referenced in the bibliography.

NEWTOWN CREEK WATERSHED CONSERVATION PLAN

HERITAGE CONSERVANCY

N

UPPER MAKEFIELD TOWNSHIP

WRIGHTSTOWN TOWNSHIP

LOWER MAKEFIELD TOWNSHIP

NEWTOWN TOWNSHIP

NEWTOWN BOROUGH

NORTHAMPTON TOWNSHIP

MIDDLETOWN TOWNSHIP

STOOPVILLE RD

EAGLE RD

413

532

WASHINGTON CROSSING RD

LOWER DOLINGTON RD

Hidden Lake

Dam

DURHAM RD

SWAMP RD

NEWTOWN YARDLEY RD

332

Neshaminy Creek

NEWTOWN RICHBORO RD

Newtown Creek

Old Sketch

NEWTOWN BP

Core Creek

BUCK RD

NEWTOWN LANGHORNE RD

Core Creek Reservoir

195

Map 1 - Basemap

Legend

- NEWTOWN CREEK WATERSHED
- MAJOR WATERSHED BOUNDARY
- SUBWATERSHED BOUNDARY
- STREAMS
- BODY OF WATER
- MUNICIPALITIES
- INTERSTATES
- US HIGHWAYS
- PA STATE ROUTES
- OTHER STATE ROADS
- LOCAL ROADS

0.5 0 0.5

Miles

Data Sources: Watershed Boundaries - Pennsylvania Department of Environmental Resources, Roads and Municipal Boundaries - PennDOT, Hydrology - PDEP

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DATE: 4/27/2011

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II. The Planning Process

Steering Committee

A steering committee for the Newtown Creek Watershed Conservation Plan was established as a working group of the Newtown Creek Coalition in June 2010. The Newtown Creek Coalition (NCC) was established in 2006 as a volunteer group made up of interested citizens living in the vicinity of Newtown Creek. The NCC is a broad-based group of residents, business owners, and public officials from both the Borough and Newtown Township that was formed to improve and preserve the creek. Since its inception, the NCC has held regular monthly meetings that are open to the public.

The steering committee is comprised of NCC members and additional watershed stakeholders from local, county and state governmental agencies and environmental groups. The purpose of the steering committee is to identify the important river related values and issues of concern to be included in the RCP, as well as proposing management options for the watershed.

Representatives provided critical assistance in the development of the plan. Its members include:

Pam Fitzpatrick	-	Newtown Township Environmental Advisory Council
Annamarie Kaminski	-	Newtown Township
Jeffrey Marshall	-	Newtown Township
Meghan Rogalus	-	Bucks County Conservation District
Jerry Schenkman	-	Newtown Township Supervisor
Michael Sellers	-	Newtown Borough Council – Watershed Plan Liaison
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Julia Woldorf	-	Newtown Borough Council
Warren Woldorf	-	Newtown Borough Planning Commission

Community Participation via the Newtown Creek Coalition

Community participation is a key component of the RCP process. In 2009 and 2010, the NCC convened meetings to solicit input from interested citizens and property owners adjacent to the creek to define the geographical boundaries, character and appropriate uses for five zones of the creek from the impounded section of the creek located upstream of Route 532 (Washington Crossing Road) southward to Route 332 (Newtown Bypass). Recommendations for improvements and management specific to each zone were also generated during these public meetings.

In order to inform the public about the creek and solicit feedback on the zone plan and recommendations for future improvements, the NCC staged three public presentations in April 2009, March 2010 and April 2011. These presentations provided background on the cultural and natural history of the Newtown Creek and Common, the creek zones and visioning plans for the future of Newtown Creek. The April 2011 meeting also included a summary of the draft Newtown Creek Watershed Conservation Plan. The presentations

were followed by feedback sessions that invited attendees to indicate what should be changed or preserved along the creek. The feedback from these meetings provided valuable input on the recommended actions for the watershed conservation plan. A list and ranking of these recommendations are included in Chapter XII.

Community Outreach Events

A number of creek work days were hosted by the NCC and attended by numerous volunteers from the community. These workdays included trash and debris removal and invasive plant removal.

Public Survey

In addition to the public visioning meetings held by the NCC, a short web-based survey was made available to give citizens within the area of the Newtown Creek Watershed several opportunities to provide their ideas in the planning process. Survey invitations were e-mailed to approximately 360 citizens who participated in the NCC visioning public workshops. In addition, the survey link was posted on the Newtown Borough and Newtown Township websites. Announcements regarding the survey were made in local newsletters. The survey was a useful tool to capture input from interested people within the watershed, especially those who might have been unable to physically attend the various meetings. A total of 127 responses to the survey were received and tabulated by Heritage Conservancy. The results are summarized below. Full survey results may be found in Appendix A.

General Information (Q1 – Q5)

Over 90% of the respondents indicated that they were residents of either Newtown Borough or Newtown Township, and lived in their respective communities an average of 20+ years. The majority of respondents (52%) live within ½ mile of the creek. About 8% of survey takers indicated that they owned businesses in proximity to the Newtown Creek. Of that small amount, most were located more than ½ mile from the creek and had not experienced flood-related damage. Respondents were split evenly among those that visited the creek consistently and those that rarely or never visited the creek.

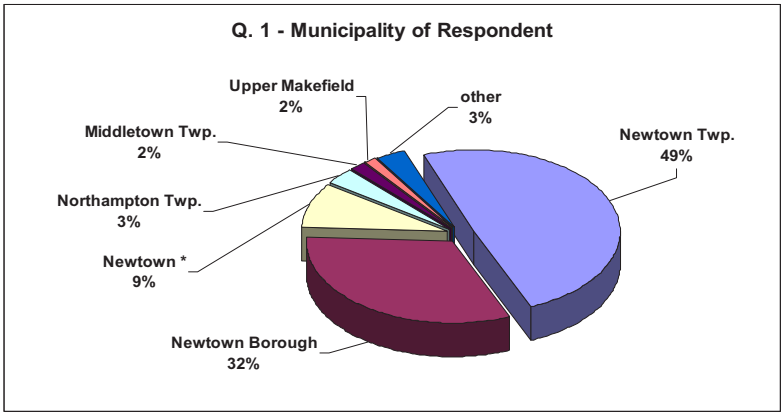

Figure 3 - Survey Question 1 - Residence of Survey Takers

* Respondent did not indicate if resident of borough or township.

Parks, Recreation and Open Space (Q6-Q9)

Linton Memorial Park and Tyler State Park were the municipal and state parks most frequented by the survey respondents. Sports and active recreation activities were most popular at the municipal parks, while hiking and biking were most popular at the State Park.

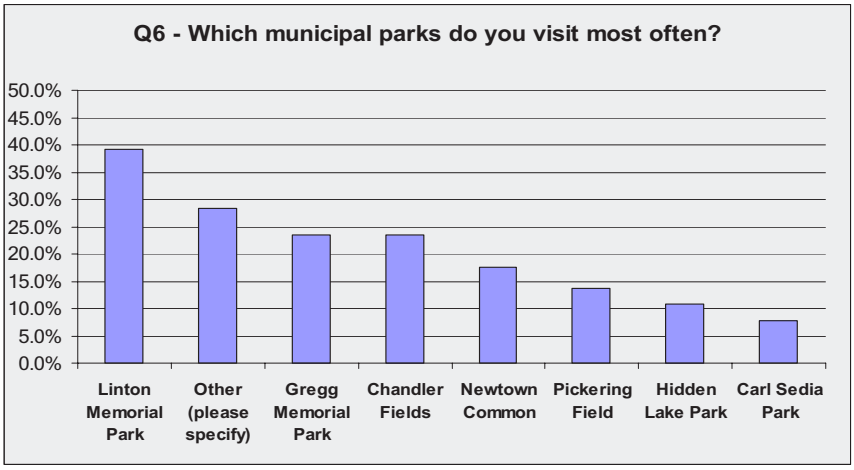

Figure 4 - Survey Question 6 - Municipal Park Visited Most Frequently

Issues and Recommended Implementation Tasks (Q10 – Q14)

Questions 10-14 asked respondents to rank/prioritize various threats to the Newtown Creek, important resources and implementation tasks. The three top-rated threats to the watershed were listed as:

- Improper streamside management
- Stormwater runoff
- Loss of wildlife habitat/streamside vegetation

The resources which respondents listed most frequently as most important were:

- Natural open spaces
- Recreational opportunities
- Historical resources

When asked which resources would they most like to see improved, the top responses included:

- Natural resources (streambanks, streamside vegetation)
- Views to the creek
- Creek access points

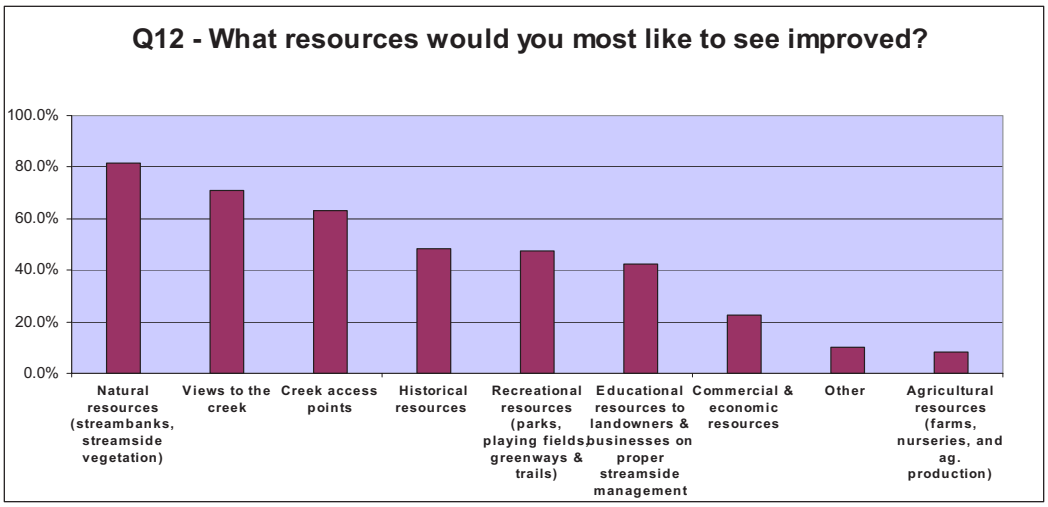

Figure 5 - Survey Question 12 -Resources Needing Improvement

The survey results indicate that the top three activities important to implement are:

- Beautification of streams (planting of native trees, shrubs and wildflowers)
- Permanent protection of open space along the creek
- Improving access along and/or across the creek

The responses to this survey were consistent with views and issues identified in the various public meetings and visioning sessions held within the community. Among the highest rated recommendations identified in the public workshops were: adding pedestrian bridges and trail connections; stronger protection measures for streamside properties; and encouraging the inclusion of public spaces, trails and improved stormwater facilities for development proposed along the creek. The results of the survey and public meeting input formed the basis of the management actions described in Chapter XII.

III. Plan Goals and Objectives

Development of Plan Goals

The goals for the Newtown Creek Watershed Conservation Plan were developed by the watershed steering committee with input from the public via a series of Newtown Creek visioning sessions and public survey as described in the previous chapter. In addition, the steering committee reviewed goals and recommendations from prior watershed planning efforts including the Upper and Middle Neshaminy Creek River Conservation Plan (DRKN, 2003) and the Newtown Creek Planning and Recommendations Report (NCC, 2010). For reference, these existing goals and recommendations are summarized below.

Goals and Objectives – Upper & Middle Neshaminy Creek River Conservation Plan - 2003

The following goals were cited in the Upper and Middle Neshaminy Creek River Conservation Plan (RCP) developed by the Delaware Riverkeeper Network in 2003. This RCP included the Newtown Creek sub-watershed.

- Sustain and Restore the Quantity and Quality of Streams and Groundwater
- Maintain and Improve Healthy Streams
- Protect and Restore Wetlands and Related Vegetative and Hydrologic Systems
- Improve Stormwater Management Practices
- Improve Wastewater Management
- Protect and Maintain Natural and Recreational Resources
- Protect and Maintain Cultural, Historical, and Scenic Resources
- Promote Sustainable Land Use and Conservation Practices, including Agricultural and Developed Areas
- Educate Municipal Officials, Community Groups, and the Public

NCC General Recommendations – June 2010[2]

The following are a set of general recommendations for the Newtown Creek developed by the Newtown Creek Coalition in its June 2010 plan.

- Devise and implement a comprehensive plan for creek through its entire length
- Restore and/or manage creek banks and larger watershed area to control erosion and improve water quality and reduce stormwater runoff
- Improve visual and physical access to creek at crossings and strategically defined public zones with a history of public, agrarian and industrial use.
- Promote creek as focus for enjoyment and activity
- Take advantage of the opportunities to create a unique sense of place at appropriate locations along the creek.
- Foster a sense of community and connection to the creek.
- Interpret the original extent of the Newtown Common, for programmed use

[2] Newtown Creek Coalition, Planning Recommendations & Report– Newtown Creek, Bucks County PA. June 2010

- Clean up debris from creek
- Control exotic invasive plant species on the creek banks
- Educate owners of adjacent properties as to appropriate bank treatment and vegetative restoration techniques
- Implement the recommendations put forth in 2006 *Stream Assessment and Recommendations* by the Delaware River Keeper Network.
- Map the historic, environmental and cultural assets of creek
- Assess existing land uses along the creek and adopt land use plans, open space plans and building codes to control redevelopment projects on land that borders or impacts the creek.
- Commission a water quality study of the creek along its entire length.(Prior studies assessed only sections of the creek)

In addition to these general recommendations, the NCC also endorsed a series of specific recommendations for each of the creek zones. These are detailed in Chapter XII – Management Options and Action Plan.

Newtown Creek Watershed Conservation Plan – General Goals

Based on a review of past watershed goals and objectives the following general goals were established for this plan:

- Protect & improve surface and groundwater quality
- Improve the way stormwater is managed to reduce flooding, protect stream baseflow and maintain hydrologic balance
- Protect cultural resources
- Protect natural resources
- Maintain & enhance recreational opportunities, parks and open space
- Educate the public about watershed issues
- Encourage resource protection and stewardship
- Enhance economic opportunities for the businesses located adjacent to the creek

IV. Issues Concerns and Constraints

Newtown Creek is an important piece of the local history and identity for both Newtown Borough and Newtown Township. The 9.6 mile long stream tributary to Neshaminy Creek is characterized by a mixture of forest, agricultural, residential, suburban and urban land uses from its headwaters to its confluence with the main stem Neshaminy Creek, in Middletown Township. This creates a series of distinctly different landscape sections as the creek flows southerly from its headwaters in the suburban northwest corner of Newtown Township.

By example, the riparian corridor in the headwaters section of the creek is made up of relatively contiguous forest and preserved lands, lending it to continued protection measures. In contrast, the section of the creek which flows through Newtown Borough is surrounded by urban land uses and narrow riparian buffers which have been degraded through invasive species such as multi-flora rose and Japanese honeysuckle. Most of the creek's riparian areas are also privately-owned, which has created some seemingly irreversible access changes. In some locations, the stream banks have been armored with stone walls, resulting in steep bank angles and an altered channel. These differences are illustrated in Figures 6 and 7.

To reinforce the creek's multi-faceted zones and the importance of the overall health of the stream, the Newtown Creek Coalition held a series of public meetings to inform residents of the creek's potential as an environmental, cultural and economic asset to the Township and Borough. As part of this effort, NCC created distinct zones to reinforce the creek's multi-faceted resources. These zones are described in Table 1 and illustrated on Figures 8.

Table 1 - Newtown Creek Zone Designations

Zone	Boundaries	Municipalities	Predominant Land Use
Headwaters Zone	Headwaters to Impoundment Dam	Wrightstown, Newtown Township	Single Family Residential, open space
Zone 1	Impoundment Dam to Frost Lane	Newtown Township, Newtown Borough	Large lot residential
Zone 2	Frost Lane to Greene Street	Newtown Township, Newtown Borough	Commercial, Village Commercial and small-lot residential
Zone 3	Greene Street to one lot south of Penn Street	Newtown Township, Newtown Borough	Commercial/ historically significant structures
Zone 4	One lot south of Penn Street to Barclay Street	Newtown Township, Newtown Borough	Village Commercial, institutional, and active recreation
Zone 5	Barclay Street to Newtown Bypass	Newtown Township	Residential, bus storage, office
Confluence Zone	Newtown Bypass to confluence with main stem Neshaminy Creek	Newtown Township, Middletown Township	Residential, Institutional (George School), open space.

Restoring connections to the creek and access along the creek in this historic area has been suggested by the NCC as an important strategy to foster a sense of community and place. The Newtown Creek watershed residents, through the various public workshops and meetings, have indicated the importance of increased awareness of and access to the creek as a historic, economic and environmental asset to both communities.


Figure 6 - Concrete Debris along banks of Creek in Newtown Borough

Restoration and enhancement of the Newtown Creek riparian corridor is recommended in several recent stream assessment studies and planning efforts. These include the Upper and Middle Neshaminy Creek River Conservation Plan (RCP) prepared by the Delaware River Keeper Network in 2003 and the Newtown Creek Stream Assessment Study (Delaware River Keeper Network, 2005). The Upper and Middle Neshaminy RCP Action Plan included a number of recommendations consistent with the goals of this watershed conservation plan including: 1) Provide riparian buffer zones along streams; 2) Purchase undeveloped land as protected open space; 3) Improve existing recreational areas and create stream access areas; 4) Educate residents, municipal parks and recreation staff on sustainable landscaping practices; 5) Restore stream areas with erosion and degradation; 6) Restore buffers and stream bank vegetation and protect existing systems; 7) Assist and encourage private landowners to restore riparian buffers on their property; 8) Protect existing riparian corridor greenways and create new greenways where possible; and 9) Remove invasive plant species, particularly in riparian areas.


Figure 7 - Aerial View of Confluence Zone – Newtown Creek & Neshaminy Creek

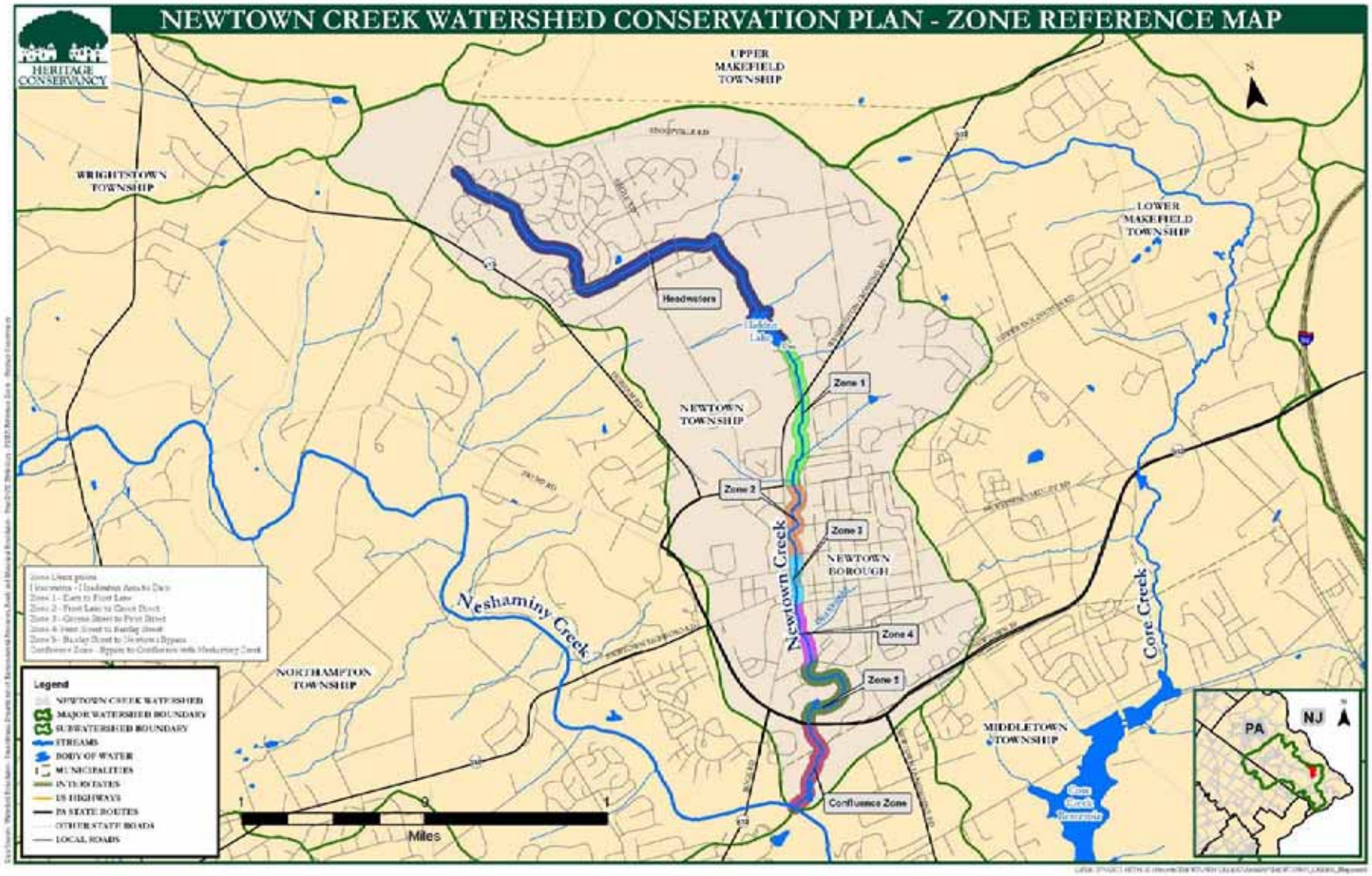

Figure 8 - Newtown Creek Zone Reference Map as Developed by Newtown Creek Coalition

V. Project Area Characteristics

Watershed Description

The Newtown Creek Watershed is a 6.3 square mile (4,007 acres) sub-basin of the Neshaminy Creek, situated in southeastern Bucks County. As noted in Table 2, over 90% of the sub-basin is located within Newtown Township and Borough, with small sections in Middletown and Wrightstown Townships. Newtown Creek is located in Suburban Philadelphia. According to 2010 census data, population densities vary widely among the watershed municipalities ranging from 300 persons per square mile in Wrightstown Township to 4,087 persons per square mile in Newtown Borough. Middletown Township has the highest population among watershed municipalities, while Newtown Borough has the smallest.

The Newtown Creek is a freestone[3] creek which flows in a southerly direction for approximately 9.6 miles from its headwaters in the suburban subdivisions of Newtown Township to its confluence with the main stem Neshaminy Creek in Middletown Township. Newtown Creek includes a total of 7 tributary streams; 6 unnamed tributaries, three of which are situated above the Newtown Dam and 3 below. The seventh tributary is locally known as Olde Skunky and flows within the Borough of Newtown.

The creek is surrounded by a mix of forested, agricultural, residential suburban and urban land uses and includes a dam owned by Bucks County which provides for flood control and recreational uses. It is located within a mile of Tyler State Park and Core Creek County Park and is intersected by the Newtown Township Trail and the abandoned Newtown regional rail line.

The creek forms the boundary between Newtown Borough and Newtown Township and was an integral focal point in the planning of the central common area envisioned by William Penn. Today, that same land which comprised the heart of this "common" is divided between Newtown Township and Newtown Borough. Most of the common lands along the creek are now in private ownership and there are few pedestrian connections. The creek has lost visibility and has become more of a dividing line than a link between the two municipalities.

Table 2 - Distribution of Municipal Acreage - Newtown Creek Watershed

Name	Acreage within Watershed Area	% of Total Watershed Area	% of Municipality in Study Area
Newtown Borough	351.8	8.8%	100%
Newtown Township	3,349.5	83.6%	44%
Wrightstown Township	193.9	4.8%	3%
Middletown Township	111.4	2.8%	1%
Northampton Township	0.4	.01%	> 1%
Total	4,007.0	100%	

Source: Heritage Conservancy Calculations

[3] Freestone is a term used to describe creeks which are fed by springs flowing from non-limestone geologic formations.

Transportation Facilities

The watershed area is accessible via a number of major state roads and mass transportation lines. Major east/west routes include the Durham Road/ Newtown Bypass (state Route 413), Newtown Richboro Road (State Route 332) and Washington Crossing Road (State Route 532). The nearest major north-south route is Interstate 95 which has a direct exit unto Route 332. The region is not directly accessible by regional rail. The nearest regional rail station is located at Woodbourne in Middletown Township. The station has a connector bus service to Newtown via the Newtown Rush Bus.

There are two bus routes which serve the watershed municipalities. They are the Route 130 bus line operated by the Southeastern Pennsylvania Transportation Authority (SEPTA) and the previously noted Newtown RUSH commuter shuttle.

SEPTA's Route 130 bus traverses the watershed region as it makes connections between the Bucks County Community College and Newtown Grant in Newtown Township to the Franklin Mills Mall in Philadelphia. The service connects the college, the Newtown Business Commons and other areas of the township to the SEPTA West Trenton Regional Rail line in Middletown Township (Langhorne Station) and to employment and commercial centers in the southern part of Bucks County.

The Newtown RUSH bus, operated by the Transportation Management Association (TMA) of Bucks County, also provides fixed route bus service to Newtown Borough, Newtown Township, Middletown Township and Lower Makefield Township. The Newtown RUSH is a job access and reverse commute shuttle, which provides transit services that offer a link between existing transit services (in this case, the SEPTA West Trenton train at Woodbourne Station in Middletown Township) and suburban job locations. The service operates only during peak commuting hours.

The Newtown area was previously served by the Newtown (R-8) rail line, which ran from Fox Chase in Philadelphia to Newtown Borough. The Newtown branch of the SEPTA Regional Rail service was discontinued in the early 1980s due to a variety of factors. There is ongoing debate about the benefits of re-activating this line to help alleviate increased traffic from this area to center city Philadelphia.

Major Sources of Employment

There are several employment centers in the Newtown area, including the Newtown Business Commons, Lockheed Martin, the Silver Lake Executive Campus, the ICT Group, and the Luxembourg Executive Campus.

Large regional employers include the St. Mary's Medical Center (2,800 employees), Council Rock School District, and Bucks County Community College. Additional office and commercial employers are located in Newtown Township's office research district (Rt. 332 near I-95), the Newtown Business Commons, and Sycamore Street. Major commercial centers are located in the vicinity of Newtown Borough, near the Taylorsville-Washington Crossing Area in Upper Makefield. Other commercial areas include the State Street commercial core for the Borough, Penn's Park Area and Anchor Area in Wrightstown.

Social/Economic Profile

The following review of demographic data has been generated based on analysis of several demographic sources including the US Census Bureau and the Delaware Valley Regional Planning Commission (DVRPC). Data represents totals for each municipality.

Population and Housing Growth: 2000 - 2010

A review of U.S. Census data shows that overall, the municipalities within the Newtown Creek Watershed have experienced varying degrees of growth within the last decade. Figure 9 portrays the percent population increase of the four watershed municipalities from 2000 – 2010. Table 3 summarizes the percent increase as well as absolute increases in population within the watershed municipalities during the last two decades. Although growth occurred in the three townships, the percent change over the last decade was much lower than in the previous decade. For example, between 1990 and 2000, Newtown Township experienced a 33% increase in population, compared to a 5.7% increase between 2000 and 2010. Collectively the watershed municipalities have experienced an increase of 1,093 persons from 2000 - 2010, compared to the previous decade's growth of 5,759 people. The 2010 figures also reveal that Newtown Borough's rate of population decline has decreased from the previous decade (10% from 1990 to 2000 compared to 3% from 2000 and 2010). These numbers may reflect several concurrent socio-economic shifts such as the economic recession, aging baby-boomers downsizing and growing interest in urban living.

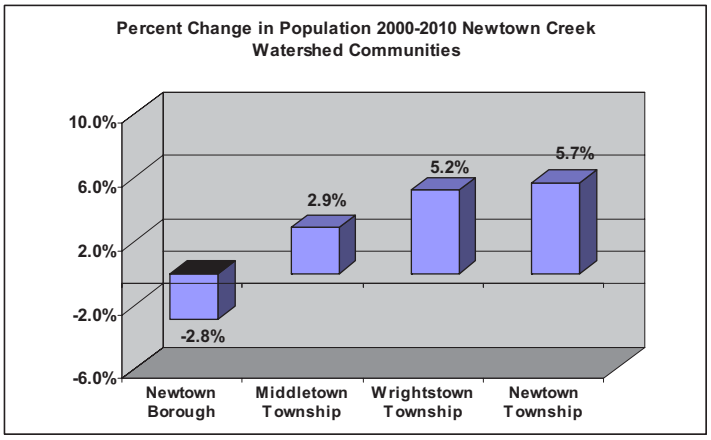

Figure 9 - Percent Change in Population 2000 – 2010

Table 3 - Population Change in Newtown Creek Watershed Municipalities 1990-2010							
Area	US Census Data			Numeric Change	Numeric Change	Percent Change	Percent Change
	1990	2000	2010	1990-2000	2000-2010	1990-2000	2000-2010
Bucks County	541,174	597,635	625,249	56,461	27,614	10.4%	4.6%
Planning Area Municipalities							
Newtown Borough	2,565	2,312	2,248	-253	-64	-9.9%	-2.8%
Newtown Township	13,685	18,206	19,299	4,521	1,093	33.0%	6.0%
Middletown Township	43,063	44,141	45,436	1,078	1,295	2.5%	2.9%
Wrightstown Township	2,426	2,839	2,995	413	156	17.0%	5.5%

Sources: US Bureau of the Census, Census 1990 and 2000 and 2010.

Another indicator of population change is reflected in housing unit numbers. Typically these numbers correspond to population growth trends, however in all of the watershed municipalities, housing unit growth outpaced population growth. Newtown Borough actually increased its housing units by nearly 10%. Data showing housing unit change for 1990, 2000 and 2010 are shown on Table 4. Housing unit increases for all watershed municipalities are somewhat higher than the county average. Higher growth of housing units compared to population may be attributed to the formation of smaller households, i.e. less children per household, or increases in over-55 housing. Over-55 housing tends to include households with less people (no children and potentially single-occupant, as well). Specific socio-economic data for 2010 has not yet been released on the municipal level to confirm some of these potential demographic trends in this region.

Table 4 - Change in Housing Units 1990-2010							
Area	**Housing Units**			**Numeric Change**	**Percent Change**	**Numeric Change**	**Percent Change**
	1990	**2000**	**2010**	**1990-2000**	**1990-2000**	**2000-2010**	**2000-2010**
Bucks County	199,934	225,498	245,956	25,564	12.8%	20,458	9.1%
Newtown Borough	1104	936	1027	-168	-15.2%	91	9.7%
Newtown Township	5329	6848	7618	1,519	28.5%	770	11.2%
Middletown Township	14942	15713	17316	771	5.2%	1,603	10.2%
Wrightstown Township	863	986	1088	123	14.3%	102	10.3%

Sources: US Bureau of the Census, Census 1990 and 2000.

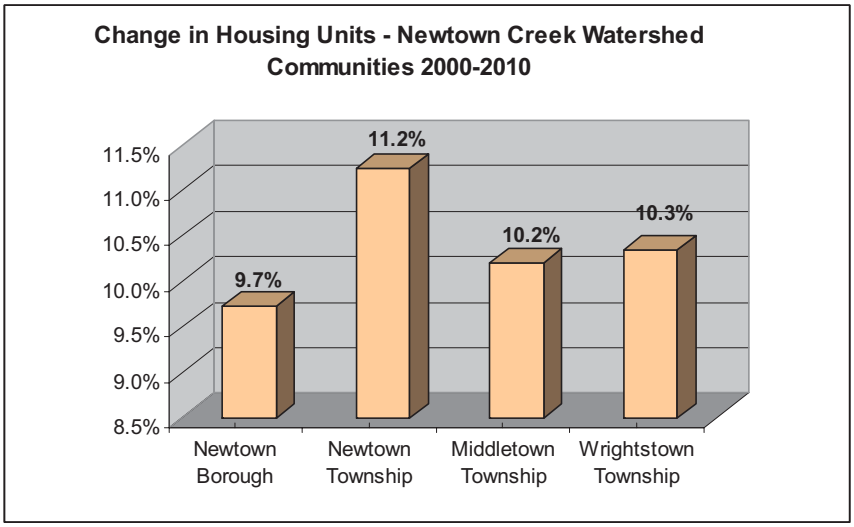

Figure 10 - Percent Change in Housing Units

Population Projections

Table 5 shows the forecasts developed by the DVRPC in August 2007. These numbers indicate that collectively the population of the municipalities within the Newtown Creek Watershed would increase by approximately 14,000 people or 20% overall growth from 2007 to 2025. In general the estimates derived in 2007 were higher than the actual 2010 census information. All of the watershed municipalities were forecasted to increase population by 2025. With the exception of Newtown Borough, the watershed municipalities were predicted to grow at rates exceeding Bucks County. Table 5 reflects the percent increase in population for the communities using the 2010 actual population as a base. The percent increase is graphically represented on Figure 11.

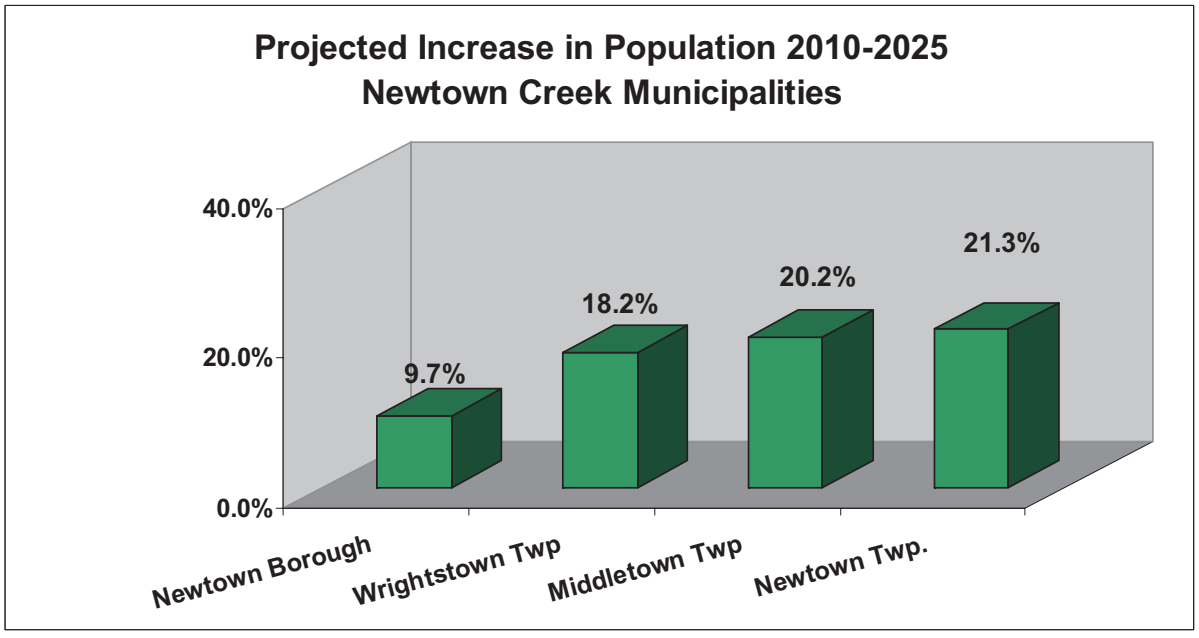

Figure 11 - Projected Population Increase 2010 - 2025 Newtown Creek Municipalities

Table 5 - Population Projections for Newtown Creek Watershed Municipalities 2000-2025

Area	Estimate Base	US Census	Projections*	% Change	
	2000	2010	2025	2000 -10	2010-2025
Bucks County	597,635	625,249	715,819	4.6%	14.5%
Newtown Borough	2,312	2,248	2,466	-2.8%	9.7%
Newtown Township	18,206	19,299	23,416	6.0%	21.3%
Middletown Township	43,962	45,436	54,624	3.4%	20.2%
Wrightstown Township	2,805	2,995	3,541	6.8%	18.2%
Planning Area Municipalities	**67,285**	**69,978**	**84,047**	**4.0%**	**20.1%**

*Sources: Delaware Valley Regional Planning Commission, Regional, County and Municipal Population and Employment Forecasts, 2005-2035. Analytical Data Report No. 14, August 2007.

Demographic Analysis

The demographic information reveals that the watershed municipalities have experienced varying degrees of growth over the past two decades. These communities are located within close proximity to major transportation routes and employment centers, making them attractive places to live. Much of the growth that has occurred over the past two decades has been in the in Newtown Township and in Middletown Township. However the rate of growth in these communities slowed considerably between 2000 and 2010.

To varying degrees over time, home-buying has been more attractive in this area, and thus municipalities continue to be faced with development pressure and the desire to accommodate reasonable growth, but in a sustainable manner. Due to the severe economic downturn of the last several years, this pressure has been less intense than in the earlier part of the decade. This provides an excellent opportunity to re-evaluate growth and development objectives in the watershed municipalities. Although 2010 population data indicate slowing growth rates, land use trends suggest that in some areas, new development tends to consume a disproportionate amount of land which places additional stress on the watershed health by reducing woodland and open space areas and increasing impervious surfaces.

VI. Land Resources

Geology and Topography

Geology and topography exert great influence on the land uses and natural communities in a region. The topography of a region is the configuration of a surface in relation to man-made and natural features. Topography is typically described in terms of differences in elevation and slope. The majority of the Newtown Creek Watershed's topography is characterized by undulating valleys and hills of the Triassic Lowland section of the Piedmont Province region. This geologic region tends to include areas of natural slopes which may be gentle, moderately steep, or steep, but stable. As illustrated on Map 2 - *Topography/Steep Slopes*, this section's rolling terrain lies between altitudes of about 34 feet to 512 feet above sea level. Ridge tops, illustrated locally in Newtown Township rise to elevations of about 320 feet.

As shown on Map 3 – *Geology and Water Features*, the surface geology of the watershed consists primarily of Stockton Formation (2,208 acres) and Lockatong Formation (1,653 acres). There is also a small area (160 acres) of Brunswick Formation in the northern section of the study area.

Stockton Formation

Stockton Formation creates topography featuring valleys of low relief with stable natural slopes. Contained in a broad band that runs east and west through the southern half of Newtown Township, this formation is recognized for its generally good water yields. The Stockton formation is perhaps the best source of groundwater within the Newtown area, and it is also the most developed. While groundwater yields can be expected to support continued moderate growth in this area, there may not be sufficient quantities to support development in other portions of the Newtown area, underlain by poor yielding aquifers. The wells that supply water for the Newtown Artesian Water Company are located within this formation.

Lockatong Formation

Lockatong Formation is the second most prevalent geology in the study area. It has good surface drainage, low porosity and low permeability. The topography associated with this formation is rolling hills of medium relief with moderately steep and stable slopes. This formation is contained in a band which extends through the northern portion of Newtown Township. Composed of rather fine grained tightly cemented sediment, this formation is characterized by a gray to black shale, the object of quarry operations in adjacent Wrightstown Township. This nonporous rock formation is capable of transmitting water only where it has been faulted or jointed and exposed to weathering. Therefore, the capacity of the Lockatong formation to store and transmit water is very low. The location of this formation on the fringe of rapidly developing areas in Newtown Township suggests a natural constraint to continued intensive development in this area.

Brunswick Formation

Brunswick Formation consists mainly of reddish-brown shale, mudstone and siltstone. It has topography of undulating hills of low relief with moderately steep and stable slopes. This formation also exhibits good surface drainage.

This moderate yielding aquifer exists in a small area in the northernmost portion of Newtown Township just north of Stoopville Road. Water yield can vary widely within this formation as it is closely related to the fractured pattern of the shale rock. Due to its unpredictable permeability, groundwater recharge may be a critical limiting factor for development within this formation. A typical well may have a relatively high yield when drilled, but may decline as the water table in the immediate vicinity is diminished. This situation may be compounded when several wells in close proximity are tapping the same aquifer. This area may be expected to support additional development with careful planning.

Soils

Soil characteristics have a direct impact on the way land is used and developed. They help determine an area's suitability for farming and building, as well as answer questions regarding potential drainage problems and erosion. The most common soil types in the study area are Urban land-Lawrenceville Complex (753 acres) and Lawrenceville silt loam (294 acres). The majority of land in the study area is classified as Urban Land (1,499 acres). Urban Land is created when native soils are disturbed or destroyed by the construction process of homes, industry or active recreation facilities. Soil characteristics of Urban Land are highly variable due to the disturbed nature of these soils.

Nearly level to sloping, moderately well-drained types of soils including Lansdale and Lawrenceville are located in the southern portion of Newtown Township and all of Newtown Borough. Nearly level to sloping – moderately deep and somewhat poorly drained soils such as Abbotstown, Readington, and Reaville soils cover northern Newtown Township and Wrightstown.

The Borough is underlain by a variety of soil types. Due to the developed nature of the community, the major soil type is Urban-Lansdale Complex. Along the Newtown Creek, soils consist of Bowmansville Silt Loam.

Steep Slopes

Steep slopes are natural features of the landscape that generally create limitations to development. The United States Department of Agriculture's Natural Resource Conservation Service (NRCS) Soil Survey for Bucks County has four classifications for slopes: 0-3 percent, 3 to 8 percent, 8 to 15 percent and 15 to 35 percent. Generally, as the slope increases, the depth of topsoil and the ability of the soil to support structures usually decreases. Increased runoff and sedimentation from disturbed slopes require increased public expenditure for flood control and stormwater management. In addition, different species of plants and the associated wildlife that depend on these plants may be present only on slopes, creating unique wildlife habitats.

As illustrated on Map 2, there are not many areas of steep slopes over 15% in the watershed. Areas of steep slopes that generally fall between 8 – 15% are located near the creek riparian areas and within the open space surrounding Hidden Lake Reservoir in Newtown Township.

Hydrologic Soil Groups

Hydrologic soil groups (HSG) are used by soil scientists to indicate the minimum rate of infiltration of bare soil after prolonged wetting. The rate of infiltration is the speed at which

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HERITAGE CONSERVANCY

UPPER MAKEFIELD TOWNSHIP

WRIGHTSTOWN TOWNSHIP

LOWER MAKEFIELD TOWNSHIP

NEWTOWN TOWNSHIP

NEWTOWN BOROUGH

NORTHAMPTON TOWNSHIP

MIDDLETOWN TOWNSHIP

STOOPVILLE RD

EAGLE RD

413

532

Hidden Lake

Dam

WASHINGTON CROSSING RD

LOWER DOLINGTON RD

I95

DURHAM RD

SWAMP RD

332

NEWTOWN YARDLEY RD

Neshaminy Creek

NEWTOWN RICHBORO RD

Newtown Creek

Old Stumps

NEWTOWN BP

Core Creek

BUCK RD

NEWTOWN LANGHORNE RD

Core Creek Reservoir

N

Legend

- Contours (5ft)
- Slopes 8 - 25%
- Slopes >25%
- NEWTOWN CREEK WATERSHED
- MAJOR WATERSHED BOUNDARY
- SUBWATERSHED BOUNDARY
- STREAMS
- BODY OF WATER
- MUNICIPALITIES
- INTERSTATES
- US HIGHWAYS
- PA STATE ROUTES
- OTHER STATE ROADS
- LOCAL ROADS

0.5 0 0.5

Miles

Data Sources: Watershed Boundaries - Pennsylvania Department of Environmental Resources, Roads and Municipal Boundaries - PennDOT, Hydrology - PADEP, Contours - DVRPC

Map 2 - Topography and Steep Slopes

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NEWTOWN TOWNSHIP

NEWTOWN BOROUGH

NORTHAMPTON TOWNSHIP

MIDDLETOWN TOWNSHIP

STOOPVILLE RD

EAGLE RD

413

532

WASHINGTON CROSSING RD

LOWER DOLINGTON RD

I95

DURHAM RD

SWAMP RD

NEWTOWN RICHBORO RD

NEWTOWN YARDLEY RD

NEWTOWN BP

NEWTOWN LANGHORNE RD

BUCK RD

332

Hidden Lake

Dam

Old Skunky

Neshaminy Creek

Newtown Creek

Core Creek

Core Creek Reservoir

N

Legend

- Floodplain
- Wetlands
- Brunswick Formation
- Lockatong Formation
- Stockton Formation
- MAJOR WATERSHED BOUNDARY
- SUBWATERSHED BOUNDARY
- STREAMS
- BODY OF WATER
- MUNICIPALITIES
- INTERSTATES
- US HIGHWAYS
- PA STATE ROUTES
- OTHER STATE ROADS
- LOCAL ROADS

0.5 0 0.5

Miles

Data Sources: Watershed Boundaries - Pennsylvania Department of Environmental Resources, Roads and Municipal Boundaries - PennDOT, Hydrology - PDEP, Geology - DCNR/PA Geologic Survey, Wetlands - USFWS, Floodplain - FEMA

Map 3 - Geologic Formations & Water Features

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water enters the soil at its surface. Soils with low runoff potential and high infiltration rates are classified as Group A. These soils tend to be deep, well-drained sand or gravel. Group B consists of soils with moderate infiltration rates. They are moderately deep or deep and moderately well-drained to well-drained. Lower infiltration rates indicate Group C soils. Group C soils typically have a layer of soil that restricts the downward movement of water. Its texture is moderately fine to fine. The final HSG is Group D. This type of soil has high runoff potential with a very low infiltration rate (0-0.05 in/hr). Typically, Group D soils consist of one or more of the following: clay with high swelling potential, soil with a very high, permanent water table, soil with a layer of clay near the surface, shallow soil over nearly impervious material. The infiltration rates of the HSGs are shown on Table 6.

Table 6 - Hydrologic Soil Type Definitions

Type	USDA Soil Texture	Infiltration Transmission Rate (in/hr)
A	Sand, loamy sand, sandy loam	> 0.30
B	Silty loam, loam	0.15-–0.30
C	Sandy clay loam	0.05-–0.15
D	Clay	0.00-–0.05

Source: National Engineering Handbook, Section 4, Hydrology, Chapter 7 Hydrologic Soil Groups, Victor Mockus, 1972

Table 7 describes the hydrologic soil group classification of soils within the Newtown Creek Watershed and Figure 12 shows the distribution of these soil types. The majority of soils within the Newtown Creek (39%) are classified as Hydrologic Group C, followed by soils that are classified as B (13%). The soils are shown on Map 4 – *Hydrologic Soil Groups*. Unclassified soils are those that have been so altered that the NRCS can not determine HSG values. Approximately 37.7 % of those with an unclassified HSG are Urban Land soils, which tend to have low infiltration rates.

In the Neshaminy Creek watershed, the abundance of soils with low infiltration and moderate to high runoff rates can lead to increased stormwater runoff, based on land cover and also contribute to the watershed's characteristic of being flashy during storm events. This means that stream levels can rise quickly in response to rainfall events and fall very quickly, once the rain stops. Newtown Creek watershed has similar hydrologic features as the overall Neshaminy and has had incidences of flooding over the years. Downstream flooding within the Newtown Creek basin was the basis for the construction of the Newtown Dam in 1980.

Table 7 - Hydrologic Soil Groups within Newtown Creek Watershed

Hydrologic Group	Total Acres	% of total
B	520.9	13.0%
B/D*	272.5	6.8%
C	1568.0	39.13%
D	133.8	3.34%
Not Classified**	1511.4	37.72%

Source: Heritage Conservancy, NRCS

* Some soils are in Group D because of a high water table that creates a drainage problem. Once theses soils are effectively drained, they are placed in a different group. For example, Soils classified as B/D indicates that the drained soil is in Group B and the undrained in group D.
** These soils have been altered so that NRCS can no longer determine their hydrologic characteristics.

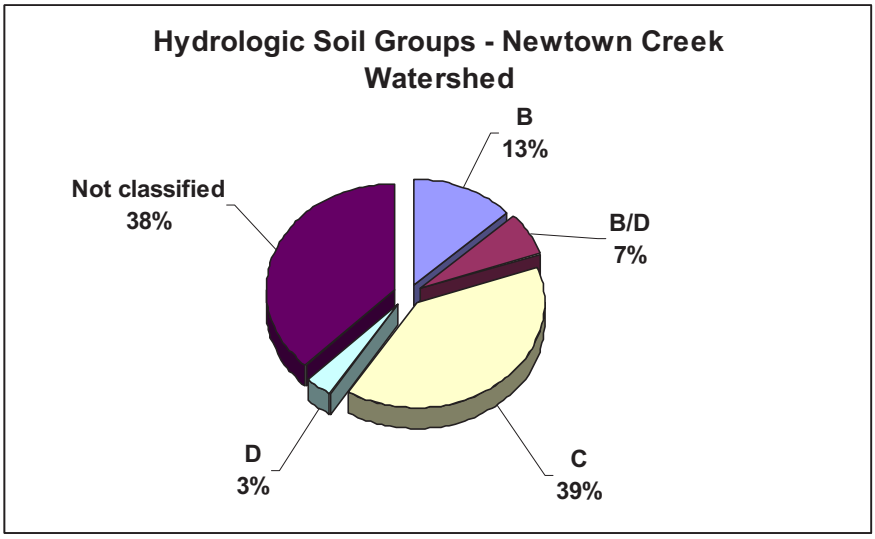

Figure 12 - Hydrologic Soil Groups - Newtown Creek Watershed

Alluvial and Hydric Soils

Alluvial (floodplain) and hydric (wetland) soils exhibit characteristics of both land and aquatic environments. Due to their unique properties, areas within the land/water interface such as floodplains and wetlands are particularly susceptible to adverse environmental impacts. Hydric soils are one of the primary indicators of the existence of a wetland area. A hydric soil is saturated, flooded or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of wetlands vegetation.

Floodplain or alluvial soils are rich in nutrients and easily support plant growth. This provides an environment that typically supports many different species of plants, animals and birds. Alluvial soils are important in areas where the National Flood Insurance Program has not identified and calculated the floodway and flood fringe areas. In these unmapped areas, the floodplain or alluvial soils indicate where flooding had occurred in the past. Unless a hydrological study is undertaken to prove that flooding has not occurred in recent times, these floodplain soils should be considered part of the floodplain and regulated as a floodway. (See further discussion on floodplains and flooding in Chapter IX – *Water Resources.)*

Existing Land Use

The following information describes 2005 land uses within the watershed. Land use refers to a property's use for economic or development purposes, (i.e., commercial, residential, or industrial). Land use information was obtained from the DVRPC based on digital orthophotography created from aerial surveillance completed in the Spring of 2005.[4] This data was used so that comparisons could be made to land use information described in earlier studies of this watershed. The DVRPC defines 31 land use categories. These categories also included separate delineations of parking for 13 specific land uses. To allow comparison with DVRPC's earlier land use files, the numbers have been aggregated using the same general

[4] Delaware Valley Regional Planning Commission. July 2008. Analytical Data Report #16, Land Use in the Delaware Valley, 2005.

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STOOPVILLE RD

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413

532

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LOWER DOLINGTON RD

Hidden Lake

Dam

DURHAM RD

SWAMP RD

NEWTOWN RICHBORO RD

Neshaminy Creek

Newtown Creek

Old Skinker

NEWTOWN BP

NEWTOWN-YARDLEY RD

NEWTOWN-LANGHORNE RD

BUCK RD

Core Creek

Core Creek Reservoir

332

195

N

Legend

Hydrologic Soil Classes

- B
- B/D
- C
- D
- NA

- MAJOR WATERSHED BOUNDARY
- MAJOR WATERSHED BOUNDARY
- SUBWATERSHED BOUNDARY
- STREAMS
- BODY OF WATER
- MUNICIPALITIES
- INTERSTATES
- US HIGHWAYS
- PA STATE ROUTES
- OTHER STATE ROADS
- LOCAL ROADS

0.5 0 0.5

Miles

Data Sources: Watershed Boundaries - Pennsylvania Department of Environmental Resources, Roads and Municipal Boundaries - PennDOT, Hydrology - PDEP, Soils - USDA/Natural Resources Conservation Service 2004

Map 4 - Hydrologic Soils

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methodology and categories as were used previously. Areas of single-family detached units, row homes, and mobile homes, for example, have been aggregated as "single-family residential". All identified parking lots (regardless of their related use) have been included in the transportation category, and light and heavy industrial uses have been combined as "manufacturing".

As summarized in Table 8 and illustrated in Figure 13, the highest single land use type in the watershed is Single-Family Residential at 38.1%, followed by Wooded at 14.7% and Agriculture at 14.36%. Most of the existing woodlands in the watershed are located along the headwaters areas above the reservoir and within Carl Sedia Park at the southern lower end of the stream. Map 5 – *Land Use* provides an overview of the watershed land uses. Also included on Table 8 are land use figures derived from 1995 imagery. This allowed a comparison of changes over time. Between 1995 and 2005, single family residential land use increased by over 30%, while agriculture land use decreased nearly 50% and wooded areas decreased by nearly 20%. These land use changes could reflect conversions from agricultural and woodland areas to residential or other development. When comparing this land use data to the watershed population trends, it is notable that increased population tends to be consistently reflected in increased residential land cover.

Table 8 - Newtown Creek Watershed Land Use Distribution (1995 & 2005 Comparison)

Land Use Description	Acreage (1995)	% in 1995	Acreage (2005)	% in 2005	% change
Single-family Residential	1174	29.30%	1527	38.10%	30.07%
Multi-family Residential	255	6.30%	314	7.80%	23.14%
Agriculture	1111	27.70%	585	14.60%	-47.34%
Wooded	735	18.30%	590	14.70%	-19.73%
Vacant	217	5.40%	337	8.40%	55.11%
Commercial	153	3.80%	183	4.60%	19.61%
Transportation	129	3.20%	186	3.55%	44.19%
Recreation	94	2.30%	114	2.90%	21.28%
Community Service	60	1.50%	119	3.00%	98.33%
Utility	47	1.20%	34	0.80%	-27.66%
Water	19	0.50%	19	0.40%	0.00%
Industrial*	12	0.30%	0	0.00%	-100.00%
Total	**4006**	**100.00%**	**4007**	100.00%	

Source: DRKN – Upper & Middle Neshaminy RCP, 2003 based on DVRPC 1995 land cover data and DVRPC Land Cover Data, 2005. Some categories have been combined or modified due to inconsistencies between 1995 and 2005 data.
* Change in industrial land acreage may be attributed to changes in way industrial land use was defined between 1995 and 2005.

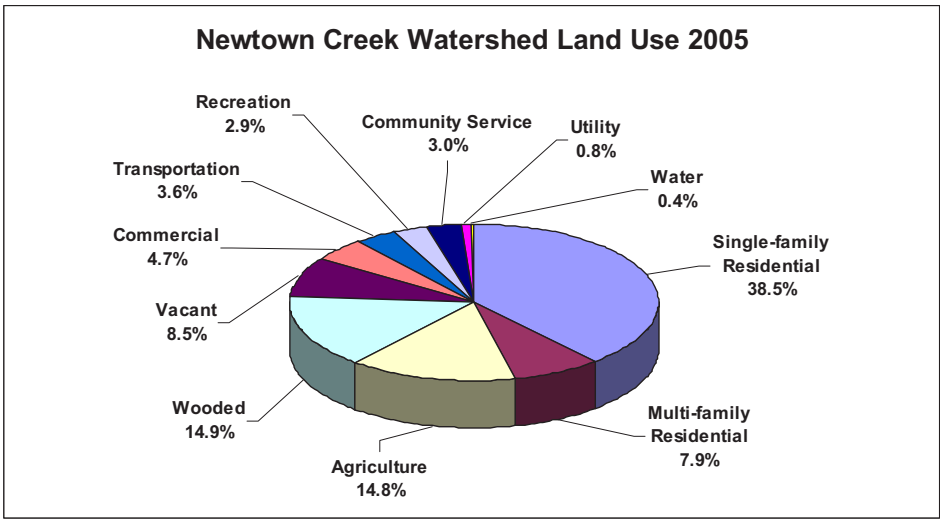

Figure 13 - Newtown Creek Watershed Land Use 2005

From a watershed perspective, increased land consumption usually leads to higher percentages of impervious surfaces (i.e. surfaces which do not allow for natural water infiltration to the soil). Implications of impervious cover are discussed below.

Impervious Cover and Stream Health

Land use is a valuable tool in assessing stream quality health because it provides an indicator of the intensity of development. As the intensity of development increases, (i.e. from woodland to residential); so does the generation of nonpoint source water pollution, or polluted runoff. A good indicator of the intensity of development in a given area is the amount of impervious surface. Impervious surfaces like asphalt, concrete and roofing increase the volume and velocity of the runoff. In addition, by blocking the infiltration of water and its associated pollutants into the soil, impervious surfaces interfere with natural processing of nutrients, sediment, pathogens and other contaminants, resulting in degradation of surface water quality.

Impervious surfaces do not allow rainfall to infiltrate back into the soils and thus increased impervious cover leads to increased stormwater runoff volume discharging directly into our streams and rivers. The amount of imperviousness directly relates to the amount and type of development in a watershed. The relationship between impervious cover and stream degradation has been verified in numerous studies. Perhaps the most well-know illustration showing the relationship between percent impervious cover and water quality is the "Impervious Cover Model" developed by the Center for Watershed Protection. This model, shown in Figure 14, illustrates that when watershed imperviousness reaches a threshold level of about 10%, stream quality indicators are impacted and at about 25% impervious cover, stream degradation occurs. These threshold level percentages can vary depending upon the sensitivity of the stream.

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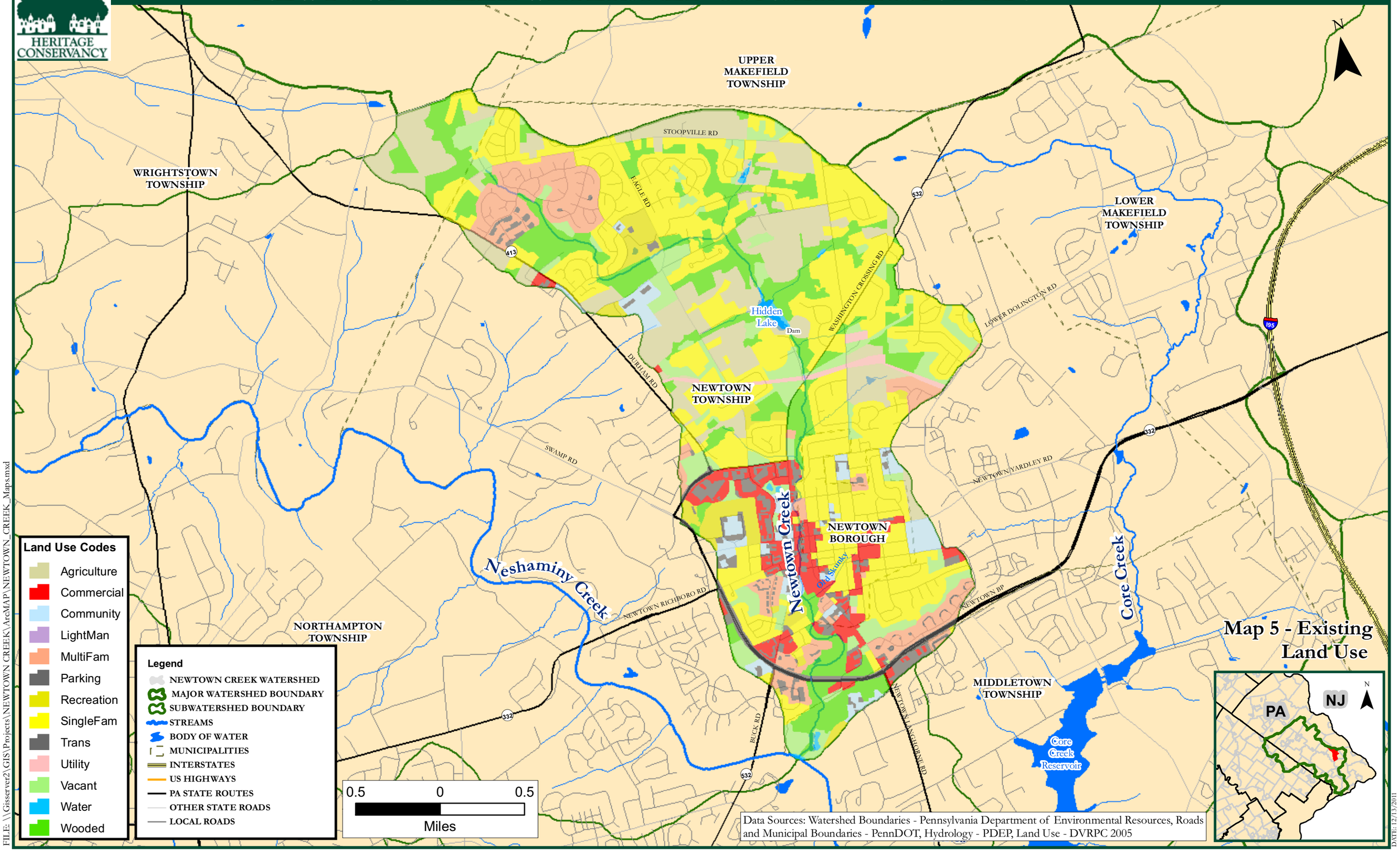

Land Use Codes

- Agriculture
- Commercial
- Community
- LightMan
- MultiFam
- Parking
- Recreation
- SingleFam
- Trans
- Utility
- Vacant
- Water
- Wooded

Legend

- NEWTOWN CREEK WATERSHED
- MAJOR WATERSHED BOUNDARY
- SUBWATERSHED BOUNDARY
- STREAMS
- BODY OF WATER
- MUNICIPALITIES
- INTERSTATES
- US HIGHWAYS
- PA STATE ROUTES
- OTHER STATE ROADS
- LOCAL ROADS

Map 5 - Existing Land Use

Data Sources: Watershed Boundaries - Pennsylvania Department of Environmental Resources, Roads and Municipal Boundaries - PennDOT, Hydrology - PDEP, Land Use - DVRPC 2005

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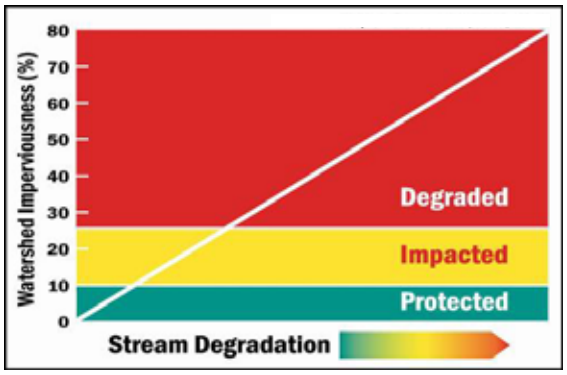

Figure 14 - The Impervious Cover Model (Center for Watershed Protection)

Impervious Cover in the Newtown Creek

Table 9 translates land use data into impervious coverage to provide an overall picture of the watershed. This calculation was based on conversion rates used in the 2003 Upper and Middle Neshaminy Creek RCP so that the comparison would use similar methodology. Using generalized factors, the updated analysis indicates that approximately 701 acres of the 4,007 total watershed area are impervious. This translates to an overall watershed imperviousness of about 17.5%. This same calculation was made in 1995 resulting in an impervious cover of 14%. [5] This seems to correlate with water quality data for the creek. The overall watershed percentage falls above the 10% impact threshold, but below the 25% degraded mark. At present, the entire main stem of the Newtown Creek is not impaired. However, the overall impervious cover percentage is within the caution zone where impacts to water quality are typically seen. It is important to maintain the health of this creek so that future impairments are minimized.

It should be noted that sub-sections of the watershed would have different impervious levels. For example, more rural areas of Newtown Township probably fall below the 10% impervious cover level, while the section of the watershed that encompasses Newtown Borough would be much higher since most developed areas have very high impervious cover. Thus the management options and recommendations for streamside lands will differ based on where they fall within the entire basin. This is reflected in the development of management recommendations based on the various creek zones defined in this plan.

Table 9 - Newtown Creek Watershed Impervious Cover Calculations

Land Cover Category (2005 Data)	Acreage	Percent Impervious	Impervious Area in Acres
Low Density Residential	1527	15.00%	229.05
Agriculture	584.8	5.00%	29.24
Wooded	590.24	1.00%	5.9024
Vacant	336.9	1.00%	3.369
High Density Residential	314	30.00%	94.2
Commercial	183.4	80.00%	146.72
Transportation	186	60.00%	111.6

[5] DRKN, 2003. Upper & Middle Neshaminy Creek Watershed River Conservation Plan..

Table 9 - Newtown Creek Watershed Impervious Cover Calculations			
Land Cover Category (2005 Data)	**Acreage**	**Percent Impervious**	**Impervious Area in Acres**
Recreation	114.3	3.00%	3.429
Community Service	119.3	50.00%	59.65
Utility	33.81	5.00%	1.6905
Water	17	98.00%	16.66
Total	**4,007**		**701.51**
Percent Impervious in Watershed			**17.51%**

Source: Based on 2005 Land Use Cover Data - DVRPC

Municipal Planning & Zoning

As noted in the table below, all of the municipalities within the watershed have adopted comprehensive plans; and as a result of the Bucks County Open Space Program, all of the municipalities within the watershed have completed updates to their municipal open space plans within the last 2 years.

Table 10 - Status of Comprehensive and Open Space Plans for Newtown Creek Watershed Municipalities			
Municipality	**Comprehensive Plan**	**Open Space Plan**	**Environmental Advisory Board or Council**
Newtown Borough	2010	2010	Yes
Newtown Township	2008	2009	Yes
Middletown Township	1994	2009	Yes
Wrightstown Township	2008	2010	Yes

A general review of the municipal natural resource protection ordinances was undertaken to determine the type of protection measures currently in place within the watershed municipalities. This review utilized information compiled by the Bucks County Planning Commission (updated in 2009). A summary matrix is included in Appendix B. The majority of municipalities have ordinances which restrict development in natural areas such as steep slopes, floodplains, wetlands, lakes, and ponds, and woodlands.

Newtown and Wrightstown Townships have specific riparian buffer ordinances which delineate specific zone widths, permitted uses and management measures. Middletown Township restricts disturbance of areas within 100 feet of wetlands and lakes and ponds, requiring that 80% of these buffer zones remain undisturbed. Newtown Borough has established a Riparian Buffer along Newtown Creek extending 20 feet in width from top of bank and extending along both sides of stream. No grading, paving, removal of vegetation except for public walkways is permitted. Removal of invasive or noxious vegetation can be permitted to improve habitat conditions.

Although each municipality restricts development in wetlands and the 100-year floodplain, some do not provide the same level of protection for wetland buffer, flood fringe areas or floodplain soils. Newtown Borough, Newtown Township and Wrightstown Township do not regulate buffers surrounding wetlands.

Hazard Areas

A search of EPA's hazardous facility databases including the Envirofacts Warehouse list of EPA Regulated Facilities, the EPA Toxic Release Inventory (TRI), Water Discharge permits (PCS) and Biennial Reporting List (BR) for waste generated on site or received from offsite facility revealed no active sites within the watershed basin.

A review of facility records from the PA DEP E-map system indicated the following active pollution control discharge facilities:

Franks Auto Center – 101 South Sycamore Street
First Student Inc., Newtown Facility - 470 S. State Street

Additionally, there are two permitted stormwater discharge facilities to the creek:
PelMor Lab – 401 Lafayette Street
Newtown Bucks County Joint Municipal Authority Sewage Treatment Plant (below Route 332)
All of the above facilities are listed as being in compliance with regulations.

An inactive treatment plant (Exxon Mobile) located south of W. Washington Avenue and west of Route 532, was also indicated on the E-Map Search within the watershed.

There are no abandoned mines/quarries or sinkholes indicated within the watershed basin.

Analysis

According to the DEP watershed assessment study, there are significant impacts to the Newtown Creek basin from human activities. Land uses include agricultural activities, residential developments, and the urban areas of Newtown. There is a significant amount of newly constructed subdivisions in the upper portions of the watershed.[6] The DRKN stream assessment notes that riparian conditions were continuously the most impacted habitat component along Newtown Creek. Additional habitat concerns include a general lack of pool variability and in-stream cover. The study notes that much of the riparian areas along Newtown Creek are contiguous. It recommends that to maintain this quality of riparian corridors for years to come, protection measures such as riparian ordinances, conservation easements, tax benefits, and similar efforts should be considered by municipalities to encourage preservation of these areas.[7]

Land use in 1995 was 30% low-density development, 28% agricultural, and 18% wooded. The ratio of undeveloped to developed land was 52% to 48%. In comparison, 2005 land use information revealed a reduction in agricultural land cover to 14.6% and woodlands to 14.7%. In the same period developed areas increased to 62% (combination of residential, commercial, institutional, industrial and transportation) vs. undeveloped land of 38%. Also in 1995, watershed imperviousness was calculated to be about 14%. Using the same calculation method, the watershed impervious cover increased to 17.5%. This increase in impervious cover seems to correlate with the increased development which occurred in the watershed between 1995 and

[6] Pennsylvania Department of Environment, Stream Redesignation Evaluation Report
Water Quality Standards Review, Newtown Creek Bucks County, April 2004.
[7] Delaware RiverKeeper Network, Newtown Creek, Newtown Township Bucks County, Stream Assessment and Recommendations, January 2006.

2005. These statistics are important due to the relationship between local land use practices and protection of natural resources, as noted in the discussion of watershed impervious cover. The watershed impervious cover percentage is between the 10% threshold level for stream impacts and the 25% level for degradation. The Newtown Creek is not considered impaired at this point, so efforts to conserve land and maintain forested riparian buffers in areas of low impervious cover are vital to maintain the creek's water quality and stream bank stability.

Although the watershed is not characterized by steep topography, the underlying geologic formations and hydrologic soil characteristics can lead to high runoff potential and low infiltration during storm events. These conditions, coupled with the increases in impervious surfaces from development, contribute to increased volume of stormwater runoff during storm events and increases in non-point source pollution. Consequently, the Newtown Creek does have a history of flooding. The flood control dam which created the Hidden Lake Reservoir was constructed in 1979 for the purpose of minimizing flood damage along the downstream portions of Newtown Creek. The dam and reservoir are described in more detail in Chapter 10. More recently, Newtown Borough commissioned a study of the Old Skunky stream tributary, which has experienced flooding due to unmanaged stormwater runoff within Newtown Borough. The study recommends a suite of potential stormwater infrastructure and stream channel improvements to help minimize bank erosion and localized flooding events.

Municipalities are encouraged to review and update, if necessary, their natural resource protection ordinances to assure that the most sensitive features such as wetlands, floodplains and riparian areas are properly protected and managed. Municipalities should also consider regulating the uses within hydric soils, which are generally associated with wetlands.

Natural resource based planning to assure protection and conservation of sensitive natural areas is an important method to guide the type and intensity of new development in a community. The process to update the municipal open space plans provided an opportunity for the watershed municipalities to identify the most valuable resources for preservation efforts and utilize this information to help guide their future land use decisions both individually and collectively.

The Delaware Valley Regional Planning Commission maintains samples of municipal ordinances from this region which they feel are outstanding resource protection examples. This list can be accessed via their website at:
http://www.dvrpc.org/Environment/NaturalResourceProtectionTools/ordinances.htm

Proper environmental review of development plans to encourage conservation design and the use of stormwater best management practices are also recommended so that new and redevelopment can be accommodated in a sustainable manner, including designs which minimize the amount of impervious cover. This requires continuing education and technical assistance to municipal elected and appointed officials and staff as well as the real-estate development community on the link between land use practices and water quality.

VII. Open Space, Parks and Recreation Resources

The following information has been drawn from the municipal open space plans recently updated for the four watershed municipalities. These plans should be consulted for specific information regarding open space, parks and recreation planning.

State and County Parks/Open Space

There is one County–owned open space property within the study area, Hidden Lake Reservoir located in Newtown Township. There are no state parks within the study area boundaries; however Tyler State Park is within a short distance to the watershed communities. The Hidden Lake Reservoir is a flood control impoundment located on Newtown Creek above Newtown Borough and State Route 532. The Dam and lake are owned by Newtown Township, however the Bucks County Department of Parks and Recreation holds conservation easements on the dam, lake and open space surrounding the lake. It is used for flood control and recreational uses.

Municipal Parks and Open Space

The majority of parks located within the study area are municipally owned. These municipal parks make many recreational resources available for public use, including playing fields, hiking trails, picnic areas, tennis and volleyball courts, and playground equipment. A description of the resources available at the municipal parks is included in Table 11 and shown on *Parks and Open Space Resource maps* included in Appendix C..

Table 11 - Newtown Creek Public Parks, Recreation and Preserved Open Space Resources

Property Name	Municipality	Use	Acres
Pickering Field	Newtown Borough	ball fields	3.14
Brian S. Gregg Memorial Park	Newtown Borough	open space and playground	1.00
Linton Memorial Park	Newtown Borough	playground	0.50
Newtown Commons	Newtown Borough	passive park	0.08
Chandler Field	Newtown Township	active recreation	11.40
Carl Sedia Park	Newtown Township	active & passive recreation	3.70
Roberts Ridge Park	Newtown Township	undeveloped fields	22.80
Hidden Lake	Newtown Township	undeveloped open space	42.00
Pickering Chase Woodlands	Newtown Township	undeveloped open space	17.20
Merion Drive Parcel	Newtown Township	undeveloped open space	8.40

Preserved lands within the study area include parks and recreational facilities, open space, and private preserved lands (including lands under conservation easement). These areas are shown on summarized in Table 11. Approximately 110 acres within the study area are preserved as parks and open space.

Greenways & Trails

Greenways and trails are crucial keys to help promote open space, parks, and recreation, and to link all of these resources together, in an environmentally and healthy manner. Connecting open space is more effective for wildlife habitat and for recreation than open space fragmented by developed areas. A Greenway can serve many regional and local needs.

Greenways can be implemented by a municipality by utilizing existing corridors such as stream corridors, old railways, and utility corridors; these corridors then become the spokes in a green infrastructure framework, serving to connect other natural amenities and recreational resources.

Trails located within greenways and those that connect greenways provide a tremendous resource of recreational use. The Bucks County Open Space Task Force listed preserving and creating greenways and trails as a top priority. Trails need not only serve a recreational role, but as a means of transportation as well.

Newtown Creek Watershed Trail Systems

Newtown Creek Corridor

The Newtown Creek from headwaters to confluence was identified in the *Newtown Area Linked Open Space Plan* of 1988 as part of a proposed regional link park system for Wrightstown, Newtown, Upper Makefield Townships and Newtown Borough. The *Newtown Borough Comprehensive Plan and Open Space Plan* (2010) also identifies the potential of this corridor and recommends that the Borough maximize greenway acquisition and access along Newtown Creek and the vestiges of Newtown Common.

SEPTA Rail Line Corridor

The former Fox-Chase/Newton Regional Rail (R-8) line of SEPTA presents a linkage that begins at the station property on the corner of Penn Street and Lincoln Avenue down through the southern tip of the Borough. The right-of-way runs from the Borough through Newtown Township and eventually links up with Churchville Nature Center and Churchville Park in Northampton Township. The *Newtown Borough Open Space Plan* also recommends using the greenway along the SEPTA right-of-way from the station to the southern Borough line for pedestrian and bicycle use, and, if extended into Newtown Township, to link the Borough to any future rail station in Newtown Township.

Linkages with Newtown Township are also promising. Newtown Township has prepared a trail plan where there are proposed connections at Greene Street and Washington Avenue. These connections would link up with destinations such as Tyler State Park, Bucks County Community College, Goodnoe Elementary School, Council Rock High School, Council Rock Junior High School, Carl Sedia Park and Core Creek County Park in Middletown Township. There are linkages between Chandler Field and Council Rock North High School by way of Sycamore Street and Swamp Road.

Bucks County Greenways Plan

The Bucks County Planning Commission recently released data from its draft open space and greenways plan. Included in the list of proposed multi-use greenways are areas which would include the following connections through the Newtown Creek Watershed:

- Houghs-Newtown Creek Multi-Use Greenway – linking Newtown Borough with the Delaware River Water Trail, D&L Heritage Corridor and the Neshaminy Main Stem Greenway.
- Neshaminy Main Stem-Wrightstown/Northampton/Newtown Multi-Use Greenway[8] - linking Tyler State Park, Northampton Township Recreation Complex, Core Creek Park and Bucks County Community College with several Neshaminy Creek Greenways, the New Hope-Ivyland Railroad Heritage Corridor, the Mill-Neshaminy-Core-Dyers Creeks (Cross County) Greenway and the Paunacussing-Lahaska-Mill-Jericho-Pidcock Creeks Greenway.

Funding Conservation of Open Space, Farmland & Natural Areas

Over the years, Bucks County and several of the municipalities have raised money for the protection of important land resources. In 2007, the Bucks County Board of Commissioners budgeted $87 million over a ten year period for these purposes. Many municipalities appropriate their own funds for financing parks and recreation programs. Others utilize funds from the county open space programs for open space protection. All of the other funding programs were approved by voter referenda. The county and municipal funding initiatives within the Newtown Creek watershed are summarized in Table 15.

Table 12 - Open Space Bond Referenda in Newtown Creek Watershed Municipalities

Municipal Referenda	Amount Raised	Year(s)
Newtown Township	2.75 million	1998
Middletown Township	0.325 million	1998
Wrightstown Township	1.5 million, 1.5 million, 1.5 million	1995, 2002 & 2006
Bucks County Referenda	**Amount Raised**	**Year(s)**
Bucks County	3.5 million, 59.0 million, 87.0 million	1994, 1996 & 2007

Source: HC analysis – 2010

Both Newtown and Wrightstown Townships have dedicated a percentage of their earned income tax revenues to support open space programs. Newtown Township residents approved a 0.1 percent EIT for open space programs in 2008 and Wrightstown approved a 0.15 EIT in 2002.

Analysis

There are a wide range of parks, recreational and open space opportunities within the Newtown Creek Watershed ranging from small local playgrounds to larger municipal park facilities. The majority of these areas are owned, operated and maintained by the individual municipalities. As described in the Bucks County Open Space and Greenways Plan, there may be potential for creating multi-municipal trail linkages among the individual trail and greenways in place within the watershed. Many opportunities exist along the Newtown Creek corridor as noted in the

[8] Included in Bucks County Park & Recreation Plan 1986 as a proposed link park and the DVRPC Destination 2030 Greenspace Network-Neshaminy Creek.

municipal open space plans. Municipalities should continue to explore developing these linkages through their existing open space and land use planning.

The recently completed open space plan updates for the watershed communities provide specific recommended actions to help protect open space, historic and sensitive natural resources for the future. Municipal officials should use both appropriate ordinance methods and capital investments to achieve their community's land and natural resource protection goals.

Figure 15 - Trail to Hidden Lake along Newtown Creek

VIII. Biological Resources

The Newtown Creek Watershed is located in a cool climate region with relatively high rainfall (42 inches per year), and moderate temperatures. The watershed's biological resources, which include its flora, fauna, aquatic habitat, mammals, birds and other wildlife, should be viewed as important resources to be protected. This chapter reviews the various biologic resources found in the watershed from a variety of sources.

The current responsibilities for biological protection at the state level reside within three agencies. The Pennsylvania Department of Conservation and Natural Resources, Bureau of Forestry (BOF) maintains responsibility for plant species. The Pennsylvania Game Commission (PGC) administers to birds and mammals and the Pennsylvania Fish and Boat Commission (FBC) has jurisdiction over fish, reptiles and amphibians.

Pennsylvania Natural Diversity Inventory (PNDI)

The Bureau of Forestry, in partnership with the Western Pennsylvania Conservancy and The Nature Conservancy, maintains a list of species and habitats for a number of watersheds in Pennsylvania and is accessible via the web at www.naturalheritage.state.pa.us. A specific request for information limited to the Newtown Creek Watershed was submitted to the Pennsylvania Natural Heritage Area program for updated PNDI information within the Newtown Creek Watershed. Responses were received by three state and one federal review agencies including the PA Fish and Boat Commission, Pa Game Commission, PA, PA DCNR, the US Fish and Wildlife Service. Appendix D contains a summary of the PNDI information for the Newtown Creek watershed. This includes the key to the state ranking system and the species indicated as being near the Newtown Creek watershed listed by scientific name. See Appendix E for full copies of the response letters from the review agencies. Three of the four agencies responded that although some species or resources of concern are located in the vicinity of the project, none are known to be located within the Newtown Creek Watershed Boundary. Species known approximately 2-3 miles away from the boundary of the watershed are indicated in Table 13.

Table 13 - PNDI Species Known to Occur within the Vicinity of the Newtown Creek Boundary

Scientific Name	Common Name	PA Current Status	PA Proposed Status
Andropogon glomeratus	Bushy Bluestem	Tentatively Undetermined	Rare
Bartonia paniculata	Screw-stem	Not Currently Listed	Rare
Gentiana saponaria	Soapwort Gentian	Tentatively Undermined	Endangered
Juncus bilflorus	Grass-leaved Rush	Tentatively Undetermined	Threatened
Panicum longifolium	Long-leaf panic grass	Tentatively Undetermined	Endangered
Carex crinita var. brevicrinis	Short Hair Sedge	Endangered	Endangered

Source: PA DCNR PNDI Review Letter: February 07, 2011

The PA Fish and Boat Commission indicated that two threatened or endangered species are found near the watershed in Bucks County and could potentially occur within suitable habitats in the Newtown Creek Watershed. These include the Eastern Redbelly Turtle (*Pseudemys rubriventris,* state threatened) and the Eastern Spadefoot Toad (*Scaphiopus h. holbrookii,* state endangered). This information is useful in understanding potential threats to habitat resulting from new development or alteration of existing land which may result in habitat destruction or poor water quality.

County Natural Areas Inventories

The Natural Areas Inventory (NAI) is a list of priority areas that hold crucial biological, ecological and hydrological resources. These inventories present a comprehensive picture of Bucks and Montgomery's natural diversity. In 1999, Bucks County engaged the Morris Arboretum to inventory these natural features of the county, and 240 individual sites were surveyed. The resulting document listed 115 sites prioritized into four different levels of importance ranging from Level 1 (highest, statewide importance) to Level 4 (Lowest – local importance). There are no priority sites within the Newtown Creek Watershed Basin. The updated NAI has been released for internal review.

Other Biological Studies

Native Plant Communities

The DRKN documented one native plant community in the Newtown Creek watershed as part of their 2006 watershed assessment study. This community is described below:

***Acer (rubrum, saccharinum) - Fraxinus* spp. - *Ulmus americana* Forest**
Translated Name: (Red Maple, Silver Maple) - Ash species - American Elm Forest
Common Name: Maple - Ash - Elm Swamp Forest
Unique Identifier: CEGL005038
Classification Approach: International Vegetation Classification (IVC)

Summary:

This silver and red maple forest swamp community type occurs in the east-central United States and adjacent Canada. Stands occur in moist, deep (>100 cm), hydric soils associated with wetland depressions on level plains and floodplain back swamps. Soils are saturated for a few months of the growing season, but often are dry by late summer. Canopy cover is complete and dominated by Red Maple (*Acer rubrum),* Silver Maple *(Acer saccharinum)*, Green Ash (*Fraxinus pennsylvanica)*, and American Elm (*Ulmus Americana)*. Pin-Oak (*Quercus palustris)* and Black Gum (*Nyssa sylvatica)* are also commonly encountered. The subcanopy consists of a shrub layer which may contain a mixture of Ironwood (*Carpinus caroliniana),* Winterberry Holly *(Ilex verticillata),* Spicebush*(Lindera benzoin),* Common Elderberry *(Sambucus canadensis),* Poison Ivy *(Toxicodendron radicans),* Arrowwood Viburnum *(Viburnum dentatum var. lucidum)*, and Alder (*Alnus incana - ssp.rugosa* in parts of its range). The depth and duration of flooding and light penetrating the forest canopy regulate density and diversity found in the herbaceous layer. Jewelweed (*Impatiens capensis),* Jack-in-the-pulpit *Arisaema triphyllum,* fowl mannagrass (*Glyceria striata)*, and a variety of rushes (*Juncus* spp.) and sedges (*Carex* spp.) are among the most common species encountered.
Conservation Status
Rounded Global Status: G4 - Apparently Secure (03Oct1996)

Non-Native and Invasive Species[9]

Non-native and invasive species occurrences within the Newtown Creek were evaluated as part of the Delaware Riverkeeper Network (DRKN) Stream Assessment conducted in 2005. The DRKN surveyed conditions at twelve locations along the creek to obtain stream and riparian conditions. Riparian conditions were the most impacted habitat component along Newtown

[9] Delaware Riverkeeper Network. 2005. Newtown Creek Stream Assessment and Recommendations.

Creek and much of the riparian degradation occurring in both the upper creek area (above Newtown Borough and in the lower sections (Newtown Borough and downstream) is associated with the presence of invasive species such as multiflora rose (*Rosa multiflora*), Japanese stilt grass (*Microstegium vinemeum*), Japanese honeysuckle (*Lonicera japonica).* The downstream portions of the creek are also heavily impacted by the invasive species noted upstream plus Norway maple (*Acer plantanoides*) which dominate much of the canopy layer. In addition, the report noted a monotypic stand of Japanese knotweed located along most of the creek bank along Carl Sedia Park.

Benthic and Fish Studies[10]

The PA DEP water quality assessment cited water quality data from 2002. According to the report, Department staff collected habitat, benthic macroinvertebrate, and fish data at a single sampling location on January 24, 2002. This data was used to support the Department's finding that the Newtown Creek supports a warm water fishery and its recommendation that the entire Newtown Creek Basin be designated Warm Water Fishes (WWF). This data also supported the designation of Migratory Fishes (MF) since the creek is an unimpeded tributary to the Neshaminy Creek which is also designated MF. The results of the water quality evaluation are summarized below:

Habitat. In stream habitat conditions were evaluated at the station where benthic macroinvertebrate and fish were sampled. The habitat evaluation consists of rating twelve habitat parameters to derive a station habitat score. The habitat score total for Newtown Creek was 165 - generally considered to reflect sub-optimal habitat conditions.

Benthos. Newtown Creek supports a simple benthic macroinvertebrate population dominated by a number of pollution-tolerant genera. The macroinvertebrate sample revealed a relatively low taxa richness (total # of taxa) value of 13. Normally, in streams of this size, taxa richness scores > 20 can be expected. The benthic sample was dominated by the tolerant taxonomic group; chironomidae. Based on subsample results, this group comprised about 70% of the benthos. This benthic community condition reflects impacts from the previously described land uses observed upstream.

Fish. Newtown Creek fish populations were also sampled. Six species of fish were captured in 15 minutes of sampling a 100m section of Newtown Creek. Abundance of fish was low with 47 total fish captured during sampling. All species collected are commonly found in warm water habitats and classified as pollution tolerant taxa.

Analysis

Important Resource Areas

Although no PNDI species are known to occur in the watershed and there were no priority properties identified in the County's Natural Areas Inventory, the watershed's flora, fauna and aquatic resources are still important to protect, especially considering that water quality assessments indicate that the creek supports warm water fishes. Areas which buffer the Newtown creek and those lands directly adjacent to the creek should not only be priorities for preservation but also for land management programs. Non-native invasive species are a chronic

[10] PA DEP, Stream Redesignation Evaluation Report, Newtown Creek Bucks County. 2004

problem in disturbed natural areas, and require management strategies to prevent them from turning the region's natural areas into habitat deserts. Studies undertaken by the DRKN recommend widespread management of invasive species either through municipal weed ordinances or removal programs. Management tasks also include planting of native vegetation. Goose and deer depredation on newly planted vegetation must be reduced to ensure the success of newly planted areas. Multiflora rose, Japanese honeysuckles, Oriental bittersweet, Norway maple, lesser celandine, Japanese stilt grass, garlic mustard, invasive privets and Japanese knotweed are the most persistent non-native invaders of this region. Japanese knotweed poses a particularly difficult challenge and should be addressed before it spreads too far.

As indicated by the PA Fish and Boat Commission, two state endangered or threatened species have been known to occur in areas near the watershed. The eastern redbelly turtle and eastern spadefoot toad are found near the watershed and could potentially occur within suitable habitats within the Newtown Creek watershed. The eastern redbelly turtle is known to inhabit relatively large, deep streams, rivers, ponds and lakes with permanent water. The eastern spadefoot toad prefers sandy or other soft loamy soils for burrowing. It is important to preserve and protect the areas that may be suitable for these species.

Since much of the Newtown Creek riparian areas are contiguous, protection measures such as riparian ordinances, and the use of conservation easements and similar efforts should be considered by the township and borough to encourage preservation of these areas. To maintain and enhance the creek's riparian forests, areas lacking adequate vegetation should be restored to a more naturalized state.

Education and Coordination

Volunteers, members of the public as well as municipal staff should be educated about invasive plants and enrolled in their removal. Long-term strategies for cultivating native vegetation and habitats within the creek's riparian areas and open spaces within the watershed basin should be as high a priority as preserving the space in the first place. Volunteer monitoring could also be implemented to periodically confirm the status of the plant communities and riparian buffers along the creek.

IX. Water Resources

This chapter will provide an overview of the various water resources found within the Newtown Creek including Lakes, Reservoirs, Wetlands, Floodplains, and Riparian Buffers. This chapter also reviews the current water quality conditions of the Newtown Creek and various potential sources of impairments that may occur in the watersheds resulting from point and non-point sources of pollution. A summary of local, state, and federal regulatory programs addressing these issues is also included. Water resources, including Lakes & Reservoirs, National Wetlands Inventory (NWI) wetlands, 100-year floodplains are indicated on Map 3 – *Geology and Water Resources.*

Summary of Water Cycle

To understand the relationship of ground and surface water within a watershed, it is important to be familiar with the process by which water moves through the earth. This process, known as the Natural Water Cycle or Hydrologic Cycle is basic to understanding how our activities impact the water cycle. Essentially the water cycle involves five basic processes, precipitation (rainfall), infiltration (and percolation), surface runoff, evaporation and transpiration. As illustrated in Figure 16, the hydrologic cycle is continuous as water changes from liquid to vapor to ice.

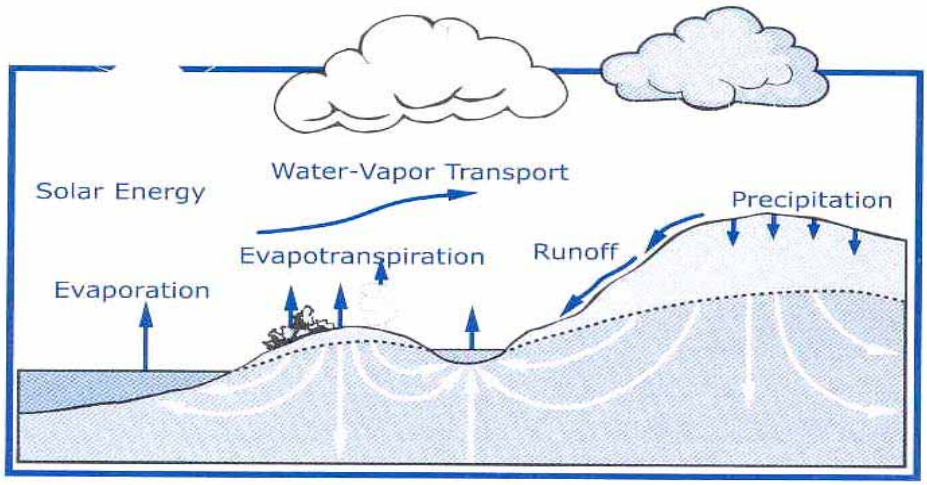

Figure 16 - The Water Cycle[11]

Water falls to the land and water surfaces through precipitation in the form of rain and snow. This precipitation can return water directly to a body of water or can fall on pavement, rocks, soils, etc. The water will then travel downhill as runoff to the nearest body of water. Water can also fall on permeable surfaces such as some soils and sands and be absorbed into the ground and eventually into saturated zones. The saturated zone is the groundwater portion of the water cycle. The rocks and soils that hold and transmit this groundwater are known as aquifers. This water is eventually moved upward back into the atmosphere through evapotranspiration. This

[11] Source: Miller, Patricia and A. Jantrania. Managing our Watersheds, A Systems Approach to Maintaining Water Quality, Small Flows Quarterly, Fall 2000, page 18.

process of evapotranspiration is a combination of evaporation from land and water and transpiration from the leaves of plants.

Disruption of the Water Cycle[12]

When development occurs, the resultant alteration to the land can lead to dramatic changes to the hydrology, or the way water is transported and stored. Impervious man-made surfaces (asphalt, concrete, rooftops) and compacted earth associated with development create a barrier to the percolation of rainfall into the soil, increasing surface runoff and decreasing groundwater infiltration. This disruption of the natural water cycle leads to a number of changes, including:

- increased volume and velocity of runoff;
- increased frequency and severity of flooding;
- peak (storm) flows many times greater than in natural basins;
- loss of natural runoff storage capacity in vegetation, wetland and soil;
- reduced groundwater recharge; and
- decreased base flow, the groundwater contribution to stream flow. (This can result in streams becoming intermittent or dry, and also affects water temperature.)

Impacts on Stream Form and Function[13]

Impacts associated with development typically go well beyond flooding. The greater volume and intensity of runoff leads to increased erosion from construction sites, downstream areas and stream banks. Because a stream's shape evolves over time in response to the water and sediment loads that it receives, development-generated runoff and sediment cause significant changes in stream form. To facilitate increased flow, streams in urbanized areas tend to become deeper and straighter than wooded streams, and as they become clogged with eroded sediment, the ecologically important "pool and riffle" pattern of the stream bed is usually destroyed. Bank erosion and severe flooding destroy valuable streamside, or riparian, habitat. Loss of tree cover leads to greater water temperature fluctuations, making the water warmer in the summer and colder in the winter. Most importantly, there is substantial loss of aquatic habitat as streambed is covered by a uniform blanket of eroded sand and silt.

Water Quality in the Newtown Creek

A stream's ability to support aquatic life, provide drinking water and to function as a recreational resource is all dependent on its water quality. Scientists who assess water quality study both its chemistry (what is dissolved in water) and biology (what is alive in the water). Chemical monitoring provides a "snap shot" of the water condition at the time the sample is collected. Some of the common chemical indicators of water quality include[14]:

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[12] Text from, "Impacts of Development on Waterways", NEMO Program Fact Sheet #3. © 1994 The University of Connecticut. Used with permission of the University of Connecticut Cooperative Extension System. Heritage Conservancy is a charter member of the National NEMO Network.

[13] Text from, "Impacts of Development on Waterways", NEMO Program Fact Sheet #3. © 1994 The University of Connecticut. Used with permission of the University of Connecticut Cooperative Extension System. Heritage Conservancy is a charter member of the National NEMO Network.

[14] From DRBC Water Quality Terminology, http://www.state.nj.us/drbc/snapshot_terms.htm

Carbon Dioxide – is an odorless, colorless gas produced during the respiration cycle of animals, plants and bacteria and through the burning of materials that contain carbon. When carbon dioxide levels are high and oxygen levels low, fish have trouble respiring and their problems become worse as water temperature rises.

Dissolved Oxygen (DO) – is oxygen that is dissolved in water. The amount of DO is affected by temperature. Cold water generally contains more DO than warm water. Oxygen levels can be reduced by run-off from farm fields and residential yards containing phosphates and nitrates (the ingredients in fertilizers). Under these conditions the size of water plants increase a great deal. Respiring plants will use much of the available DO. When these plants die, they become food for bacteria, which in turn multiply and use large amounts of oxygen. Plankton/phytoplankton are organisms such as algae that float on or near the surface of the water. Most are rounded and single-celled. All phytoplankton use photosynthesis for their energy. Excessive amounts of phytoplankton causes DO levels to decrease.

Nitrate and Phosphate – are necessary for aquatic plant growth, which supports the rest of the aquatic food chain. Both of these nutrients are derived from a variety of natural and artificial sources, including decomposition of plant and animal materials, man-made fertilizers, and sewage. While excessive nutrients do cause undesirable plant growth, an appropriate level of nutrients is one of the driving forces of the aquatic ecosystem.

Turbidity – refers to the optical property of a water sample, (i.e. whether or not it is cloudy). Any substance that makes water cloudy will cause turbidity. The most frequent cause of turbidity in lakes and rivers are plankton and soil erosion from storm water runoff.

Water Temperature – is an important environmental factor for fish and other aquatic life, with many species needing specific temperature ranges to thrive. Temperature affects concentrations of dissolved oxygen in water, with higher concentrations occurring with colder temperatures.

In contrast to the chemical parameters noted above, the biological indicators or living organisms show what is happening in the stream over a period of time. Certain types of plants and animals are more tolerant than others to changes in habitat and water quality. Common indicators of biological health are fish, algae and macroinvertebrates.

Macroinvertebrates are a group of animals without a backbone including crustaceans and worms but most are aquatic insects. Beetles, caddisflies, stoneflies, mayflies and dragonflies are among the groups of insects represented in streams. Macroinvertebrates are an important link in the food web between the producers (leaves and algae) and consumers such as fish. See previous chapter for more information on the biological resources of Newtown Creek.

Current Water Quality Designations and Impairments

Pennsylvania sets water quality standards for surface waters of the Commonwealth. These standards are important indicators of the biological health of the waterway as well as its recreational potential and aquatic life diversity. The standards are based upon water uses, which are to be protected and considered by the PA DEP in its regulation of discharges such as those from wastewater treatment plants or industry. Water quality standards and designations are published in 25 Pa. Code, Chapter 93. In 2004, The PADEP determined that during the

compilation of Chapter 93, the Newtown Creek basin was not assigned a "designated use." The designated uses listed for the receiving Neshaminy Creek drainage segment is Warm Water Fishes (WWF) and Migratory Fishes (MF) but they did not include Newtown Creek. Therefore the DEP undertook an investigation of the creek to determine its proper Chapter 93 designation. As a result of the data and information gathered, the DEP determined that the designated use for the Newtown Creek is Warm Water Fisheries (WWF) and Migratory Fisheries supporting such fish as the American eel.

Section 303(d) of the Clean Water Act requires that states assess the quality of surface waters biannually. Streams considered impaired or not meeting their designated use are included on the "303d list". The 2010 water quality assessment data compiled by the PA DEP under the state's Unified Watershed Assessment program indicates that the entire Newtown Creek Stream meets its designated uses for aquatic life. Assessment results are based on biological and habitat surveys conducted by the PA DEP as noted above. These results reflect that the aquatic life present meet criteria established for expected species diversity and abundance. This is illustrated via the green lines represented on the Pennsylvania E-map website as shown in Figure 17. Note: Streams that do not meet established criteria are considered "impaired". These are noted in red on Figure 17.

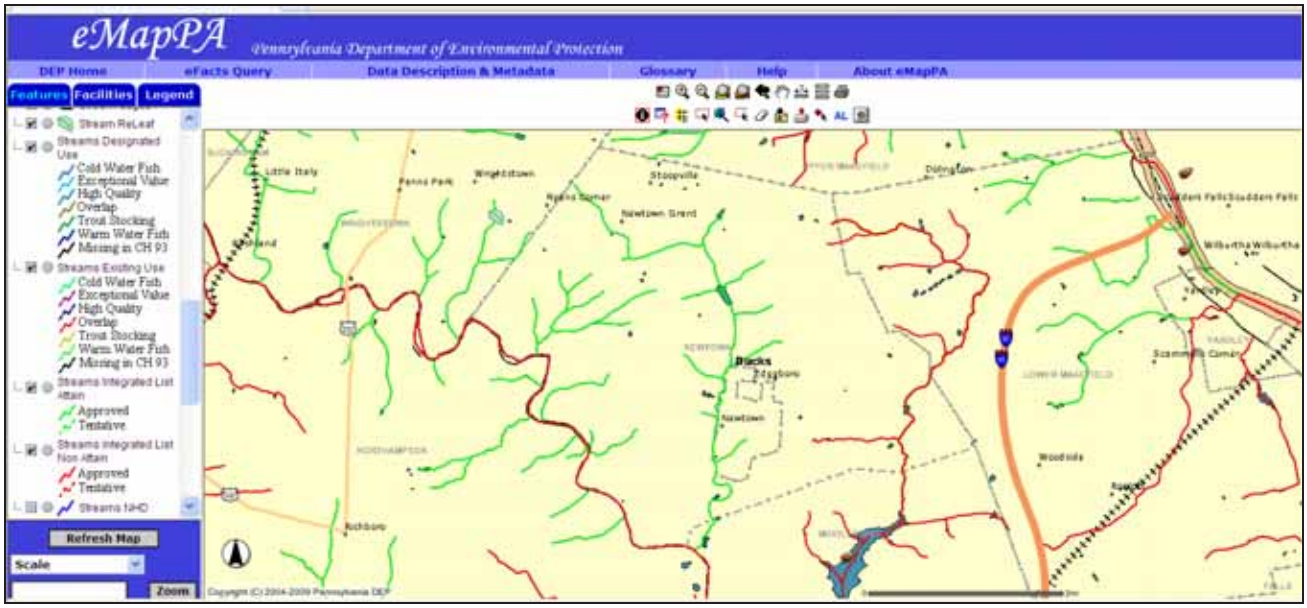


Figure 17 - E-map PA screen shot showing that the Newtown Creek tributary is not impaired. March 2011.

Lakes/Ponds/Reservoirs/Impoundments

Lakes and ponds provide habitat for aquatic life as well as water sources for wildlife. These landscape features are scenic amenities and have aesthetic value. One impoundment is located within the Newtown Creek Watershed in Newtown Township, just north of the Borough. The impoundment, locally known as Hidden Lake was created with the construction of dam PA 621. The dam is located on Newtown Creek, 2,000 feet above PA 532 north of Newtown Borough. The 43-foot high structure controls runoff from 3.04 square miles, providing 679 acre-feet for floodwater storage and 69 acre-feet for sediment storage. A permanent pool has been created of

about 11 acres, which increases up to a maximum of 82 acres during flood events.[15] Figure 18 shows the Hidden Lake Reservoir and Figure 19 shows the Newtown Dam.

The Newtown dam and reservoir are used as a flood control structure for the downstream borough of Newtown. The impoundment was designed by the United States Department of Agriculture, Soil Conservation Service in 1976-77 and the structure was officially completed in 1980. The dam is classified as an 'Intermediate' size structure with a 'High' hazard classification, consistent with its potential in the event of failure for extensive property damage and loss of life downstream of the dam. The SCS designed this dam as a Class C structure, which requires that the spillway systems be designed to pass the Probable Maximum Flood (PMF).[16]

The lake and surrounding open space total about 42 acres which is owned by Newtown Township. However, Bucks County owns easements covering 39.6 acres including the lake, and adjacent property including the floodplain and dam. The dam and adjacent open space lands are maintained jointly by the county and Newtown Township public works staff. The dam was built primarily to alleviate flooding downstream from its location. The reservoir provides habitat for aquatic life as well as water sources for wildlife. The location of Hidden Lake Reservoir is shown on Map 3 – *Geology and Water Resources*.

Figure 18 - Hidden Lake Reservoir

Wetlands

Wetlands are areas that are seasonally or perennially wet, due to replenishment of water from a groundwater source. They are often characterized by soil types, the presence of standing water for parts of the year, and the plant communities that they support. A unique landform, wetlands are often called bogs, swamps, marshes, seeps or springs. They provide specialized habitats for wildlife, often serving as breeding areas for amphibians and fish, and can serve as important passive recreational areas for bird and wildlife viewing.

15 Bucks County Planning Commission, Neshaminy Creek Watershed Stormwater Management Draft Plan, August 2010.

16 Drawn from a report by Woodward-Clyde Consultants as part of the National Dam Inspection Program, August, 1980.

There are approximately 554 acres of wetlands located within the study area. These areas are shown on Map 3. Wetlands were identified by the National Wetlands Inventory (NWI) which is a service provided by the U.S. Fish and Wildlife Service. The NWI identifies wetlands from aerial photographs and is not field verified. As a result, data may be inaccurate or incomplete, and more formal verification is required for regulatory purposes. As noted in the DRKN stream assessment study, there are many small wetland pockets found along the creek corridor just downstream of Route 532. These areas are low-lying, where the water table is just below the surface. In general, wetlands along the Neshaminy Creek and its tributaries tend to lie within a floodplain, if not set back from the creek.

The federal and state permitting process for disturbances within wetlands is regulatory, rather than protective. If the proper information is provided and the permit conditions satisfied, the permit is issued. Thus, the municipality's role becomes more important in terms of protecting these resources. At the local level, wetland areas can be protected through the use of wetland protection and wetland buffer zone ordinances. All municipalities within the study area prohibit development in wetland areas. However, protection measures are only effective if the wetland areas are properly identified through wetland delineation as described above. Municipalities should require that applicants delineate wetlands on their property prior to development or provide evidence that no wetlands exist. In addition to wetlands, Middletown Township regulates the intensity of development in wetland buffer areas. Local wetland buffer ordinances are very important, because the protection of wetland buffers is not mandated at the state level. The Bucks County Planning Commission recommends a buffer zone to extend 100 feet from the wetland boundary or to the limit of the delineated hydric soils whichever is less. Within this area, 80% of the buffer area must be protected from development.

Floodplains

Floodplains are the land areas adjacent to a stream channel that are susceptible to periodic inundation, and are usually categorized by the frequency of this inundation. A key term used in floodplains, especially in ordinances, is the 100-year floodplain. This is an area that has a one percent chance of being flooded in any given year. These areas are typically restricted for new development or disturbance. Floodplains consist of two primary components: Floodway and flood fringe. A floodway is the portion of the 100-year floodplain that serves as a flood channel to pass deep, fast moving waters. The flood fringe is the portion of the floodplain outside of the floodway, which contains the shallow, slower moving floodwater. The 100-year floodplains are delineated on Map 3 based on studies associated with the National Flood Insurance Program (NFIP). Floodplain areas are based on elevation data and hydrologic modeling.

The Federal Emergency Management Agency (FEMA) recently re-examined existing flood hazard areas and updated the flood insurance rate maps for this region. These updates have been completed and were provided to the county planning commission for initial review.

The natural function of floodplains is to accommodate floodwater. The natural vegetation supported by moist floodplains helps trap sediment from upland surface runoff, stabilizes stream banks for erosion control and provides shelter for wildlife and proper stream conditions for aquatic life.

Due to their unique characteristics, ecological significance and susceptibility for adverse impacts, development within floodplains is regulated at the local, state and Federal levels. Regulations seek to minimize damage to life and property for existing development, control future development and protect water quality.

There are also numerous state legislative programs directly or indirectly related to floodplain development and protection including the 1978 Stormwater Management Act (Act 167), the 1978 Dam Safety and Encroachment Act (Act 325), and the 1978 Pennsylvania Floodplain Management Act (Act 166) and its amendments of 1986, and 1989. Each municipality within the study area restricts development within identified 100-year floodplain areas and most place restrictions on flood fringe areas.

Flood Control

The flood record history of the Neshaminy Creek watershed is over 50 years old. Flooding problems began in the early 1950's when urbanization changed the landscape of the lower watershed municipalities. Two major events occurred due to hurricanes, one in 1955 which resulted in a flood crest that registered 22.7 feet and the other in 1971 with a flood crest of 18.9 feet. As a result of these events, numerous studies were undertaken in the watershed. A new county agency, the Neshaminy Water Resources Authority (NWRA) was formed and facilitated a work plan to build a network of 10 dams within the watershed.[17] One of the dams constructed as a result of this work plan was the Newtown Dam (PA 621), which is described earlier in this chapter.

Riparian Buffers

Riparian buffers act as a natural filter of stormwater and stabilizer of stream banks to help reduce erosion usually through areas of vegetation that grow along the stream banks. Riparian buffers may be forested, wetlands or meadows. Proper riparian vegetation can hold the soil intact and remove excess nutrients and pollutants before they reach the water. In addition, riparian buffers slow the velocity of stormwater. The vegetation helps shade the streams allowing for more sustainable aquatic life, as well as supporting habitat and cover for wild life. These buffers are often undervalued by landowners but are vital to providing a healthy and stabilized stream environment. However, this can change with the continued use of ordinances and the enforcement of these ordinances.

As noted in Chapter IX, riparian conditions were the most impacted habitat component along Newtown Creek. Much of the riparian degradation occurs in both the upper creek area (above Newtown Borough) and in the lower sections (Newtown Borough and downstream) and is associated with the presence of invasive species. Efforts to remove invasive species and replace with native plants should be encouraged and maintained to help maintain the creeks aquatic health.

Water Supply

The majority of residents and businesses are served by served by public water and sewer utilities, with the exception of Wrightstown Township. All water service in Wrightstown Township is

[17] BCPC, Neshaminy Creek Watershed Stormwater Management Draft Plan, August 2010. Pg.24.

provided by individual wells while sewer effluent is handled by on-site septic, sand mound or spray irrigation systems. The public water utilities that service the watershed municipalities are local or county municipal authorities that rely on both groundwater and purchased surface water for supply. According to data provided in the Newtown Area Joint Municipal Comprehensive Plan, groundwater accounts for the majority of water that is supplied in the study area. The Newtown Artesian Water Company (NAWC) provides service to Newtown Township, Newtown Borough and a portion of Middletown Township. NAWC obtains it water supply from five groundwater sources and by means of an interconnection with the Bucks County Water and Sewer Authority which provides water from the Delaware River.

The Newtown Creek watershed lies within the Delaware River Basin Commission's Groundwater Protection Area of Southeastern Pennsylvania. This protection act serves to protect water resources in the Triassic Lowland region of the Delaware River Basin with regulations on water withdrawals, and to promote water conservation.[18] Groundwater protected area regulations apply to new or enlarged daily withdraws of 10,000 gallons or more involving municipal, public, industrial and commercial water suppliers. The DRBC encourages municipalities to monitor public and private water use to determine each community's sustainable groundwater yields. The Joint Municipal Zoning Ordinance provides regulations to protect areas that have been determined important to the recharge of groundwater resources.

There are no sites listed on the Comprehensive Environmental Response Compensation and Liability Information System (CERCLIS) in the Newtown Creek Watershed.

Stormwater Planning and Regulations in the Watershed

The following paragraphs describe the current state and federal regulatory programs, which are intended to address both stormwater quantity and quality issues.

Pennsylvania Act 167 Stormwater Management Plan

In order to mitigate some of the effects of stormwater run-off, the Pennsylvania state legislature passed the Stormwater Management Act of 1978. Under this legislation, the Bucks County Planning Commission completed the first Neshaminy Creek Stormwater Management Plan in 1992. This plan primarily emphasized the problem of peak stormwater flows. A "peak" discharge is that point in time where the maximum speed and volume of runoff discharging occurs during the entire storm event. The Act 167 Plan for the Neshaminy Creek resulted in municipalities within the watershed adopting the model stormwater ordinance set forth in the plan.

In 2010, the Bucks County Planning Commission released the update to the Act 167 plan for the entire Neshaminy Creek Watershed. The 2010 plan models stormwater flows for the entire watershed basin. Stormwater flows from various storm events are calculated by the model and increased runoff is analyzed for potential impact. The watershed level control strategy described in the updated plan creates a system of stormwater management in which the anticipated increases in runoff volume will not degrade water quality, nor increase peak flow rates throughout the watershed. This plan contains standards and criteria to address the following:

[18] Delaware River Basin Commission. Ground Water Protected Areas in Southeastern PA. October 29, 1961 Amendments include 1999

- Volume control criteria for water quality and groundwater recharge
- Peak rate control (implemented through management districts) to control accelerated runoff.
- Computational methods for stormwater management measures.

The Newtown Creek is divided into two stormwater management subareas. The plan assigns each subarea a management district classification. There are three potential classifications: A, B and C. Peak runoff volume is managed differently within each classification as noted in Table 14. The Newtown Creek above the dam is classified as management district A. The watershed area below the dam is classified as management district B.

Table 14 - Peak Rate Runoff Control by Stormwater Management Districts, Newtown Creek Sub-Watershed

District	Design Storm Post-development	Design Storm Pre-development
A – Reduces peak flow rates at storms which occur most frequently (2- year storm) to a level of runoff equal to a smaller storm-event.	2-year 5-year 10-year 25-year 50-year 100-year	1-year 5-year 10-year 25-year 50-year 100-year
B – Controls to reduce outfall to a higher frequency (smaller) storm for all storm events.	2-year 5-year 10-year 25- year 50-year 100-year	1-year 2-year 5-year 10-year 25-year 50-year

Source: Neshaminy Creek Watershed Stormwater Management Draft Plan, Volume I: Plan and Model Ordinance, August 2010

As in the 1992 plan, a model stormwater ordinance is included that specifies mandated standards and criteria, which much be adopted by the watershed municipalities. In addition to the Act 167 stormwater management ordinance, each municipality has regulations related to stormwater facilities in their subdivision and land development ordinances.

National Pollutant Discharge Elimination System (NPDES) and Phase II Stormwater Regulations

In 1972, the Clean Water Act prohibited the discharge of any pollutant into a waterbody of the United States without a permit. The NPDES program was designed to track the point sources of pollution and required the implementation of controls designed to reduce this pollution.

In 1987, the U.S. Congress amended the Clean Water Act to establish a national program for addressing stormwater discharges. The program was to be implemented in two phases. Phase I required NPDES permits for municipal separate stormwater systems (MS4s) for municipalities serving populations of 100,000 people or more. Phase I also regulated discharges from industrial point sources.

As of 2003, designated MS4s with populations of less than 100,000, within an urbanized area and meeting population density criteria (> 1,000 persons per square mile), were required to apply for NPDES permits to cover municipal separate stormwater systems. Each municipality in the

Newtown Creek Watershed is a designated MS4 and they are required to submit plans to address six minimum control measures set forth by the state DEP. These minimum measures include:

- Public education and outreach
- Public participation and involvement
- Elicit discharge detection and elimination.
- Construction site runoff control
- Pollution prevention
- Good housekeeping for municipal operations

Analysis

A review of the natural resource protection ordinances for the municipalities within the watershed indicated that three of the four have specific riparian buffer ordinances. Although each municipality restricts development in wetlands and the 100-year floodplain, some do not provide the same level of protection for wetland buffer, flood fringe areas or wetland soils. Municipalities should review ordinances to strengthen protection of 100-year floodplains, flood fringe, wetlands and wetland margin areas and to assure that protection measures for significant natural areas are in place. In addition to having these protection measures in place, municipalities must be diligent in their enforcement.

Municipalities should also consider regulating the uses within hydric soils, which are generally associated with wetlands. In 1978, the Pennsylvania Flood Plain Management Act (Act 166 of 1988) was enacted and gave broad powers for municipal protection of flood prone areas. Act 166 does not limit a municipality's power to adopt more restrictive regulations than the minimum required.

Figure 19 - PA 621 Newtown Dam

X. Archeological and Historic Resources

The Newtown Creek watershed contains numerous historic properties and structures that have met criteria for listing on the National Register as well as many that have been determined eligible for listing on the registry. These resources were identified based on inventories contained in the watershed municipal open space plans, as well as those listed in the Upper and Middle Neshaminy Creek RCP. Appendix C includes maps from these plans showing the location of historic sites within the watershed.

Pre-Historic Era

Before European settlement, in prehistoric times, the Neshaminy Creek Watershed was occupied by indigenous people. The earliest of these were the Paleo-Indians who came to North America from Asia beginning around 12,000 B.C. Around 8000 B.C. the landscape began to change and the mammals that inhabited the area began to look similar to what we know today. Humans evolved as well and became more sophisticated in their hunting and gathering techniques. Tools began to be used, including a distinctive spear-throwing device. Spear points from this period are notched and are similar to the typical arrowheads used by Native Americans. This period, which lasted until 1000 B.C., is known as the Archaic period. Beginning around 1000 B.C. is the Woodland period, which is characterized by even greater technological advances by Native Americans including farming, pottery making, and hunting with bow and arrow. It was during the Late Woodland Period, starting around 1550 A.D., which Europeans began to explore and eventually settle in North America.

The predominant tribe of Native Americans at the time of European settlement was the Lenni Lenape. In 1681, King Charles II of England granted William Penn 40,000 acres of land, which became known as Pennsylvania. William Penn provided just compensation to the Lenni Lenape for their lands, but upon his death in 1718, the Lenni Lenape were not treated nearly as well and eventually they were driven out of Pennsylvania.

The impact of Native Americans on the area remains in the form of numerous archaeological sites from prehistoric times and the name Neshaminy is a Native American word that means the place where we drink twice. The period from the beginning of European settlement is referred to in archaeological terms as the Historic Period. Some archaeological sites in the watershed contain materials from the Historic Period. The European settlers began constructing mills, establishing farms, building roads and rail lines, and started towns and village.

Historic Resources

In 1966, Congress authorized the creation of the National Register of Historic Places to serve as the nation's official list of cultural resources worthy of protection. The National Register of Historic Places (National Register or NR) is maintained by the National Park Service. The Pennsylvania Historical and Museum Commission's (PHMC) Bureau for Historic Preservation manages the National Register for Pennsylvania. Properties listed in the NR include districts, sites, buildings, structures and objects that are significant in American history, architecture, archeology, engineering and culture. NR properties are distinguished by having been documented and evaluated according to uniform standards. Listing in the NR, however, does not interfere with a private property owner's right to alter, manage or dispose of property. It often changes the

way communities perceive their historic resources and gives credibility to efforts to preserve these resources as irreplaceable parts of our communities[19].

Newtown Borough

Originally surveyed in 1684, Newtown Borough is a classic example of William Penn's village planning principles in which each purchaser owns a lot within the townstead (containing a central common) and a plantation in the outlying areas. By 1700, the community grew to a substantial size along the banks of the Newtown Creek. Figure 18 is an illustration of an early 18th century map of the Newtown Region including the commons area and the Newtown Creek.

Newtown served as an outpost for Continental soldiers during the Revolutionary War and served as the headquarters of General George Washington before and after the Battle of Trenton. Due to its convenient location and the presence of existing buildings for public business, Newtown was the county seat from 1726 until 1813, when the courts and county offices moved to Doylestown. During this period, there was significant economic growth and development. The oldest library in Bucks County (and third oldest in the state) is the Newtown Library, which dates back to 1760. The first educational institution in town was Newtown Academy, built around 1798.

Figure 20 - Map of Newtown 1703. Source: Newtown Creek Coalition, Newtown Creek Planning Recommendations & Report, June 2010

During the nineteenth century, Newtown was an important agricultural center. Many affluent farmers moved into the village and constructed prominent Victorian houses, many of which can be seen today along sections of Chancellor and State Streets and Washington Avenue. Newtown was incorporated as a Borough in 1838. Since then, and well into the twentieth century, the Borough continued to grow and prosper as a center for commercial and professional services for the surrounding area.

Due to over 300 years of development history, Newtown Borough contains many significant historic resources. Some of the more notable resources include the Bird in Hand residence (built prior to 1690), the Half Moon Inn (1733), the Edward Hicks House (1821), the Newtown Creek Bridge (1796), the Newtown Borough Council Chambers (built prior to 1854), the Newtown Friends Meeting House and graveyard (1817), the Newtown Library Company (1760). Many of the identified historic properties fall within the Borough's Historic District, comprised of some 400 properties. The historic district covers about 2/3 of the Borough and is divided into four areas: Court Street, State Street, Washington Avenue, and the Penn-Congress-Chancellor Area. Newtown's Historic

[19] Introduction to National Register from: http://www.phmc.state.pa.us/bhp/nr/overview.asp?secid=25

District was created in 1969 and placed on the National Register of Historic Places in 1979. Its boundaries were expanded in 1986. The Newtown Borough Council Chambers, the Newtown Friends Meeting House, and the Newtown Creek Bridge over Centre Avenue were all listed on the NR before the historic district was created.

The Borough enacted a Historic District Ordinance and design guidelines to provide property owners with preservation information. In addition, the Borough created a Historic Architectural Review Board (HARB) to help protect the architectural and cultural heritage of the Historic District and Borough. The HARB reviews all proposed exterior changes to buildings and structures within the Historic District that are visible from the public way.

In addition to the HARB, Newtown Borough and Township participate in the Newtown Joint Historic Commission. The commission's primary responsibility is the protection and preservation of historically and/or architecturally significant structures in Newtown Borough and Newtown Township. The Commission is comprised of four residents from each of these two municipalities. As an advocate for historic preservation, the Joint Historic Commission can be a resource for property owners and municipal boards and committees regarding historic and/or architecturally significant structures.

Newtown Borough Scenic Resources

The 2010 Open Space Plan identified several scenic vistas including several associated with the creek. The first is looking down Newtown Creek while standing on the Jefferson Street and Centre Avenue Bridges. Farther downstream, a scenic vista can be viewed along this stream behind the former Stockburger automobile dealership property. Another vista can be seen along Old Skunky looking northeast from State Street.

In addition, a variety of street corridors throughout the Borough are particularly scenic. These include Washington Avenue from State Street, Court Street, up and down the commercial district of State Street, looking east along Penn Street, and looking south along Lincoln Avenue near the ballpark. These vistas are still important to Borough residents.

Newtown Township[20]

Seven properties within the Newtown Creek Watershed in Newtown Township have been individually listed or determined eligible for listing on the NR. These properties are shown on maps included in Appendix C and include:

- Newtown Creek Bridge – NR Listed
- Newtown Presbyterian Church – NR Listed
- Peter Taylor Farmstead – NR Listed
- Twining Farm – NR Listed
- Sycamore Street Extension of the Newtown Historic District – NR Listed
- Cary Tomlinson House - Eligible
- Elizabeth Hopkins House - Eligible

[20] Information excerpted from the Newtown Township Open Space Plan Update

Newtown Township Scenic Resources [21]

Scenic roads in Newtown Township are segments of roadway that contain natural, historic, or cultural resources in proximity to or contain an area of concentrated scenic vistas. The following are the scenic roads/vistas in the Township within the Newtown Creek Watershed as identified in the township's open space plan:

• Washington Crossing Road from Newtown Bypass to Linton Hill Road.
• Stoopville Road from Washington Crossing Road to Eagle Road.
• Linton Hill Road from Stoopville Road to Merion Place.
• Wrights Road from Durham (Rt. 413) to Linton Hill Road.
• Southwest side of Durham Road from the township boundary with Wrightstown Township to Chatham Place.

Middletown Township

The portion of the Newtown Creek Watershed within Middletown Township contains the following historic resources determined eligible for listing on the NR:

- George School Barn
- George School Cottage House
- Worth Farm (Sharon House)
- Werner House

Wrightstown Township

The portion of the Newtown Creek watershed within Wrightstown Township does not contain any historic sites listed or eligible for listing on the NR.

Analysis

The archeological and historic resources of this watershed help define the area's character and provide a great source of pride and tradition for the community. From early Indian settlements to colonial homesteads, these properties and lands are valuable for the information they provide now, and will continue to provide to future generations. It is therefore important to continue to preserve and protect these resources utilizing the tools available to us, including Federal and State programs and through stewardship provided by residents who volunteer on historic commissions, boards, and friends groups.

As noted earlier, Newtown Township and Newtown Borough have formed a joint historical commission and both communities have ordinances in place to preserve or protect historic resources. The Joint Historic Commission's primary responsibility is the protection and preservation of historically and/or architecturally significant structures in Newtown Township and Newtown Borough.

All four of the watershed municipalities currently have ordinances in place to protect historic resources.

[21] Excerpted from the Newtown Open Space Plan Update

XI. Stream Visual Assessment: Summary of Restoration Priorities

In February of 2006, the Delaware Riverkeeper Network (DRKN) completed a comprehensive study focusing on Watershed Assessment and Restoration in the Newtown Creek Watershed. This study was to help pinpoint problems in the watershed and provide viable solutions to those problems discovered. The data was collected from trained volunteers and professionals. The data is extensive covering the broad topics of Stream Channel Assessment and Water Quality Assessment. The summary below describes the key findings and solutions presented in the study.

General Assessment

Watershed impacts observed included moderate streambank erosion along much of the stream corridor, and the presence of exotic, invasive species throughout the riparian corridor.

Habitat Quality

- Riparian conditions were continuously the most impacted habitat component along Newtown Creek. Additional habitat concerns include a general lack of pool variability and in-stream cover (mostly in the reaches within Newtown and downstream).
- The abundance of forested riparian corridor is an asset to the creek and the terrestrial and aquatic life utilizing it. The abundance of vegetation protection appears to reduce some of the erosion impacts normally associated with increased stormwater inputs.
- While a relatively intact plant community is found through much of the upper watershed, much of it is being degraded through invasive species
- The riparian area just downstream of Rt. 532 appears to have potential for being a healthy forested wetland community and is dominated by sugar maple (*Acer saccharum*), tulip poplar (*Liriodendron tulipfera),* green ash (*Fraxinus pennsylvanica*), and American elm *(Ulmus americana)*. However, the area was also degraded by many of the same invasive species noted upstream.

Stream Stability – Above Newtown Borough

Given the amount of recent development in the upper watershed, stream stability appears only moderately affected. Most areas above Rt. 532 showed only minor bank erosion. Some bank erosion is evident on most streams as a result of natural stream migration.

One of the most unstable areas noted in the survey is located just downstream of South State Street. While the upstream reaches of this development appear to be stable, this lower portion displays signs of instability including moderate bank erosion, poor vegetation protection, fairly steep banks, leaning trees, and an altered stream channel.

Stream Stability – Below Newtown Borough

Once in Newtown Borough the stream appears to be moderately stable until the mowed area

located behind the Newtown Shoppes. This area lacks adequate riparian vegetation for the stream. In addition, its banks have been armored with a stone walls (along both left and right banks), resulting in steep bank angles and an altered channel.

The portion of Newtown Creek flowing through Carl Sedia Park appears to be impacted by stormwater runoff. Bank erosion and a lack of bank vegetation on the outsides of meander bends were noted. Adding to this area's overall instability is the large colony of Japanese knotweed located along the left bank.

Recommendations

Riparian Protection Measures: To maintain this quality of riparian corridors for years to come, protection measures such as riparian ordinances, conservation easements, tax benefits, and similar efforts should be considered by municipalities to encourage preservation of these areas. Widespread management of invasive species is recommended either through municipal weed ordinances or management programs. Where possible (municipal owned lands, right-of-ways), municipalities should manage invasive species.

Many small properties have cleared understory vegetation for views of the stream (such as the location behind the Newtown Shoppes) and have degraded stream and riparian habitats as a result. To maintain and enhance the contiguousness of the creek's riparian forests, areas lacking adequate vegetation should be restored to a more naturalized state.

Stream Stability Recommendations

Stormwater Management and Enhancements: Where feasible, existing infrastructure should be retrofitted to reduce or detain stormwater volumes entering the creek. Municipalities within the watershed should also encourage innovative stormwater BMPs such as filtration wetlands and other techniques.

Re-establish Bank Vegetation: Some streambanks along Newtown Creek are sparsely vegetated due to erosion. Re-vegetation of these areas through bioengineering techniques or streambank plantings can provide a low-cost method of preventing continued erosion.

Stream Restoration along Newtown Creek in Newtown Borough: The lower section of Newtown Creek is degraded due to the culmination of problems found throughout its watershed. While the creek appears to have adjusted to many of these impacts, there is still general degradation along the stream channel. By utilizing Natural Channel Design and other stream restoration techniques, Newtown Creek can be restored to a more "natural" and stable channel, while enhancing aquatic habitat and recreation.

Planning and Municipal Level Activities

1. Develop Riparian Protection Measures: Tax incentives, protection ordinances, deed transfer and conservation easements should be considered to maintain the large amount of forested riparian areas along Newtown Creek.

2. Encourage Stormwater Management BMPs: In review of planned stormwater measures associated with future construction, promote the use of innovative stormwater practices that encourage infiltration and pollution filtration through naturalistic measures.
3. Develop Municipal Invasive Weed Ordinances: Implementing municipal codes that require property owners to prevent the spread of invasive species to other properties throughout the watershed.
4. Review Future Bridge and Culvert Proposals: As noted in this report, many stream crossings (bridges/culverts) along Newtown Creek have had adverse effects including creating barriers to fish passage and creating stream instability. Municipalities should review applications for future bridge and culvert projects and ensure proper construction to prevent fish passage impacts or channel erosion.

On-the-Ground Projects

1. Carl Sedia Park Riparian Restoration: This park has a stream and riparian corridor that has been degraded through years of invasive species colonization. A restoration project composed of invasive species control, bank stabilization, and riparian plantings will aid in restoring this degraded section of Newtown Creek.
2. Carl Sedia Park Stormwater Enhancement: The large stormwater basin located in the park appears to be currently managed as turf grasses. Naturalizing this basin with native wetland vegetation will help filter pollutants and provide wetland habitat.
3. Restoration of Riparian Forest located downstream of Rt. 532: This riparian forest (located on what appears to be Verizon property) contains many small wetlands and unique plant species. To protect and restore what is currently on-site, a combination of invasive species control and deer population control is recommended

XII. Management Options and Action Plan

The main purpose of the Newtown Creek Watershed Plan is to set forth a guidance document to direct implementation projects in a coordinated manner to preserve and enhance the resources of the watershed. Many projects may involve resources well beyond the capability of local watershed organizations or municipalities to undertake on their own, thus the plan will identify lead organizations as well as potential partners who may be able to provide needed financial and technical assistance to help accomplish the projects.

Potential Implementation Partners

Bucks County Conservation District (BCCD)
http://www.bucksccd.org/

Bucks County Department of Parks and Recreation (BCDPR)
http://www.buckscounty.org/departments/parks-recreation/

Bucks County Planning Commission (BCPC)
www.buckscounty.org/departments/planning/index.html

Delaware Riverkeeper Network (DRKN)
www.delawareriverkeeper.org

Delaware Valley Regional Planning Commission – (DVRPC)
www.dvrpc.org

Heritage Conservancy and other Land Trust Organizations
www.heritageconservancy.org or www.conserveland.org

Pennsylvania Department of Conservation and Natural Resources (DCNR)
www.dcnr.state.pa.us/grants

Pennsylvania Department of Environmental Protection (PA DEP)
www.dep.state.pa.us

Regional Implementation

Once the river conservation plan is approved, the municipalities and other partners will be responsible for prioritizing and implementing projects.

One of the final requirements of the planning process is to have municipalities endorse the plan and commit to implementing the recommendations. The last official responsibility of the steering committee is to see that the plan is presented to their municipal governing bodies and request endorsement of the plan and its recommendations.

In order to continue the work of the plan and improve inter-municipal communication, it is proposed that local business and environmental groups such as the NCC continue to meet on a formal basis to discuss implementation strategies, watershed issues and guide regional projects recommended in the plan. Strong cooperation and communication is needed among municipalities within the Newtown Creek watershed as well as within adjacent municipalities to raise awareness of projects affecting adjoining communities and to share information regarding upcoming funding opportunities.

Priority Recommendations by Creek Zone

The following recommended actions were presented at the April 09, 2011 public meeting sponsored by the Newtown Creek Coalition. Attendees were asked to "vote" for actions which they felt should be the highest priority for each of the creek zones. For each zone, the recommendations with highest number of "votes" were tabulated. A summary of the highest ranked recommendations was then determined based on individual scores. The highest per zone and the highest ranked regardless of zone are summarized below.

HEADWATERS ZONE - Headwaters to Newtown Dam

- Maintain and improve (Retrofit) existing stormwater infrastructure to improve water quality.
- Educate residents, homeowners associations, and municipal parks and recreation staff, on sustainable landscaping practices.
- Restore streambanks with identified erosion and degradation issues.
- Protect existing greenways and create new greenways where consistent with County and regional greenway plans.

ZONE 1 – Dam to Frost Lane

- Consider protection measures such as riparian ordinances, conservation easements, tax benefits, and similar efforts to encourage preservation of these areas.
- Maintain healthy riparian vegetation along the creek.
- Educate streamside landowners as to sustainable management of riparian corridors.

ZONE 2 – Frost Lane to Greene Street

- Create demonstration project at the foot of Greene Street, adjacent to the Common lot, to remove concrete debris and restore a natural riparian streambank.
- Plant native species around the engineered bank stabilization project near Sycamore Street to the south of Jefferson Street to mitigate the visual and natural impacts of the intervention.
- Reconstruct pedestrian bridge at Greene Street using the footings of the historic bridge and using the public right-of-way that exists as a continuation of the Greene Street alignment between the Creek and Sycamore Street.

ZONE 3 – Greene Street to Penn Street

- Add pedestrian bridges at strategic points to facilitate pedestrian traffic between State Street and Sycamore Street and Newtown Township trail system.
- Clean, paint and restore the metal, stonework and walkways on both the Centre and Washington Avenue bridges.
- Promote walkway along creek.
- Re-work municipal parking lot to enhance stream buffer areas and to help mitigate stormwater runoff.
- Subtle lighting of the Centre Avenue Bridge to highlight the creek and foster safer pedestrian access.

ZONE 4 – Penn Street to Barclay Court

- Work with the potential developer of Stockburger property to include public spaces, a creekside trail, and innovative stormwater management measures.
- Protect Delta School property as open space.
- Continue creek walk from the Stockburger property through the Delta School property to connect to Zone 5.

ZONE 5 – Barclay Court to Newtown Bypass

- Develop creek trail connections between the Delta School Property and the George School property towards the Neshaminy Creek.
- Manage invasive species like Japanese knotweed that has a shallow invasive root system that allows bank erosion and is dispersed downstream during flood events.

CONFLUENCE ZONE – Newtown Bypass to Creek's Confluence with Main Stem Neshaminy Creek

- Restore buffers and stream bank vegetation and protect existing systems. Assist and encourage private landowners to restore riparian buffers on their property.
- Work with George School to enhance undeveloped land as protected open space.
- Educate residents, municipal parks and recreation staff, homeowners associations and businesses on sustainable landscaping practices to minimize impacts to stream.

ALL ZONES

- Restore and/or manage riparian areas and larger watershed area to control erosion and improve water quality and reduce stormwater runoff.
- Improve visual & physical access to creek at crossings and strategically defined public zones.
- Foster a sense of community and connection to the creek.

Highest Ranked Recommendations Regardless of Zone

- Add pedestrian bridges at strategic points to facilitate pedestrian traffic between State Street and Sycamore Street and Newtown Township trail system – Zone 3.
- Develop creek trail connections between the Delta School Property and the George School property towards the Neshaminy Creek – Zone 5.
- Consider protection measures such as riparian ordinances, conservation easements, tax benefits, and similar efforts to encourage preservation of these areas – Zone 1.
- Work with the potential developer of Stockburger property to include public spaces, a creekside trail, and innovative stormwater management measures – Zone 4.
- Protect Delta School property as open space – Zone 4.
- Manage invasive species like Japanese knotweed that has a shallow invasive root system that allows bank erosion and is dispersed downstream during flood events – Zone 5.

Management Options Matrix

On the following pages, the goals, objectives and recommended actions have been expanded to identify general tasks, primary partners, supporting partners and projected implementation timing. Implementation timing has been generally determined based on the complexity and funding requirements of the recommended actions. As with any planning effort, the actual timing of a proposed action can be affected by other variables such as state or national economic policies, political will and unrelated projects requiring limited municipal resources.

Table 15 - Newtown Creek Watershed Plan Management Options Matrix

Objectives	Conservation Actions	Primary Partners	Supporting Partners	Projected Time Frame
1. Water Quality				
Goal: Protect and improve the surface and ground water quality in the Newtown Creek Watershed				
Improve In-Stream Habitat	• Increase streamside vegetation to increase canopy cover and moderate stream temperature. • Promote sustainable land use practices to reduce impervious cover and increase infiltration of stormwater • Improve protection of headwaters • Reduce nutrient and sediment loadings to watershed	Municipalities, DEP, DCNR, BCCD,	PAF&BC	2-5 years
Protect Existing Riparian Areas and improve those lacking sufficient riparian corridors as identified in the Newtown Creek Stream Assessment.	• Increase riparian buffer protection in areas lacking sufficient vegetative buffers (50% canopy cover and 50 foot width forest buffer) • Develop and distribute educational materials to all landowners related to the proper care and management of streamside properties. • Purchase land or conservation easements in riparian zones to limit development and restrict uses. • Consider protection measures such as riparian ordinances, conservation easements, tax benefits, and similar efforts to encourage preservation of stream corridor between the dam and Frost Lane.	Municipalities, DCNR, DEP, BCCD,	HC, BCPC,	2-5 years
Improve Water Quality of Hidden Lake Reservoir	• Monitor water quality of lake to assess current conditions • Control fertilizers and sediments draining to Hidden Lake Reservoir (This is primarily an educational effort aimed at property owners on proper use of fertilizer and other land practices that can contribute excess nutrients and sediments to lakes or streams.)	BCDPR, BCCD, Newtown & Wrightstown Townships	BCPC, DCNR, DEP	2-5 years
Support water quality recommendations of the Newtown Creek Stream Assessment	• Restore areas lacking adequate vegetation to a more naturalized state. • Manage invasive species either through municipal weed ordinances or management programs. • Re-establish bank vegetation along streambanks that are sparsely vegetated due to erosion. • Utilize Natural Channel Design and other stream restoration techniques to restore degraded sections of Newtown Creek in Newtown Borough to a more "natural" and stable channel, while enhancing aquatic habitat and	DRKN, HC, BCCD,	DEP, BCPC, Municipalities, NCC	Ongoing

Table 15 - Newtown Creek Watershed Plan Management Options Matrix

Objectives	Conservation Actions	Primary Partners	Supporting Partners	Projected Time Frame
	recreation. • Retrofit existing stormwater management infrastructure to reduce or detain stormwater volumes entering the creek.. Encourage innovative stormwater BMPs such as filtration wetlands and other techniques. • Consider riparian protection measures such as tax incentives, protection ordinances, deed transfer and conservation easements to maintain the large amount of forested riparian areas along Newtown Creek			
Increase water quality monitoring in Newtown Creek	• Train, recruit and educate volunteer water quality monitors. • Develop annual monitoring program to evaluate impairment status	DRKN, NCC, local school districts	BCCD, Municipal EACs, DEP	1-2 years
Encourage programs to increase vegetative cover throughout watershed.	• Develop and implement residential, municipal and public education programs that address the benefits of naturalized land for water management and air quality • Educate and encourage property-owners to convert turf or mown grass to meadow or gardens. • Increase the number of street trees in developed areas of the watershed • Increase forested riparian buffers adjacent to in sections identified as having inadequate buffers.	BCCD, HC, Municipalities, EAC, STC	DCNR, DEP,	1-2 years
2. Stormwater *Goal: Improve the way stormwater is managed in the watershed to reduce flooding, protect stream base flow, protect stream quality, and maintain the hydrologic balance.*				
Reduce stormwater runoff volumes	• Restore and/or manage riparian areas and larger watershed area to control erosion and improve water quality and reduce stormwater runoff • Re-work municipal parking lot to enhance stream buffer areas and to help mitigate stormwater runoff \ • Provide incentives for developers to utilize pervious paving, bio-retention islands, green roofs and other low impact development technologies in new and redeveloped sites.	Municipalities, HC, BCPC, BCCD	DEP	1-2 years

Table 15 - Newtown Creek Watershed Plan Management Options Matrix

Objectives	Conservation Actions	Primary Partners	Supporting Partners	Projected Time Frame
	• Incorporate recommendations from the Old Skunky engineering study into plans and processes for cleanup and maintenance of Old Skunky. • Re-work municipal parking lot to enhance stream buffer areas and to help mitigate stormwater runoff between Greene Street and Penn Street.			
Improve water quality of stormwater	• Perform stormwater basin assessments to determine candidate sites for retrofits or naturalization • Retrofit and/or naturalize detention basins where possible to promote infiltration and improvements in water quality • Encourage the use of stormwater BMPs in all types of development as recommended in the Pennsylvania Stormwater BMP Manual. • Adopt and enforce stormwater quality standards and criteria of the updated Neshaminy Creek Act 167 Stormwater Management Plan.	Municipalities, EAC, BCPC, BCCD, Homeowners Associations	DEP, HC, Consultants, DVRPC, Universities	2-5 years
Determine procedures for removal of debris and obstructions in the stream	• Review applications for future bridge and culvert projects and ensure proper construction to prevent fish passage impacts or channel erosion.	DEP, Penn DOT, Municipalities, PA F&BC	BCCD	1-2 years
3. Cultural Resource Identification and Protection *Goal: Protect Cultural Resources of the Watershed.*				
Identify and protect archaeological and historic resources of the watershed.	• Protect and maintain historic & archaeological resources identified via municipal open space and comprehensive plans. • Support efforts of the Newtown Joint Historic Commission to preserve and enhance historic resources • Promote adaptive re-use of historic buildings.	NJHC, HARB, NCC, Municipalities, HC	BCPC, DCED, PHMC	1-2 years
Preserve significant scenic views and view sheds	• Maintain scenic views identified in municipal open space plans.	Municipalities	BCPC	1-2 years
Link important cultural and natural resources	• Develop trails, bike paths and greenways linking important natural and historic resources consistent with proposed municipal and county greenway plans.	Municipalities, BCPC, HC	DCNR, DVRPC	2-5 years

Table 15 - Newtown Creek Watershed Plan Management Options Matrix

Objectives	Conservation Actions	Primary Partners	Supporting Partners	Projected Time Frame
4. Natural Resource Identification and Protection				
Goal: Protect the Natural Resources of the Watershed				
Conserve sensitive natural resources of the watershed.	• Review and strengthen natural resource protection ordinances for wetlands, floodplain, groundwater recharge areas, woodlands, ponds, lakes, and hydric soils. • Protect most sensitive areas through acquisition or conservation easement consistent with recommendations of municipal open space plans.	Municipalities, HC, BCPC, EACs	DCNR	2-5 years
Implement riparian and streambank restoration where effective	• Restore streambanks and riparian buffers along priority reaches in the watershed as identified in Newtown Creek Watershed Assessment. • Continue to monitor and assess streambank conditions for additional riparian and restoration sites.	BCCD, BCDPR, HC, Municipalities	DRKN, DEP, DCNR	Ongoing
Support sustainable land management practices on community open spaces	• Promote invasive plant control, reduced mowing schedules, and other environmentally sound management practices for public and private held open spaces and common areas. • Promote use of vegetated buffers around BMPs and ponds to discourage use by Canada Geese.	BCCD, BCDPR, NRCS, DCNR	Homeowners' Associations	Ongoing
5. Economic Opportunities				
Goal: Enhance economic opportunities for the businesses located adjacent to the Newtown Creek.				
Improve pedestrian access and safety across and to the Newtown Creek.	• Add pedestrian bridges at strategic points to facilitate pedestrian traffic between State Street and Sycamore Street and Newtown Township trail system • Reconstruct pedestrian bridge at Greene Street using the footings of the historic bridge and using the public right-of-way that exists as a continuation of the Greene Street alignment between the Creek and Sycamore Street • Clean, paint and restore the metal, stonework and walkways on both the Centre and Washington Avenue bridges. • Subtle lighting of the Centre Avenue Bridge to highlight the creek and foster safer pedestrian access.	NCC, business community,	DCED, DVRPC	2-5 years

Table 15 - Newtown Creek Watershed Plan Management Options Matrix

Objectives	Conservation Actions	Primary Partners	Supporting Partners	Projected Time Frame
6. Recreational, Park and Open Space Resources				
Goal: Maintain and enhance recreational opportunities and the parks and open space resources of the watershed.				
Improve connectiveness and management of open spaces throughout the watershed	• Protect existing greenways and create new greenways where consistent with County greenway plan. • Link greenways throughout the watershed. • Develop trails, bike paths and greenways linking important natural and historic resources. • Encourage multi-municipal trail linkages among existing park systems.	Municipalities, BCPC, , Land Trusts,	DCNR, DVRPC	2-5 years
Implement Recommendations of Municipal Open Space Plans	• Implement protection of priority properties recommended in the municipal open space plans. • Specify and implement stewardship plans on existing community open space areas.	Municipalities, BCPC, BCDPR	DCNR, HC	2-5 years
Enhance municipal passive and active recreation facilities	• Maintain and improve playground and recreational facilities. • Improve walking and bike paths and trail networks throughout the watershed and park systems.	BCDPR, BCPC	DVRPC, DCNR	2-5 years
Improve access points to the creek for recreation.	• Develop creek trail connections between the Delta School Property and the George School property towards the Neshaminy Creek.	Municipalities, BCDPR	DCNR	1-2 years
Promote sustainable land management practices on community open spaces	• Specify and implement stewardship plans for public open spaces and all park land. • Utilize existing grant programs such as Tree Vitalize to purchase trees and shrubs for re-vegetating or naturalizing open spaces. • Promote environmentally sound management practices for community held open spaces and common areas.	BCDPR, BCCD, NRCS, PSCE, DCNR	HC, BCPC, DCNR, Homeowners' Associations	2-5 years
7. Watershed Resources Education & Outreach				
Goal: Educate Public about Watershed Issues				
Promote and enhance the	• Educate residents, homeowners associations, and municipal parks and	Municipalities,	BCCD, BCPC,	1-2 years

Table 15 - Newtown Creek Watershed Plan Management Options Matrix

Objectives	Conservation Actions	Primary Partners	Supporting Partners	Projected Time Frame
understanding of the cultural, economic and natural resources of the watershed among residents, business owners, and institutions	recreation staff, on sustainable landscaping practices • Promote hands-on environmental education to residents and businesses via programs such as tree planting, stream clean-ups, and stream visual assessments. • Post educational signage at stream crossings, naturalized areas, public open spaces and historical sites.	Homeowners Associations, EAC, NCC	DCNR, DEP	
Promote and enhance the understanding of the cultural, economic and natural resources of the watershed to municipal officials.	• Educate municipal officials, staff, boards and commissions on the link between land use practices and natural resource protection. • Distribute resource materials to municipalities regarding the benefits of using native vegetation in landscaping and residential gardens.	DEP, DCNR, NCC, municipalities, HC	BCPC, BCCD,	1-2 years
Promote and enhance the understanding of the cultural, economic and natural resources of the watershed among elementary and secondary school students.	• Promote service learning programs at elementary and secondary schools to teach student about basic stream ecology. • Provide access to the creek for school groups. • Work with school districts to coordinate, in partnership with non-profit organizations, curricula on the creek's resources.	BCDPR, NCC, School Districts	DRKN, HC, DEP	1-2 years
8. Sustainable Economic Development *Goal: Encourage sustainable economic development practices.*				
Promote conservation design principals and sustainable land use practices in new development or redevelopment within watershed communities.	• Update municipal zoning and subdivision ordinances to encourage the use of conservation design and low impact development techniques to reduce impervious surfaces. • Encourage the use of Stormwater BMPs as recommended in PA Stormwater Best Management Practices Manual, Olde Skunky Stream Study and Neshaminy Creek Stormwater Management Plan. • Encourage adaptive re-use of existing underutilized buildings or properties where feasible • Promote use of rain-gardens, rain barrels and green roofs in developed portions of the watershed • Work with the potential developer of Stockburger property to include public spaces, a creekside trail, and innovative stormwater management measures • Plant and maintain street trees, improve and maintain public green spaces.	Municipalities, BCCD, BCPC , EAC, STC	DEP, DCED	Ongoing

Table 15 - Newtown Creek Watershed Plan Management Options Matrix

Objectives	Conservation Actions	Primary Partners	Supporting Partners	Projected Time Frame
	• Encourage property owners to participate in landscape improvement projects.			
9. Plan Implementation				
Goal: Improve Implementation Resources				
Utilize NCC to facilitate plan implementation projects watershed awareness and fundraising.	• Promote public support for conservation funding. • Sponsor public information sessions on municipal funding initiatives for open space and watershed initiatives. • Build the capacity (volunteers, staff, resources, etc.) to implement the river conservation plan. • One year after the adoption and approval of the conservation plan, hold a meeting of the steering committee and other interested parties to evaluate progress on the implementation projects. After five years, meet to evaluate progress on the priority projects and activities and conduct update if warranted.	Steering Committee Members, NCC	HC, BCPC	1-2 years

Abbreviations: ACE – Army Corps of Engineers, BC – Bucks County, BCAS – Bucks County Audubon Society, BCCD – Bucks County Conservation District, BCDPR – Bucks County Dept. of Parks and Recreation, BCPC – Bucks County Planning Commission, BCHD – Bucks County Health Department, BHWP – Bowman's Hill Wildflower Preserve, DCED – Pennsylvania Department of Community and Economic Development, DEP – Pennsylvania Department of Environmental Protection, DCNR- Pennsylvania Department of Conservation and Natural Resources, DRBC – Delaware River Basin Commission, DRKN – Delaware River Keeper Network, DVRPC – Delaware Valley Regional Planning Commission, FEMA-Federal Emergency Management Agency, HC - Heritage Conservancy, Heritage Services, NPS – National Park Service, NRCS – Natural Resources Conservation Service, PAF&BC – Pennsylvania Fish and Boat Commission, PSCES – Penn State Cooperative Extension Services, PHMC – Pennsylvania Historical and Museum Commission, STC – Municipal Shade Tree Commission

XIII. Bibliography

Bucks County Planning Commission, 1986. *Bucks County Park & Recreation Plan*

Bucks County Planning Commission, October 2009. *Newtown Township Open Space Plan Update*

Bucks County Planning Commission, 2010. *Newtown Borough Comprehensive Plan Update*

Bucks County Planning Commission, August 2010. *Neshaminy Creek Watershed Stormwater Management Draft Plan.*

Bucks County Workforce Investment Board, 2009. *Bucks County Top Occupations by Industry Cluster – 4th quarter 2009*. Prepared by Central Pennsylvania Workforce Development Corporation

Delaware River Basin Commission. Water Quality Terminology http://www.state.nj.us/drbc/snapshot_terms.htm

Delaware River Basin Commission. *Ground Water Protected Areas in Southeastern PA*. October 29, 1961 Amendments include 1999.

Delaware RiverKeeper Network, March 2003. *Upper and Middle Neshaminy Creek Watershed River Conservation Plan.*

Delaware River Keeper Network, January 2006. *Newtown Creek, Newtown Township, Bucks County PA - Stream Assessment and Recommendations.*

Delaware Valley Regional Planning Commission, July 2008. *Analytical Data Report #16, Land Use in the Delaware Valley, 2005.*

Delaware Valley Regional Planning Commission. 2005. *Destination 2030 - The Year 2030 Plan for the Delaware Valley.*

Gannett Fleming Inc., 2005. *Recreation, Parks and Open Space Plan Update: Middletown Millennium Plan.* Prepared for Middletown Township Bucks County Pennsylvania.

Gilmore & Associates, April 2010. *Olde Skunky Stream Study, Draft.* Prepared for Newtown Borough, Bucks County Pennsylvania.

Heritage Conservancy, 2010. *Newtown Borough Open Space Plan Update.*

"Impacts of Development on Waterways", NEMO Program Fact Sheet #3. © 1994 The University of Connecticut. Used with permission of the University of Connecticut Cooperative Extension System.

Newtown Area Joint Municipal Comprehensive Plan Update (Draft – 2007)

Newtown Area Joint Municipal Zoning Ordinance 2006 supplemented through December, 2008.

Newtown Creek Coalition, June 2010. *Newtown Creek Bucks County Pennsylvania Planning Recommendations and Report.*

Miller, Patricia and A. Jantrania. *Managing our Watersheds, A Systems Approach to Maintaining* Water *Quality*, Small Flows Quarterly, Fall 2000.

Pennsylvania Department of Environmental Protection, 2004. *Stream Redesignation Evaluation Report, Newtown Creek Bucks County.*

Pennsylvania Historic and Museum Commission. Introduction to the National Register from website: http://www.phmc.state.pa.us/bhp/nr/overview.asp?secid=25

Pennsylvania Department of Environmental Protection, December 2003. *Total Maximum Daily Load (TMDL) Assessment of the Neshaminy Creek Watershed.*

Pennsylvania Department of Environmental Protection, May 2004. *Watershed Restoration Action Strategy (WRAS) State Water Plan Subbasin 02F Neshaminy Creek Watershed Bucks and Montgomery Counties.*

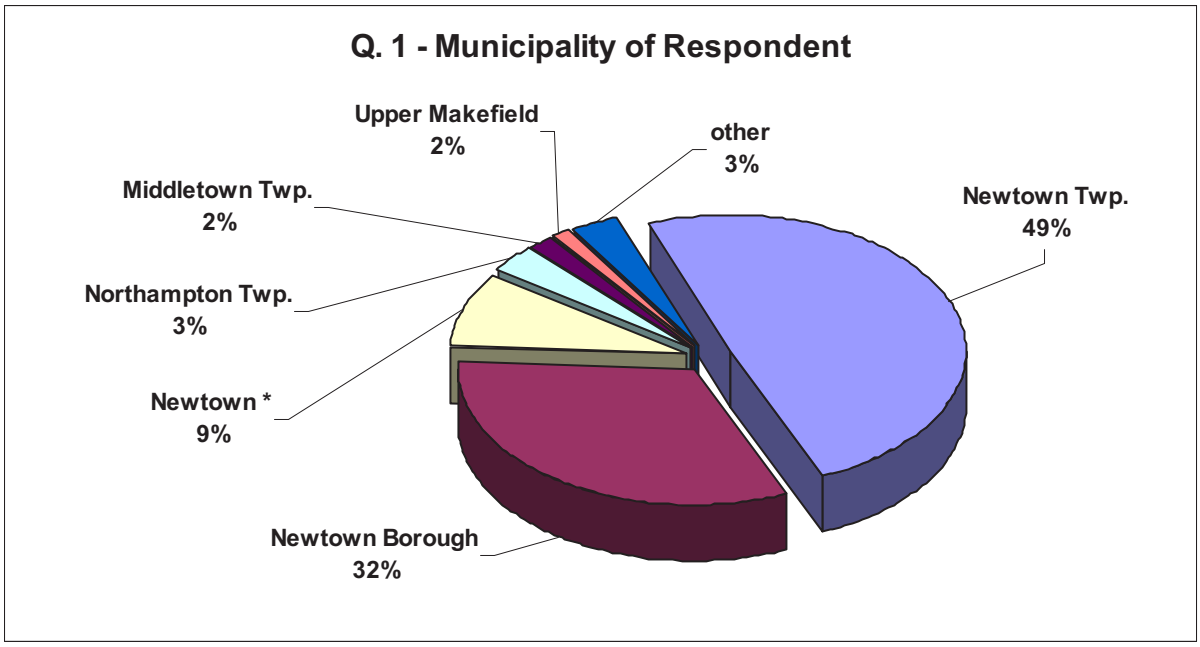
Pennsylvania Department of Environmental Protection, April 2004. *Stream Redesignation Evaluation Report Water Quality Standards Review Newtown Creek Bucks County.*

U.S. Department of the Interior, Bureau of the Census – Decennial Census Data 1990, 2000 and 2010.

Appendix A. Newtown Creek Watershed Survey Results

Newtown Creek Watershed Conservation Plan Survey		
1. Background information:		
Answer Options	Response Percent	Response Count
a) Municipality in which you live:	100.0%	125
b) Length of residency within municipality:	99.2%	124
c) Length of residency within Bucks County:	99.2%	124
answered question		125
skipped question		1

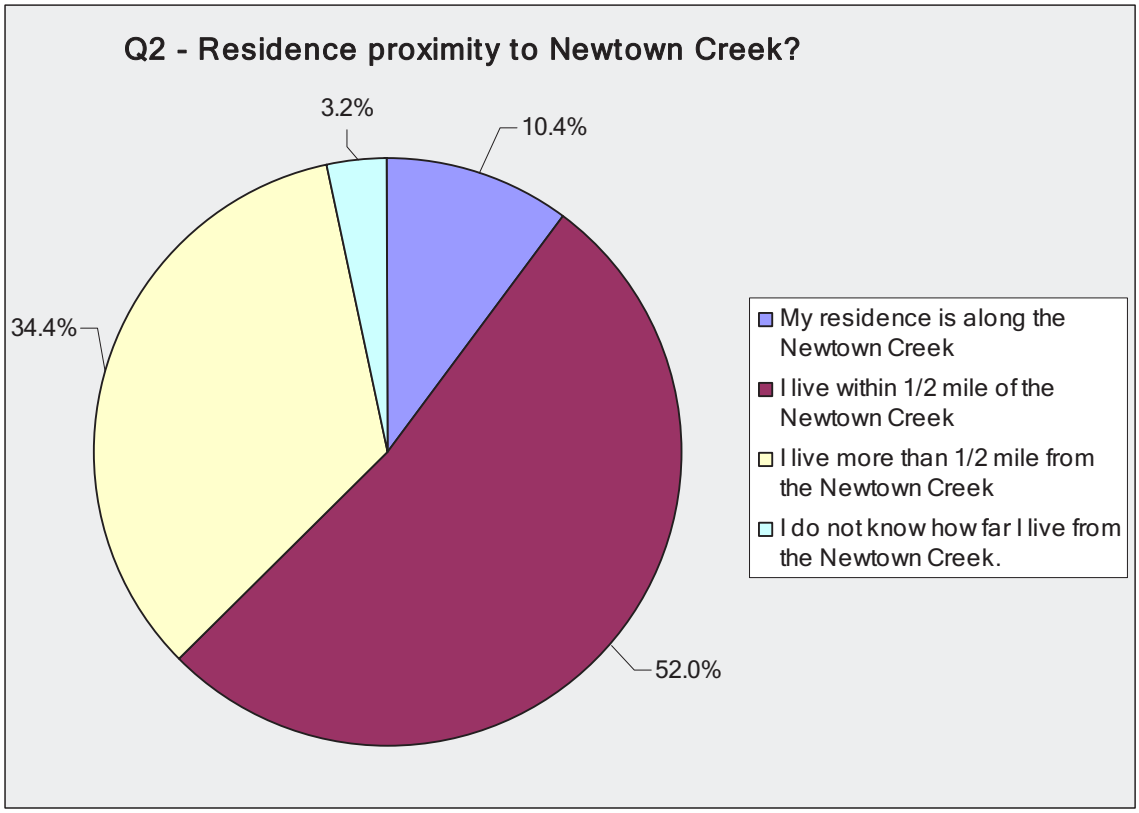
Q.1 Average Length of Residency in Municipality		
Municipality	Average Length of Residency in Muni. (years)	Avg. Length of Residency in Bucks County (years)
Northampton Township	22.8	37.3
Newtown Borough	22.7	30.0
Newtown Township	20.2	28.1
Upper Makefield Township	16.0	19.5
Others	14.8	42.5
Newtown*	10.6	17.9
Middletown Township	3.8	33.5
*Respondent did not indicate Township or Borough		



Newtown Creek Watershed Conservation Plan Survey

Q2. Residence proximity to Newtown Creek? Please check one.

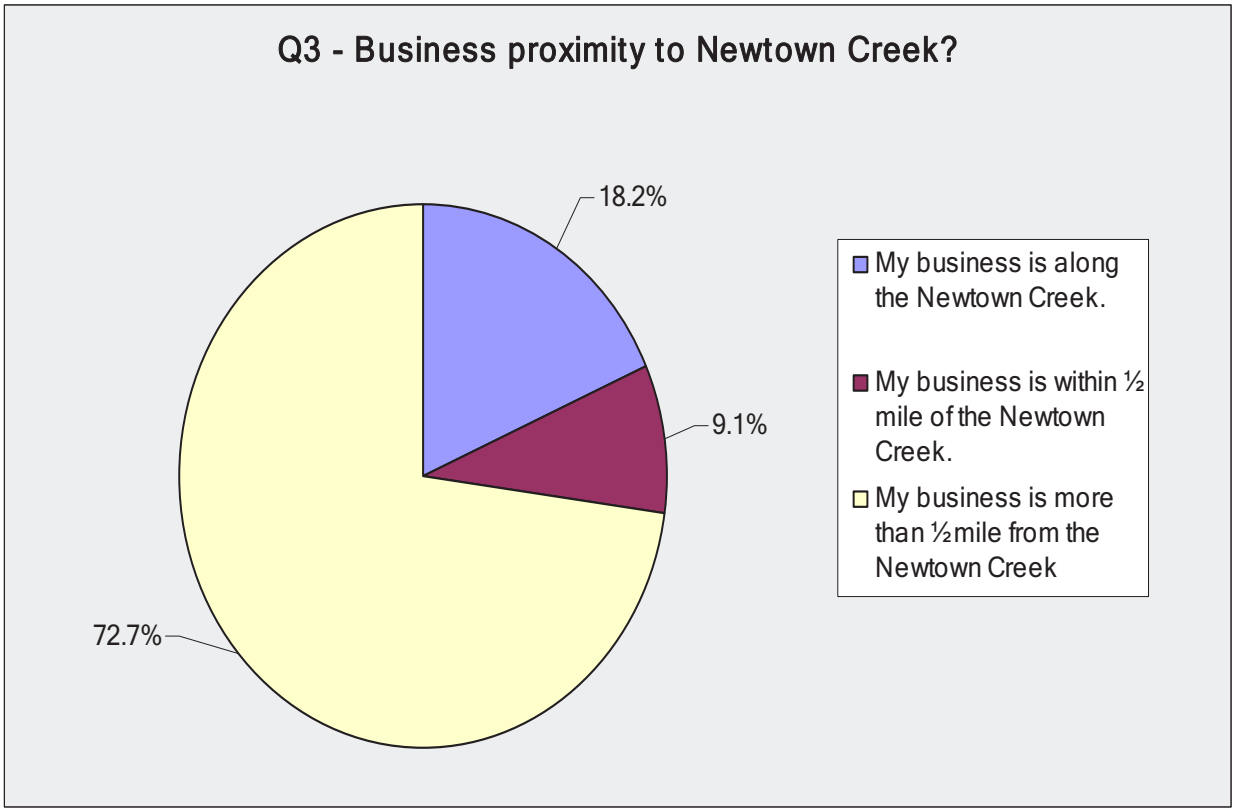
Answer Options	Response Percent	Response Count
My residence is along the Newtown Creek	10.4%	13
I live within 1/2 mile of the Newtown Creek	52.0%	65
I live more than 1/2 mile from the Newtown Creek	34.4%	43
I do not know how far I live from the Newtown Creek.	3.2%	4
answered question		125
skipped question		1



Newtown Creek Watershed Conservation Plan Survey

Q3. Business proximity to Newtown Creek? Please check one.

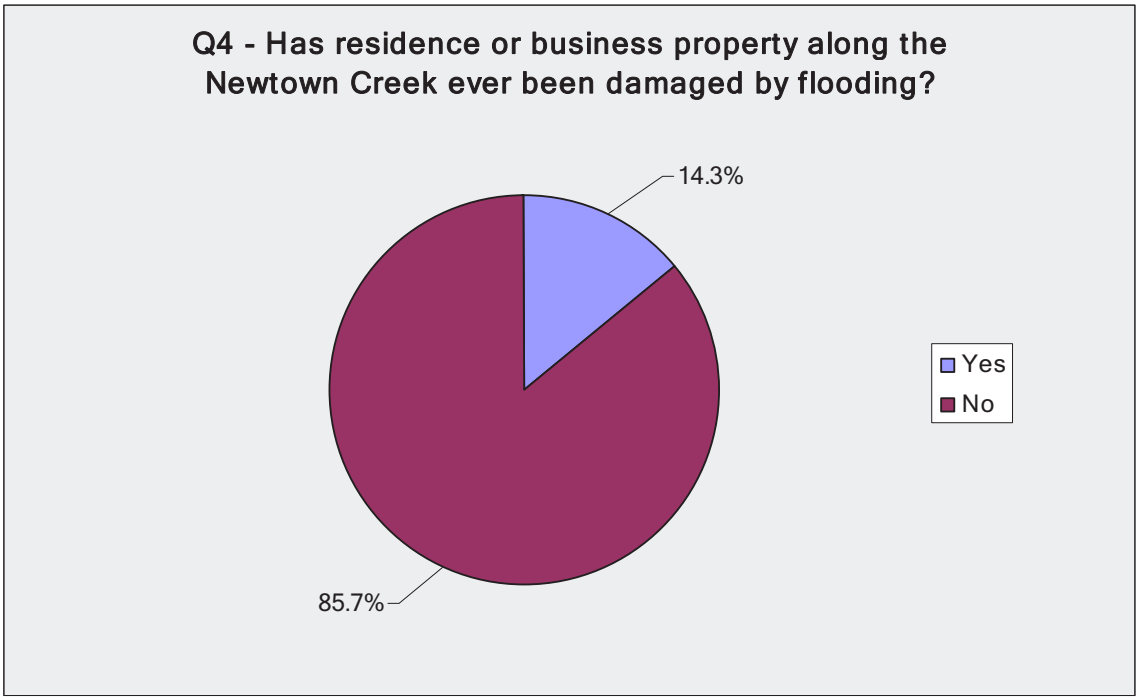
Answer Options	Response Percent	Response Count
My business is along the Newtown Creek.	18.2%	2
My business is within ½ mile of the Newtown Creek.	9.1%	1
My business is more than ½ mile from the Newtown Creek	72.7%	8
answered question		11
skipped question		6



Newtown Creek Watershed Conservation Plan Survey

Q4. If you live or own a business along the Newtown Creek, has your property ever been damaged by flooding?

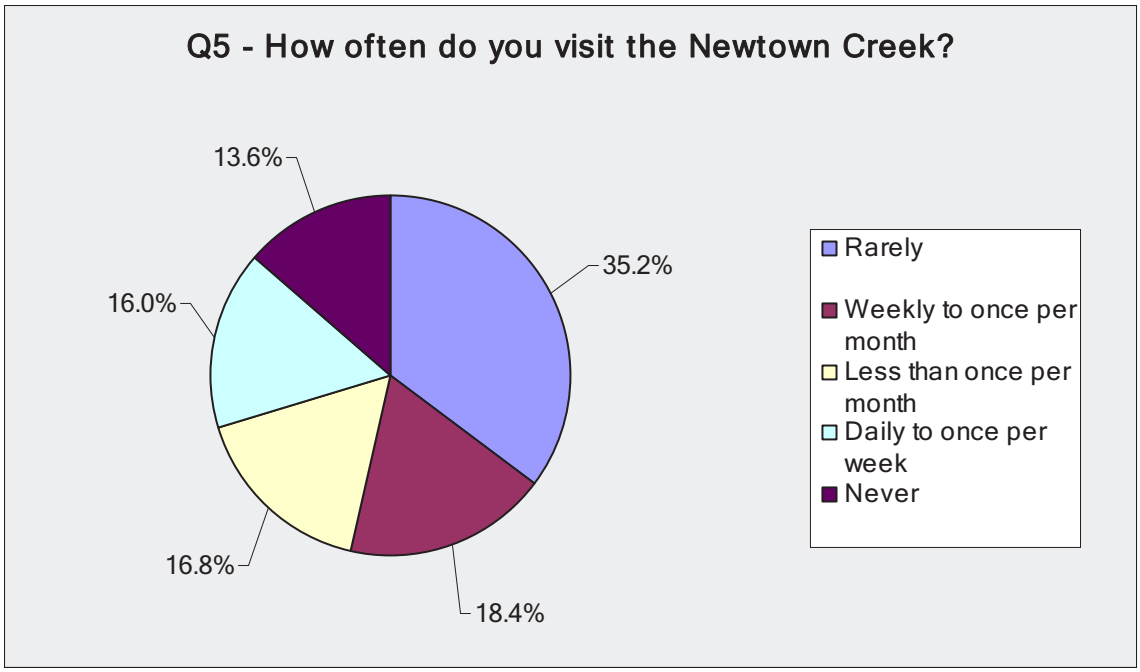
Answer Options	Response Percent	Response Count
Yes	14.3%	1
No	85.7%	6
	answered question	7
	skipped question	10



Newtown Creek Watershed Conservation Plan Survey

Q5. How often do you visit the creek?

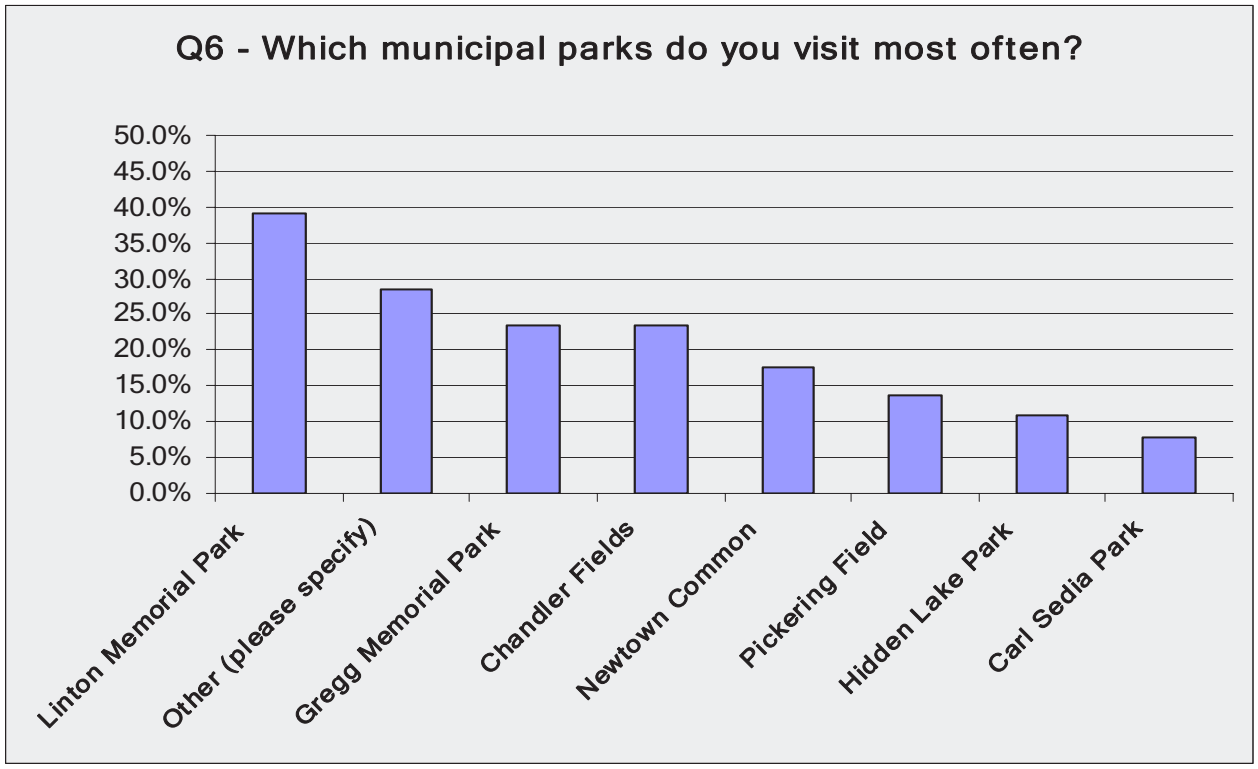
Answer Options	Response Percent	Response Count
Rarely	35.2%	44
Weekly to once per month	18.4%	23
Less than once per month	16.8%	21
Daily to once per week	16.0%	20
Never	13.6%	17
	answered question	125
	skipped question	1



Newtown Creek Watershed Conservation Plan Survey

Q6. Which municipal parks do you visit most often?

Answer Options	Response Percent	Response Count
Linton Memorial Park	39.2%	40
Other (please specify)	28.4%	29
Gregg Memorial Park	23.5%	24
Chandler Fields	23.5%	24
Newtown Common	17.6%	18
Pickering Field	13.7%	14
Hidden Lake Park	10.8%	11
Carl Sedia Park	7.8%	8
	answered question	102
	skipped question	24

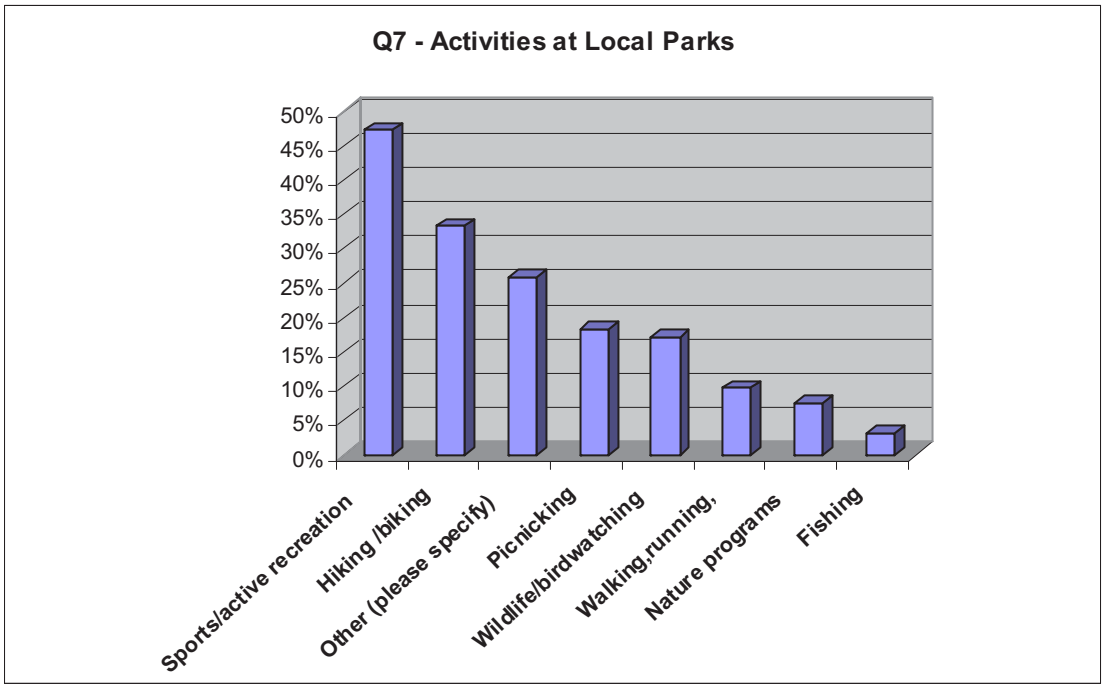


	Question 6 - Other (please specify)
1	Tyler and Core Creek but used to go to chandler and carl sedia when kids were younger
2	Helen Randall & Tyler State Park (see below)
3	SLNC, Levittown greenbelts in the 4 municipalities of Levittown.
4	Helen Randle
5	Roberts Ridge, Helen Randle Park, Clark Nature center
6	Tyler state park
7	Core Creek Park
8	Roberts
9	Tyler State Park, Core Creek Park, Lake Galena, Nockamixon State Park, Ringing Rocks
10	None. don't even know where Carl Sedia is.
11	Most of parks seem to be for sports or animals and I no longer have either so just walk by parks
12	Roberts Ridge
13	The One across from CVS
14	Walking observing
15	Hidden Lake
16	Don't visit the municipal parks on a regular basis
17	I have a yard and parks bring problems.
18	Churchville Nature Center
19	Clark Nature Center
20	Tyler
21	Helen Randle
22	None
23	The one by CVS. do not know name
24	Helen Randle
25	Roberts ridge
26	Helen Randle Park
27	We enjoy walking in the Borough but there's nothing for us to do in any of the parks.
28	Tyler, Washington Crossing
29	Roberts Ridge Park, Helen Randle Park

Newtown Creek Watershed Conservation Plan Survey

7. What activities do you participate in at these parks?

Answer Options	Response Percent	Response Count
Nature programs	7.5%	7
Sports/active recreation	47.3%	44
Fishing	3.2%	3
Hiking /biking	33.3%	31
Wildlife/birdwatching	17.2%	16
Picnicking	18.3%	17
Other (please specify)	25.8%	24
Walking, running,	9.7%	9
answered question		93
skipped question		33

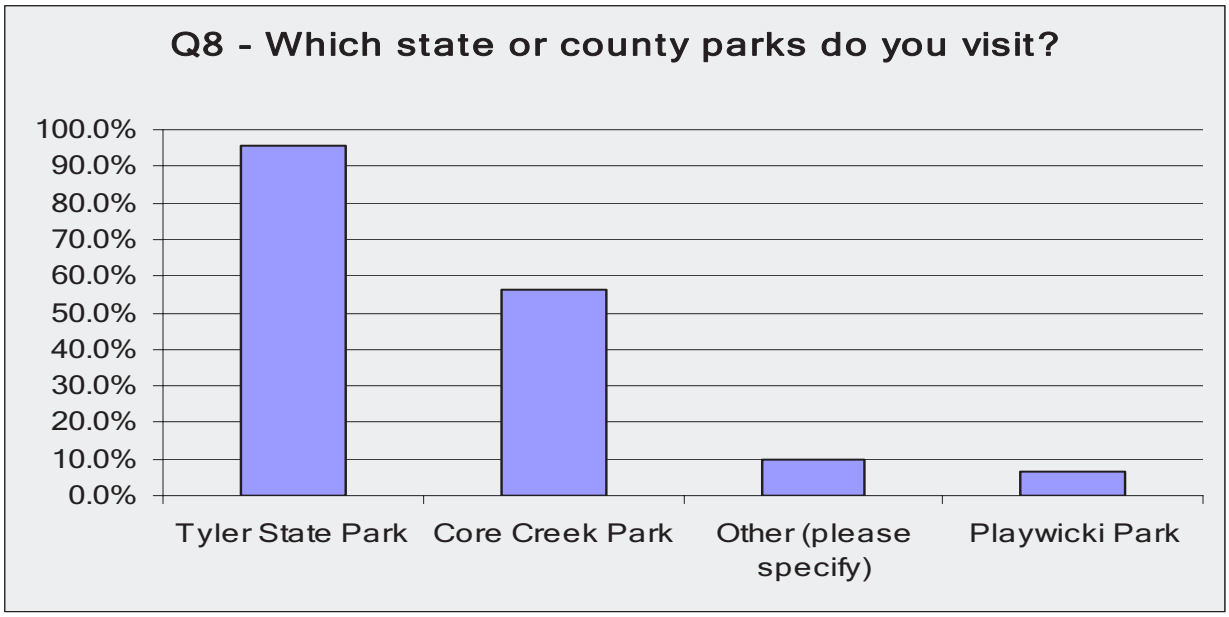


	Question 7 - Other (please specify)
1	Movies / Concerts
2	Environmental Ed classes, invasive plant removal, Native tree and plant installation, organize and run clean ups of these and other areas
3	Quiet reading
4	Flying kites
5	I take my grandchildren to play at Linton and Tyler State Park.
6	with grandchildren
7	None
8	playgrounds
9	Relax watch the birds, take a break from work.
10	Relaxing and sometimes dog walking
11	Playground
12	Community gatherings
13	invasive plant removal, tree planting & pruning, organized clean-ups/beautification
14	relaxation
15	movies
16	Specialty programs run periodically- Music in the park, etc
17	Movies in the Park at Linton Memorial Park
18	relaxing
19	None
20	Wednesday movie nights in the summer
21	Grandchildren
22	Movies in the Park is the one Park Activity we regularly enjoy. It is a wonderful community activity.
23	Children's activity
24	watching our kids play on the playgrounds

Newtown Creek Watershed Conservation Plan Survey

Q8. Which state or county parks do you visit?

Answer Options	Response Percent	Response Count
Tyler State Park	95.9%	116
Core Creek Park	56.2%	68
Other (please specify)	9.9%	12
Playwicki Park	6.6%	8
answered question		121
skipped question		5

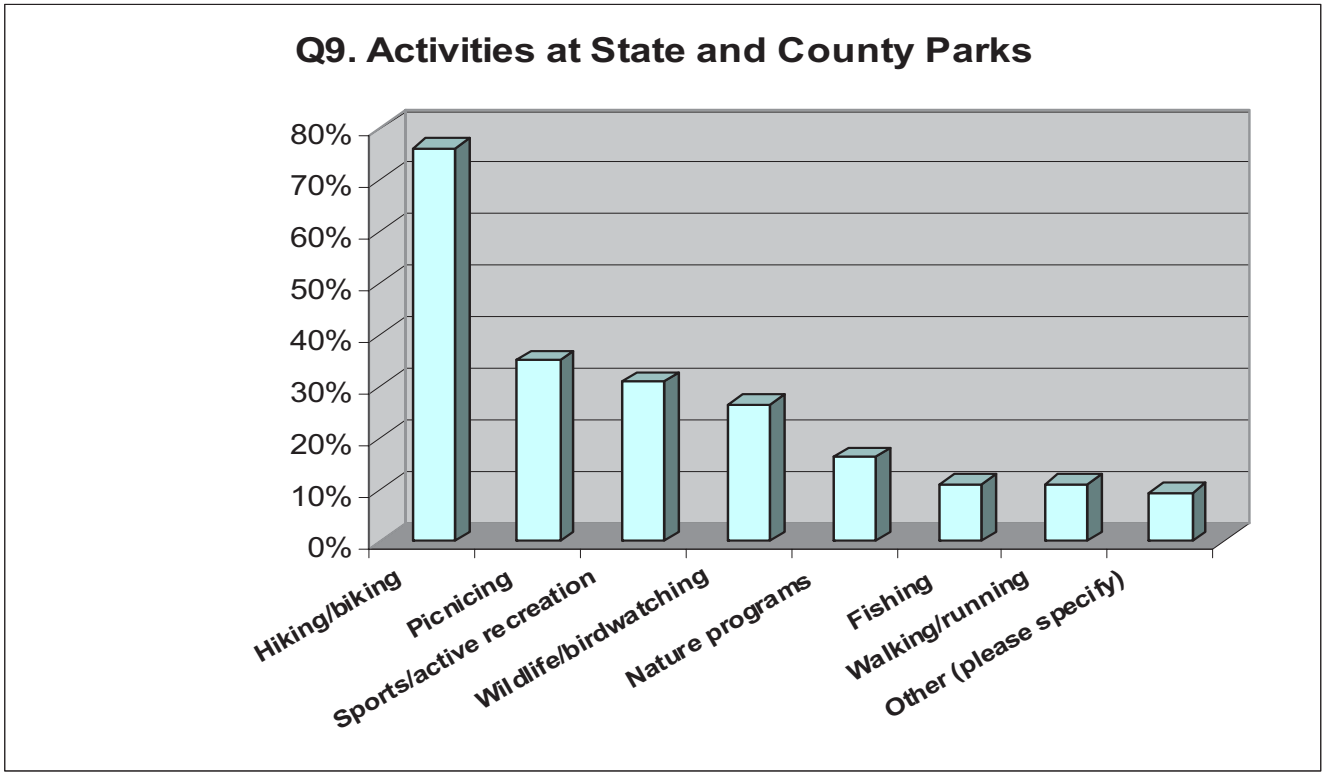


	Other (please specify)
1	Ralph Stover, Blue Rocks,
2	Neshaminy in this area, numerous others in Pa and NJ
3	Tohikon State Park
4	see above
5	Silver Lake
6	pathways along Delaware canals and river
7	Peace Valley, Nockamixon
8	Bowman's Hill Wildflower preserve
9	None
10	None
11	Churchville Nature Center, Nockamixon
12	We also walk in Peace Valley quite regularly.

Newtown Creek Watershed Conservation Plan

Q9. What activities do you participate in at the state and county parks?

Answer Options	Response Percent	Response Count
Nature programs	16.2%	19
Sports/active recreation	30.8%	36
Fishing	11.1%	13
Hiking/biking	76.1%	89
Wildlife/birdwatching	26.5%	31
Picnicking	35.0%	41
Walking/running	11.1%	13
Other (please specify)	9.4%	11
	answered question	117
	skipped question	9



	Question 9 - Other (please specify)
1	participate in planned walks and fundraisers as well as going on my own
2	Running, Walking
3	Running
4	Canoeing, camping, plant ID, geo caching, environmental cleanups
5	Canoeing
6	Quiet reading
7	Dog park
8	Kite flying
9	Swimming at Tohikon State Park with my grandchildren.
10	walking
11	Playground
12	dog walking
13	walking
14	None
15	Walking
16	walking and disc golf
17	dog park; walking
18	Walking
19	walking/biking
20	kayaking
21	None
22	Walking
23	Walking.
24	watching our kids play on the playgrounds

Note: Added walking as separate response category for charting purposes)

Newtown Creek Watershed Conservation Plan Survey

10. Please rank from 1, being the highest, to 5 being the lowest what you think are the greatest threats to the Newtown Creek.

Answer Options	1 (Highest)	2	3	4	5 (Lowest)	Response Count
Stormwater runoff	40	25	30	16	6	117
Agricultural runoff	14	20	30	22	30	116
Damage from flooding	23	30	21	26	13	113
Improper streamside land management	65	27	15	6	4	117
Loss of wildlife habitat/streamside vegetation	38	33	22	11	13	117
Other (please specify)	7	3	3	1	2	16 19
					answered question	120
					skipped question	6

Q10 - Greatest Threats to the Newtown Creek			
Top Ranked Issues	Total Indicating 1-3 Rank	Total Responses	Percent
Improper streamside land management	107	117	91.5%
Stormwater runoff	95	117	81.2%
Loss of wildlife habitat/streamside vegetation	93	117	79.5%

	Question 10 - Other - (please specify)
1	any future development
2	Overly intense development
3	Invasive plants are abundant along this creek as well as most others in Bucks County. This issue needs to be given more of a prominent placing in regards to BMP
4	Out of sight out of mind...
5	lack of access resulting in people not caring to protect from all damages listed above
6	Parking lots border the creek so the creek is essentially unavailable. Esp in Newtown.
7	Pollution
8	Toxic runoff from storm drains.
9	indifference to the existence of the creek
10	No threats perceived
11	lack of public access
12	turf grass runoff; inadequately informed homeowners; inadequately built retention/detention basins w/in housing developments; invasive plants
13	parking!!!! don't place parking along the creek
14	Politicians
15	creek walk and future development
16	People
17	Litter and garbage / People using storm drains to dispose of dog waste
18	I am not sufficiently informed on these issues to know the greatest threats. I see foaming in the creek, so I wonder about pollution.
19	Those who seek to develop this area with walking trails and bridges

Newtown Creek Watershed Conservation Plan

Q11. Please rank from 1, being the highest, to 5 being the lowest what you think are the most important resources of the Newtown Creek watershed.

Answer Options	1 (Highest)	2	3	4	5 (Lowest)	Response Count
a) Historical resources (Historically important buildings and districts)	19	22	26	18	3	88
b) Natural open spaces (streambanks, streamside vegetation, open fields/meadows, woodlands)	58	25	9	2	2	96
c) Commercial and economic resources	10	15	18	21	28	92
d) Recreational opportunities (Parks, playing fields, and trails)	17	31	29	22	3	102
e) Agricultural resources (Farms, nurseries, and agricultural production)	6	11	17	28	43	105
f) Other (please specify)	4	0	2	2	2	10
						6
					answered question	121
					skipped question	5

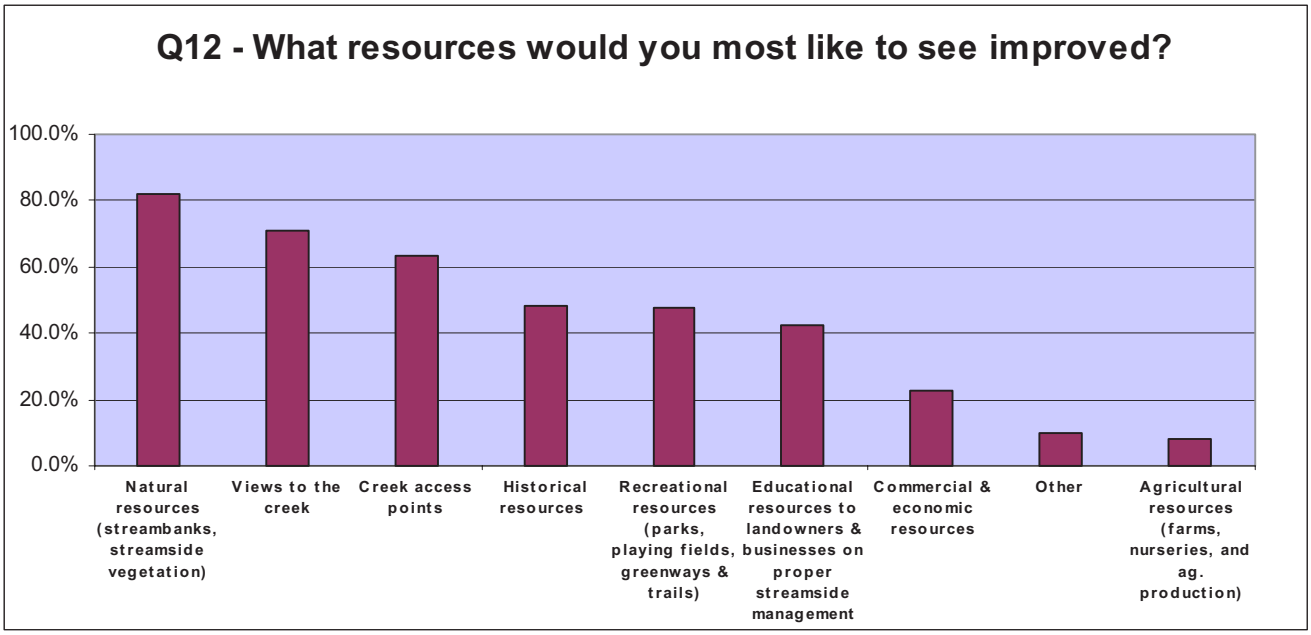
Q11 - Most Important Resources of the Newtown Creek			
Top Ranked Responses	**Total Indicating 1-3 Rank**	**Total Responses**	**Percent**
Natural Open Spaces	**92**	**96**	**95.8%**
Recreational Opportunities	**77**	**102**	**75.5%**
Historical Resources	**67**	**88**	**76.1%**

	Question 11 - (please specify)
1	Without this creek for storm water run off and filtration, you will have more flooding, less wildlife (that is structurally important to the environment), lower water quality and higher health related problems.
2	Community gardens
3	organic non chemical sustainable agriculture ONLY to improve life
4	Common areas/community center.
5	easy access to the creek will make people more appreciative
6	I don't understand this question really, but letter a is what I value most.

Newtown Creek Watershed Conservation Plan Survey

Q12. What resources would you like to see improved?

Answer Options	Response Percent	Response Count
Natural resources (streambanks, streamside vegetation)	81.7%	98
Views to the creek	70.8%	85
Creek access points	63.3%	76
Historical resources	48.3%	58
Recreational resources (parks, playing fields, greenways & trails)	47.5%	57
Educational resources to landowners & businesses on proper streamside management	42.5%	51
Commercial & economic resources	22.5%	27
Other	10.0%	12
Agricultural resources (farms, nurseries, and ag. production)	8.3%	10
answered question	120	120
skipped question	6	6



	Question 12 - Other (please specify)
1	if we do not make the environment a priority then we will eventually not have to worry about any of the other topics listed. Natural areas replenish and maintain the eco system. The most effective way to accomplish this goal is to reach as much of the public as possible
2	Water quality preservation and improvement plus enhancement of native wildlife species
3	Recreational resources -GREENWAYS, TRAILS & SMALL parks only - NO playing fields
4	The Newtown creek in totally hidden to most people awareness campaigns to connect to it and protect the creek are important
5	pedestrian walkway on Barclay St bridge. (very dangerous to get over)
6	none
7	Awareness of creek as local resource
8	with regards to recreational use, I hesitate to increase playing fields and other highly fertilized, mowed areas next to the creek
9	native plant meadow/tree buffers; no more playing fields - focus on more passive recreation & environmental education opportunities, 'nature deficit disorder' is not only affecting the health of our children, but the adults too.
10	bridges
11	Pedestrian crossing near Barclay Street bridge
12	leave it the way it is.

Newtown Creek Watershed Conservation Plan Survey

Q13. Choose 3 activities from the list below related to the watershed that you feel are most important to implement? (Please note: survey system is set to allow only 3 choices.)

Answer Options				Rating Average	Response Count
Clean up and invasive plant removal from the stream corridor	22	17	9	40%	48
Beautification of streamside parks (planting native trees, shrubs and wildflowers)	13	32	21	55%	66
Volunteer water quality monitoring	5	2	3	8%	10
Improving access along and/or across the creek	21	23	14	49%	58
Improving stream corridor segment through Newtown Borough	16	11	13	34%	40
Permanently protecting open space along creek	29	16	20	55%	65
Educating property owners on proper land management practices to protect watershed resources	11	7	24	35%	42
Other	1	1	1	3%	3
If other (please specify)					6
				answered question	119
				skipped question	7

Q13 - Activities Most Important to Implement	
Activity	Total Indicating Ranking of 1,2 or 3
Beautification of streamside parks (planting native trees, shrubs and wildflowers)	66
Permanently protecting open space along creek	65
Improving access along and/or across the creek	58
Clean up and invasive plant removal from the stream corridor	48
Educating property owners on proper land management practices to protect watershed resources	42
Improving stream corridor segment through Newtown Borough	40
Volunteer water quality monitoring	10
other	3

	Question 13 - If other (please specify)
1	Educating property owners is also important but not top three first
2	Not sure what the columns specify on this question
3	The three I picked are of equal importance along with water quality monitoring (preferably with macroinvertibrate I.D. training as well as chem. tests.
4	Protecting creek ecosystems and wildlife
5	Native plantings must accompany invasive removals or invasives will return.
6	The new Neshaminy Creek watershed plan is important for protecting Newtown creek.

Newtown Creek Watershed Conservation Plan

14. Please Let us know if you have other comments or concerns regarding the creek and watershed resources.

Answer Options	Response Count
	34
answered question	34
skipped question	92

	Response Text
1	Keep up the good work. The visioning is important to current and future planning by both the Borough and the Township. Continued inspection of the Dam is needed too. Educating the residents of Newtown about this "hidden" set of resources (the dam, creek and feeder) is a primary function of our EAC's and the coalition. Thank you.
2	Nice to have trails along the creek along with highlights and safety signs.
3	Don't waste money trying to make this a "walk." Control potential damage only.
4	Improving visibility, accessibility and appreciation of natural beauty will hopefully also help people understand impact of runoff on water quality etc. Am concerned about potential flooding.
5	The Newtown Creek watershed is an undervalued, neglected resource that should be beautified and protected from over development. The bridges that cross it in Newtown Borough do not enhance its beauty, nor do they promote its appreciation.
6	Just feel this natural area needs to be maintained and respected
7	I am very happy to see that Newtown Creek and the surrounding area are going to be improved. I had no idea that it looked so terrible until I saw pictures of it as it is now. I grew up on State Street and used to swim in the creek as a child.
8	The creek could be a lovely site but I have concerns about respecting the property rights and economic rights of land owners who live or work very close to the creek
9	Although I have lived in Princeton for 14 years, I grew up in Langhorne. My grandparents owned a farm on Buck Road. As a child, I spent considerable time in Newtown. I am happy to see your effort to help Newtown Creek
10	I read the article in the Phila. Inquirer this morning regarding the proposed plans for the creek. It is very exciting that something is possibly planned for this area in Newtown. Let's just see it actually happen, then I will support it even more!
11	I'd like to see the stream play a larger role in the downtown area. It should be cleaned up along with a marginal border around the stream which could feature a pedestrian walkway, dog waste container dispensers, benches, nice landscaping, light posts, bike racks, gazebos and picnic tables. I am not opposed to developing this area for commercial use. I'm sort of picturing a hybrid between the D&R canal towpath around Doylestown, NJ and the commerce-centric paths that run throughout Peddler's Village. Furthermore, there is currently an abandoned commercial building in back of the old Stockburger lot (currently a flooring store) that could be converted into such a space.
12	Have posters and flyers printed for voluntary displays at local and interested businesses. Advertise periodically in the Advance & Courier - Create a FACEBOOK entity and a NEWSLETTER. Have a presence at Welcome Day, Market Day, Harvest Day, Grange Fair & other events - sell Tee Shirts.

Newtown Creek Watershed Conservation Plan

14. Please Let us know if you have other comments or concerns regarding the creek and watershed resources.

Answer Options	Response Count
	34
answered question	34
skipped question	92

	Response Text
13	I am not opposed to economic LOCALLY owned development, if the mission is to provide beautiful, easy access available to the community. An outdoor public cafe with coffee shops and farmers market surrounding would bring the community together
14	The creek could be a destination for walking, hiking, restaurants could back up to the creek instead of parking lots, beautiful parks could be built around the creek (see Lithia Park in Ashland Oregon as an example). A bike path along the creek would be ideal, and could be facilitated perhaps - haven't seen a map yet of what's possible.
15	I think the Stockberger development would only be an asset for the creek and the Borough
16	As a relative newcomer, I don't know nearly enough about this resource. More educational opportunities (programs, newspaper articles, walks-'n'-talks) so that we can become better educated and more familiar with this area would be very helpful.
17	The Barclay St. bridge over the creek was repaired a few years ago. However a pedestrian section was not added. It is very dangerous to cross because Barclay street turns right before the bridge. Because of this you cannot see oncoming traffic. Also a pedestrian walkway will also allow people to get a nice view over the creek
18	For 30 years I have witnessed an impressive array of wildlife and birds that live within the creek ecosystem, about 40 feet from my back door. I support a general cleanup (including landscaping) in the areas near public access and businesses, but I am opposed to any changes to the creek that might impact the wildlife and birds. I hope that maintaining the ecosystem is the most important issue to this committee.
19	One way to improve access and awareness of the Newtown Creek, especially within the downtown corridor, would be to provide additional walking bridges connecting the Borough and Township, as well as walking paths along the Creek. Currently there are places where there are no buffers between parking lots (impervious pavement) and the Creek, which detracts from the appeal.
20	Thank you for taking leadership with regards to this underutilized, unappreciated natural resource we have in our community!
21	Homeowners Associations/property managers and the landscapers they hire (who don't necessarily live w/in Newtown) need to be included on all educational efforts for proper land management practices. IMHO, they are the worst example of how to manage land and stormwater. Do-it-yourself homeowners, or 'weekend warriors', will mimic what they see being done on common property within their community, thinking that is the best way to do things. A prime example of this is how trees are mismanaged with improper pruning (ie. 'topping') and 'mulch volcanoes', all of which succeeds only in diminishing our property values and the health/life of the trees.
22	Access and walkability should be improved to allow enjoyment and use by the community and value to the business district in Newtown Borough and Township.

Newtown Creek Watershed Conservation Plan

14. Please Let us know if you have other comments or concerns regarding the creek and watershed resources.

Answer Options	Response Count
	34
answered question	34
skipped question	92

	Response Text
23	Improving access and utilizing the creek is a great project. We need to be sure business is considered when finalizing any plans
24	We should control what people in our watershed add to their lawns, also what king of salt or anti freeze is being used. Make sure that people understand the importance of what they are doing and the wildlife
25	A creek walk and the planned future development of 260 condos in close proximity to the creek can only harm the area....the development of so many residential units should be stopped!
26	I feel that the Newtown creek coalition does a great job in protecting the watershed, especially with their volunteer clean ups. I regularly pick up trash and litter found in the creek. I am surprised that no efforts have been made to clean up the largest litter along the creek. At the end of Green street is a pile of used concrete debris piled up. Concrete does pose a negative threat to the water quality of the creek, it is also dangerous. I regularly witness children playing on the concrete piles, and have seen them shift causing children to fall and even get their legs caught in between the concrete. Recently, graffiti has been spray painted on the concrete, some of it offensive.
27	A coffee shop or eatery with views and outdoor seating on the creek would be ideal. This would also be best public awareness builder for preserving the creek, and optimize economic rationale for preserving and cleaning the creek.
28	Stop talking and start doing!!
29	I think Newtown is a great town, but it would be fantastic if we could take advantage of this natural source of the Newtown Creek, and make it accessible, with trails, small picnic areas, and a place where the locals could go to walk their dogs, stroll, bike and enjoy nature. If this could be tied in with historic borough then that would be the best!
30	As residents of Brookside and environmentalists, we are stakeholders and have a high interest in protecting and preserving Newtown Creek. We are happy about possible access points and creekside trails, so long as sound practices are followed with regard to establishing and maintaining riparian buffers and monitoring for litter and inappropriate use. We would like the area to be preserved as natural rather than being "Westernized" with plants that would otherwise not grow there, up-lighting, and so on. As a practical matter, the Barclay Street bridge is a hazard for pedestrians. Someone will die on that bridge -- it's only a matter of time. We were stunned to see that reconstruction of the bridge did not include installation of a pedestrian walkway. A separate pedestrian bridge on the Gloria Dei side of the road bridge could be installed, along with a sidewalk on the Borough side of the creek leading up to State Street, at modest cost. Kind regards and thanks for what you do, Hal and Judy Wright

Newtown Creek Watershed Conservation Plan

14. Please Let us know if you have other comments or concerns regarding the creek and watershed resources.

Answer Options	Response Count
	34
answered question	34
skipped question	92

	Response Text
31	I think entirely too much effort has been made about the creek. It is nice to have in the Borough and has been a longstanding park of the community but it is not near demise nor is it polluted any worse than it has been over the past 50+ years. Anything that can be done to make it visually more attractive would be great but I cannot see us pouring a lot of taxpayer money into trying to "save" it when it is not going anywhere. I think a lot of new residents are alarmists on this topic.
32	Any effort that includes Newtown Township official is suspect. While they feign concern for Newtown Creek they have condemned to death the Hazel Brush Creek which is a mere quarter mile away. They have allowed Toll Brothers to build over the head waters and allowed the Industrial Commons to continue what the Terry family began by dumping run-off un-checked and by slowly filling and rerouting sections of this historic creek. Newtown township officials pretend to know nothing about this waterway's existence despite the fact that it has been on official township maps since the 1820's and appears, in part, on the very map you have included here. Why should anyone believe that any Township Official has even the most remote concern for the environment beyond what might enrich their corporate masters and fatten their war chests in advance of their next grab at political office. Good Luck.
33	I attended an early meeting that showed beautiful concept drawings of a vision of Newtown creek that utilized the creek for recreation and such. There were restaurants and sidewalks along the creek. I thought that was beautiful and very desirable. Maybe the new Stockingworks II development plan could incorporate the Newtown Creek in its plans.
34	Almost all of the land on either side of the creek is privately own. The land that is publicly owned should be maintained and kept as passive open space. The creek really is too small to "develop" into full scale active recreation. Let the children enjoy it the way it is, the way I enjoyed it as a child.

Appendix B. Natural Resource Ordinance Summary Matrix

Appendix B - Newtown Creek NR Ordiance Summary

		Protection Category:	Land Resources - Soils				Land Resources - Steep Slopes				Land Resources - Woodlands				
Municipality Ordinance Requirements	**Location of recent Ordinances and date enacted. See current municipal document file (and/or assigned Municipal Planner)**	**Ordinance Requirements:**	**Agricultural Security Area (acres)**	**Restrictions on Prime Agricultural Soils (percent protected)**	**Agricultural Advisory Committee**	**Control Development on Restrictive Soils**	**Percent Protected on Slope 8-15%, % Natural Cover**	**Percent Protected on Slope 15-25%, % Natural Cover**	**Percent Protected on Slope 25+%, % Natural Cover**	**Exceptions**	**Percent Protected for Open Space in Sensitive Areas**	**Percent Protected for Open Space in Other Areas**	**Woodland Other Than Forest**	**Tree Protection Ordinance**	**Tree Protection Standards**
Source	**See current municipal document file (and/or assigned Muncipal Planner)**	**Source:**	**See Rich Harvey**	**Zoning Ordinance**	**See Rich Harvey**	**Zoning Ord.**	**Zoning Ord.**	**Zoning Ord.**	**Zoning Ord.**		**Zoning Ord.**	**Zoning Ord.**		**SALDO**	**Zoning Ord.**
Middletown Twp.	SALDO Revised Nov. 1997, Z.O. Updated 2000, Code Update (online) 8-12 2003					100% OS on floodplain soils	50%	70%	85%		80%	50%		Yes--100% in TPZ	
Newtown Borough	Stormwater Ord. #333 (2/1993), ZO. 2004, Comp. Plan 1999, SALDO 1/1/1993					100% OS on floodplain soils		70%	85%		50% all areas	50% all areas		Yes--100% in TPZ & have Shade Tree Commission	
Newtown Twp.	Joint Municipal Zoning Ordinance, Amend. 11/2002, SALDO Amend. 5/96			-In the CM Conservation Management District, no more than 25% of ag soils may be developed.		100% OS on floodplain soils		75%	85%		85% in zones JM, CM, Cr-1	50% all other areas		Yes--100% in TPZ	
Wrightstown Twp.	Newtown Area Joint Municipal Zoning Ordinance, 2001, SALDO 1991 & 2 Storm. Mgt. Ords.: No. 226, Neshaminy Creek Watershed & No. 225, Delaware River South Watershed (both, 2005)			In the CM Conservation Management District, no more than 25% of ag. soils may be developed.		100% OS on floodplain soils		75% (areas larger than 3,000sq.ft.)	85% (areas larger than 3,000 sq.ft.)		85% in zones JM, CM, CR-1	50% in all other zones		Yes--100% in TPZ	

Appendix B - Newtown Creek NR Ordiance Summary

		To be Added											
	Land Resources - Minerals	Water Resources - River Conservation	Water Resources - Water Supply					Water Resources - Water Quality					
Municipality Ordinance Requirements	Quarry Operations Regulations Location	Watershed Study/Plan	Water Conservation Devices	Well Drilling Ordinance	Water Conservation Ordinance (Date enacted)	Low Density Zoning Near Supply	Drought Contingency Plan	Watershed Location	Percent Protected for Open Space for Lake/Pond/Watercourse	Percent Protected for Open Space for Lake/Pond/Watercourse (stream Protection Area) (ft.)	Riparian Ordinance (location and date enacted)	Wellhead Protection	Private Well Testing (Location For Criteria)
Source	Zoning Ord.	Name of Plan/Study	Other municipal zoning codes	SALDO & other chapters in zoning codes	Zoning Codes	Comp. Plans	Comp. Plans	Watershed Map (out in the hall)	Zoning Ord.	Zoning Ord.	Zoning Ordinance or Stand Alone	SALDO or ZO	SALDO
Middletown Twp.	Z.O.-Ord. 01-17 Section 902 (bb) Special Exception & Section 1902 (CC) (online)	Lower Neshaminy Creek RCP, Newtown Creek RCP		SALDO - Section 513				Neshaminy & Delaware River South	100%	80% (100ft) - Lakes and Ponds			SALDO--Section 513
Newtown Borough		Middle and Upper Neshamany Creek RCP, Newtown Creek RCP	Yes--on fixtures	Private Well Supply Prohibited	Yes 2/11/92	Yes--Newtown Area Joint Municipal Comprehensive Plan		Neshaminy	100%		Z.O.--Section 506-G		private water supply prohibited
Newtown Twp.	Section 803, G-14 Quarry -- (Zon. Ord. 2002)	Middle and Upper Neshamany Creek RCP, Newtown Creek RCP	Yes--on fixtures	Ord. 167--Twp. Water Ordinance includes reguations regarding the rate of water discharge for fixtures and facilities	Chpt. 26-Part 1 Water Conservation	Yes--Newtown Area Joint Municipal Comprehensive Plan		Neshaminy	100% ponds/lakes only		Ordinance No. 2004-06. Zone 1 – 25 feet from edge of a stream channel on each side. If the land within the 25 feet has an upland slope of greater than 10%, zone one shall include the land from the stream channel edge and the upland slope and shall further extend outward 25 feet from the edge or top of such upland slope. Zone 2 – Extends 25 feet beyond Zone 1. Where the 100-yr floodplain extends greater than 50 feet from the waterway, Zone 1 shall remain at 25 feet, and Zone 2 shall extend from the outer edge of Zone 1 to the outer edge of the 100 yr floodplain.		Ord. 167-- Twp. Water Ordinance
Wrightstown Twp.	Quarry Regulation--Section 703 (ZO-2001)	Upper and Middle Neshaminy Creek RCP		Construction Standards - SALDO, Section 612	Yes - 12/92	Yes--Newtown Area Joint Municipal Comprehensive Plan		Neshaminy & Delaware River South	100%		Ord. # 2004-06 Riparian Buffer Overlay Zone (7/9/04). Zone 1 – 25 feet from edge of a stream channel on each side. If the land within the 25 feet has an upland slope of greater than 10%, zone one shall include the land from the stream channel edge and the upland slope and shall further extend outward 25 feet from the edge or top of such upland slope. Zone 2 – Extends 25 feet beyond Zone 1. Where the 100-yr floodplain extends greater than 50 feet from the waterway, Zone 1 shall remain at 25 feet, and Zone 2 shall extend from the outer edge of Zone 1 to the outer edge of the 100 yr floodplain.		Yes--Section 612-Bailer tests--SALDO 1991

	E & S Control	Industrial Regulation	Wastewater Planning			Low Impact Design Requirements		Resource Protection Standards		Stormwater		
Municipality Ordinance Requirements	**Erosion and Sedimentation Control (Location of Criteria)**	**Prevent Industrial Contamination through Code Enforcement**	**Wastewater Plan for Municipalities**	**Wastewater Pre-treatment, includes sewage treatment (plant and treatment level) All plants must also meet DEP regulations**	**On-Lot Disposal System Management or Education Programs**	**Lighting**	**Comprehensive Site Analysis**	**Relaxation of Resource Protection Standards**	**Setbacks**	**Stormwater Runoff equals Pre & Post-development**	**Stormwater Management Plans or Criteria Location**	**MS4 Municipalities**
Source	**SALDO or Stormwater Management Ord.**	**Zoning Ord.**	**Wastewater Plan List in Library**	**Sewage Facilities plans**	**Sewage Facilities plans**		**SALDO**			**SALDO or stormwater management stand alone ord.**	**SALDO**	
Middletown Twp.	SALDO - Section 407	Yes	Bucks County Sewerage Facility Plan; Lower Bucks Joint Municipal Authority Act 537 Plan (1992)	Lower Bucks County Joint (M2) Secondary						Yes	Amended Ord. 00-09 8/16/2000 & (Section 406 SALDO)	Yes
Newtown Borough	Yes--SALDO--Section 504	Yes	Newtown Twp. Act 537 Official Plan Revision (1992)& Newtown Creek Drainage Basin (1992)	N.E. Phila. (M21) Secondary	Prohibits OLDS					Yes	Stormwater Ord. #333 (2/1993), SALDO--Section 606	Yes
Newtown Twp.	Yes --SALDO 1996 & ZO 2002 Section 903, B-10	Yes	Newtown Twp. Act 537 Official Plan Revision (1992)& Newtown Creek Drainage Basin (1992)	N.E. Phila. (M21) Secondary	OLDS Management	JMZO No 2008-07 To prohibit electronic message centers (ZO 9/24/08)				Yes	Section 521 - SALDO	Yes
Wrightstown Twp.	SALDO - Section 517 & Ord. No. 225, Section 310. & Ord. # 226, Section 403.	Yes	Wrightstown Twp. 201 Facility Plan 1984	N.E. Phila. (M21) Secondary	OLDS Management & Education Program	JMZO No 2008-07 To prohibit electronic message centers (ZO 9/24/08)	JMZO No 2008-07 To prohibit electronic message centers (ZO 9/24/08)			Yes	Neshaminy Creek Watershed Storm. Mgmt.Ord. 226 3/2005 & Delaware R. South Watershed Act 167 Storm. Mgmt. Ord. 225 3/2005 & Ord 232 & SALDO Section 516	Yes

	Land/Interface Resources - Floodplain		Wetlands		Air Resources - Air Quality			Energy Resources		Wildlife	Plants			Champion Trees
Municipality Ordinance Requirements	**Percent Protected for Development in 100-yr. Floodplain (% OS)**	**Limit Development on 100-yr. Floodplain Fringe**	**Percent Protected for Open Space in Wetland Areas**	**Percent Protected for Open Space in Wetland Margins (ft.)**	**Max. darkness allowed for smoke (All found in Zoning Ordinance)**	**Max. amount of fly ash, dust, gases, fumes, and vapors, allowed (All found in Zoning Ordinances)**	**Regulate Backyard Burning**	**Encourage Use of Alternative Energy Sources**	**Regulation of Oil & Gas Development**	**Critical Wildlife Habitat**	**Native Plantings**	**Invasive/Noxious Species**	**Rare Plant Communities**	**Preservation (caliper inches)**
Source	**Zoning Ord.**	**Zoning Ord.**	**Zoning Ord.**	**Zoning Ord.**	**Zoning Ord.**	**Zoning Ord.**	**Zoning Ord.**	**Comp. Plans**	**Zoning Ord.**	**Open Space plans**	**Zoning Ord. & SALDO**	**Zoning Ordinance & SALDO**	**Bucks County Natural Areas Inventory**	**ZO/SALDO**
Middletown Twp.	100%	Yes - ZO, Section 2503, 3	100%	80% (100ft)	No emissions darker than #1 except no darker than #2 for 4 minutes in an 30 minute period.	0.3 g/ft³		Yes - WECS, ZO - Section 2305		Saba Tract	Online Code-- 1902. CC. (13)(g).		Playwicki Park & Neshaminy Creek, Saba Tract	
Newtown Borough	100%	Yes	100%		Comply with State & Federal Laws	Comply with State & Federal Laws		ZO - Section 401, C(15) - Closed loop geothermal system						
Newtown Twp.	100%	Yes	100%		No emissions darker than shade #1 (Ringlemann Chart) Except Smoke that = shade #2 only for 4 min. in an 8 hr period	0.1 g/ft³	Yes--regulates wood & coal burning stoves (Sec. 904.A.1 --?)							
Wrightstown Twp.	100%	Yes	100%		No emissions darker than shade #1 (Ringlemann Chart) Except Smoke that = shade #2 only for 4 min. in an 8 hr period	0.1 g/ft³	Yes				Ord. # 2004-06 -- Restoration and Revegetation of Riparian Buffers & Activities and Uses Permitted in the RBOZ			

Appendix B - Newtown Creek NR Ordiance Summary

	Geology	Restrictive Geologic Formations			Municipal Boards and Committees				
Municipality Ordinance Requirements	**Geologic Features**	**Carbonate Geology Ordinance**	**Limit Development in Groundwater Areas**	**Special Protection Requirements**	**Shade Tree Commission**	**Environmental Advisory Committees**	**Open Space**	**Historic Preservation**	**Park & Recreation**
Source	**Open Space plans**	**Open Space plans**	**Zoning Ord. or Comp. plan**	**Zoning Ordinance**	**Yes/No**	**Yes/No**	**Yes/No**	**Yes/No**	**Yes/No**
Middletown Twp.	Fall Line		Yes		No	Yes	No	Yes	Yes
Newtown Borough			Yes--Newtown Area Joint Municipal Comprehensive Plan		Yes	Yes	No	Yes - jointly with Newtown Township	Yes
Newtown Twp.			Yes-Joint ZO & Comp.Plan	ZO--Section 903-12 Ord.2001-09 Setbacks from the Delaware Division of the PA canal	No	Yes	No	Yes - jointly with Newtown Borough	Yes
Wrightstown Twp.	Neshaminy Palisades		Yes-Joint ZO & Comp.Plan	ZO--Section 903-12 Ord.2001-09 Setbacks from the Delaware Division of the PA canal	No	Yes	No	Yes	Yes

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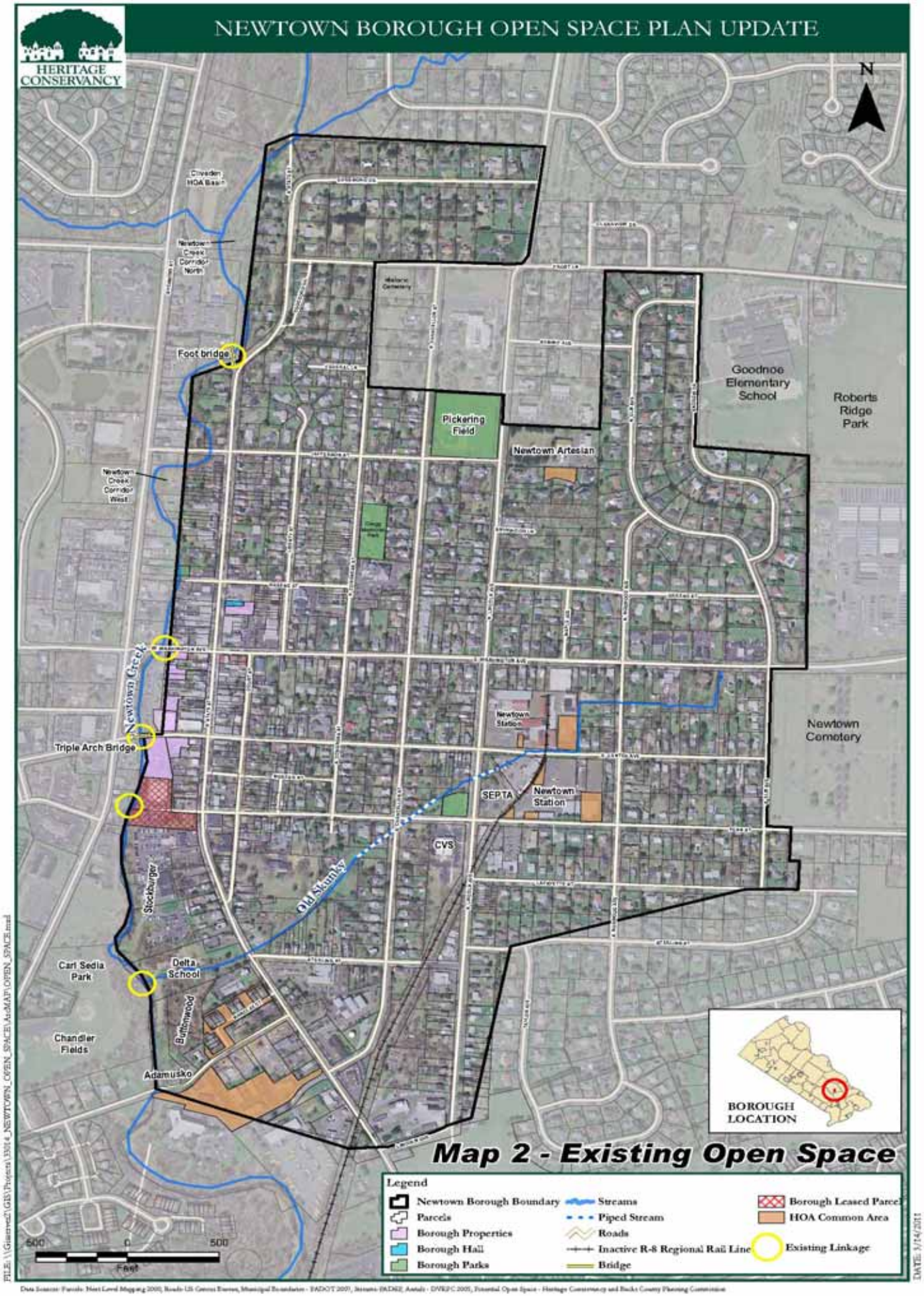
Appendix C. Additional Maps

Appendix C—Newtown Borough's Existing Open Space



Appendix C—Newtown Borough's Cultural Features

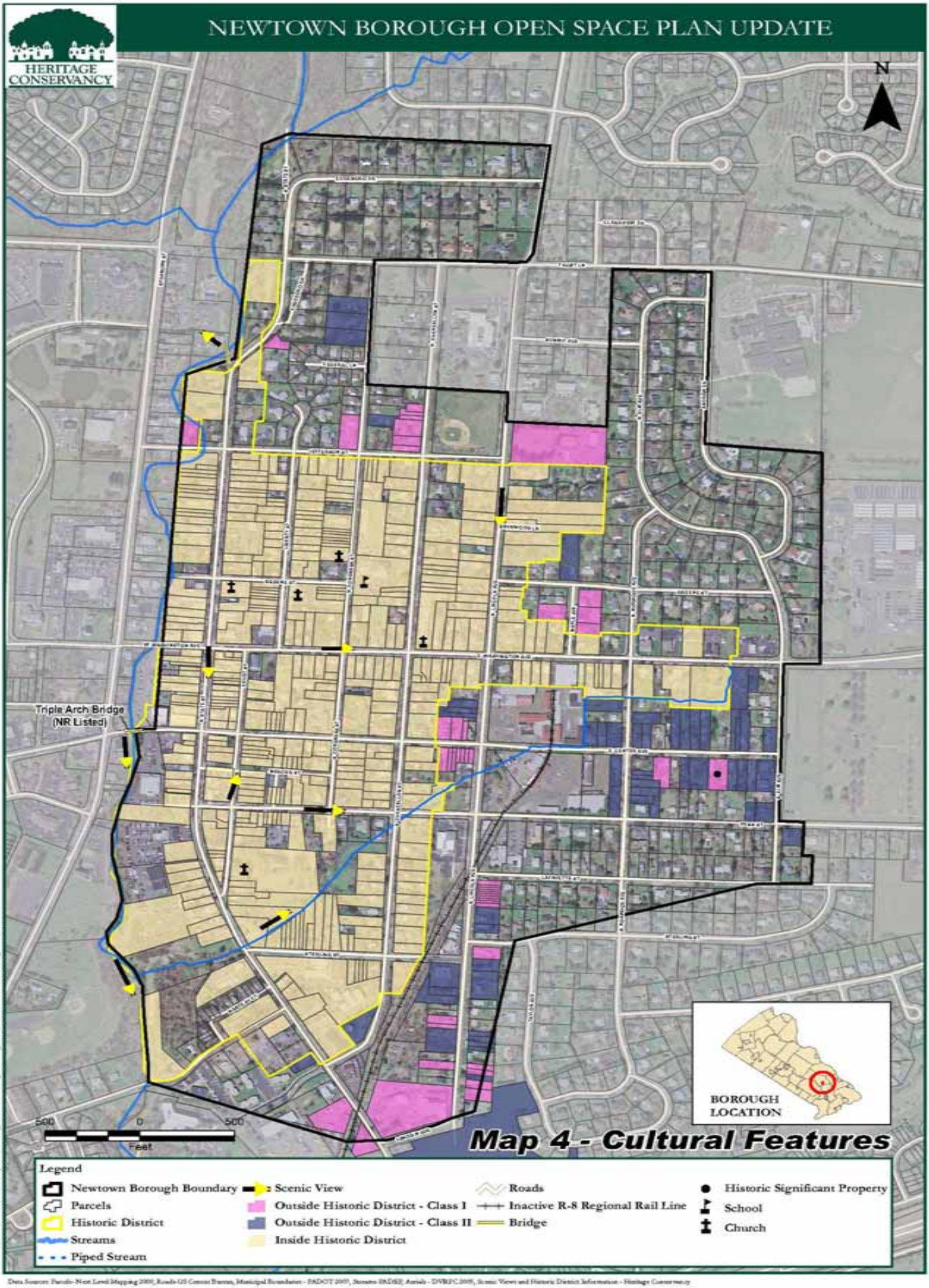
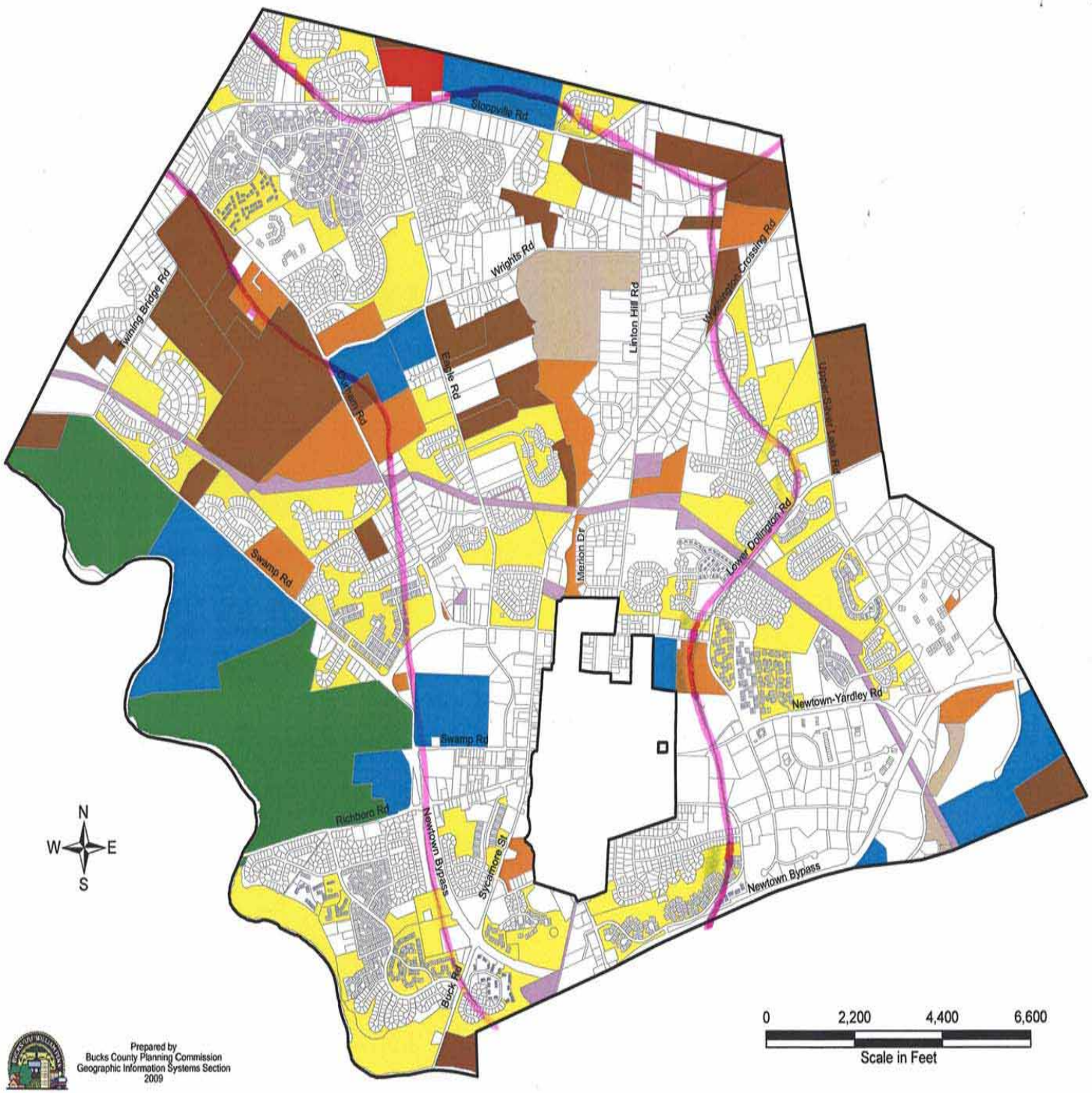


Figure 1
Newtown Township
Open Space Plan



Inventory of Protected Lands

Protected Open Space

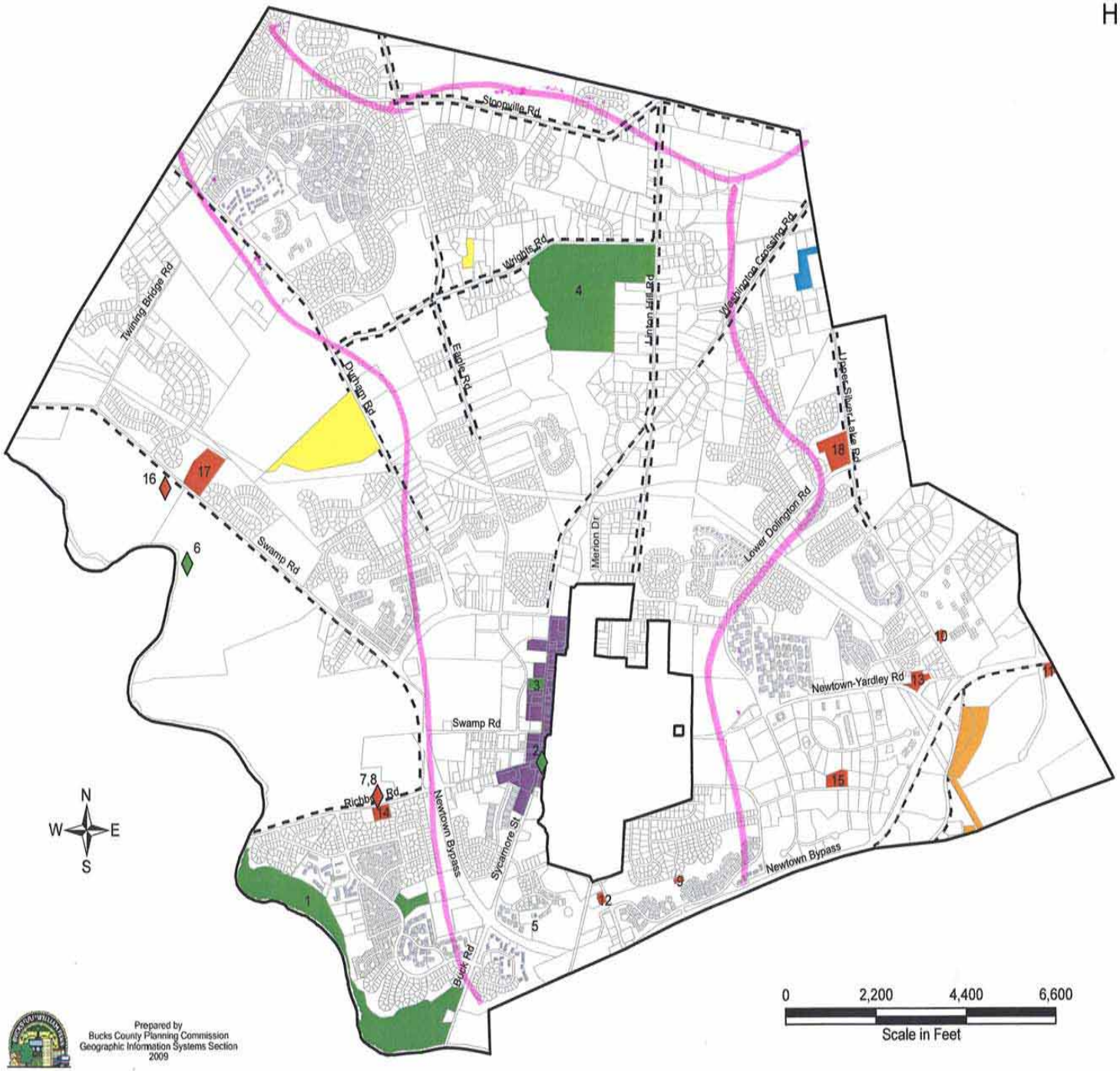
- State-Owned Lands
- County-Owned Lands
- Township-Owned Lands
- Private Land Trust Easement

Other Lands

- Lands with Preferential Assessment
- Homeowners Association
- School Property
- Utility-Owned Property
- Newtown Creek Watershed

Prepared by
Bucks County Planning Commission
Geographic Information Systems Section
2009

Figure 6
Newtown Township
Open Space Plan



Prepared by
Bucks County Planning Commission
Geographic Information Systems Section
2009

Historic Resources and Scenic Roads

National Historic Landmark

National Register Listed Property

1. David Leedom Farm
2. Newtown Creek Bridge
3. Newtown Presbyterian Church
4. Peter Taylor Farmstead
5. Twining Farm
6. George F. Tyler Mansion

National Register Eligible Property

7. Buckman Farm
8. Buckman Farm Barn
9. Cary-Tomlinson House
10. G. Cunningham House
11. Eastburn House "Willow Shade"
12. Elizabeth Hopkins House
13. John Pitner House
14. Johnson-Buckman House
15. Penquite Linton House "Woodside"
16. Benjamin Schofield House
17. Temora Farm
18. Willow Hill

Heritage Conservancy Register

National Register Listed District
Newtown Historic District

National Register Eligible Property
Core Creek Historic District

Scenic Road

Newtown Creek Watershed Boundary

Appendix D. List of PNDI Species Near the Newtown Creek Watershed

Table 16 - PNDI Key to State Ranking of Habitats.			
State Element Ranks	Implication	State Status	Implication
S1	Critically imperiled in the state (<5 occurrences)	PE	PA Endangered
S2	Imperiled in the state (6-20 occurrences)	PR	PA Rare
S3	Rare or uncommon in the state (21 – 100 occurrences)	PT	PA Threatened
S4	Apparently secure in the state	PX	PA Extirpated
S5	Demonstrably secure in the state	CA	Candidate at risk
A	Accidental in the state	N	No current legal status
B	Breeding population in the state		
N	Non-breeding population in the state		
X	Believed to be extirpated in the state		
?	Uncertain status		

Source: PA DCNR

Table 17 - PNDI Species found near the Newtown Creek Watershed.			
Scientific Name	Common Name	State Rank	State Status
Andropogon glomeratus	Bushy Bluestem	S3	TU
Bartonia paniculata	Screw-stem	S3	N
Carex crinita var. brevicrinis	Short Hair Sedge	S1	PE
Gentiana saponaria	Soapwort Gentian	S1S2	TU
Juncus biflorus	Grass-leaved Rush	S2	TU
Panicum longifolium	Long-leaf Panic-grass	SH	TU
Pseudemys rubriventris	Redbelly Turtle	S2	PT
Scaphiopus h. holbrookii	Eastern spadefoot toad		PE

Source: PA DCNR, PA Fish & Boat Commission, 2011 review letters

Appendix E. Agency Responses to Pennsylvania Natural Diversity Inventory Environmental Review

Division of Environmental
Planning and Habitat
Protection
717-783-5957

COMMONWEALTH OF PENNSYLVANIA
Pennsylvania Game Commission
2001 ELMERTON AVENUE
HARRISBURG, PA 17110-9797

"To manage all wild birds, mammals and their habitats for current and future generations."

ADMINISTRATIVE BUREAUS:

ADMINISTRATION.....717-787-5670
HUMAN RESOURCES.....717-787-7836
FISCAL MANAGEMENT.....717-787-7314
CONTRACTS AND
PROCUREMENT.....717-787-6594
LICENSING.....717-787-2084
OFFICE SERVICES.....717-787-2116
WILDLIFE MANAGEMENT.....717-787-5529
INFORMATION & EDUCATION.....717-787-6286
WILDLIFE PROTECTION.....717-783-6526
WILDLIFE HABITAT
MANAGEMENT.....717-787-6818
REAL ESTATE DIVISION.....717-787-6568
AUTOMATED TECHNOLOGY
SERVICES.....717-787-4076

www.pgc.state.pa.us

February 11, 2011 **Large Project PNDI Review**

Ms. Susan Myerov
Heritage Conservancy
85 Old Dublin Pike
Doylestown, Pennsylvania 18901

Re: Newtown Creek Watershed Conservation Plan
Newtown Township and Newtown Borough, Bucks County, Pennsylvania

Dear Ms. Myerov,

Thank you for submitting your Pennsylvania Natural Diversity Inventory (PNDI) Large Project Environmental Review request. The Pennsylvania Game Commission (PGC) screened this project for potential impacts to species and resources of concern under PGC responsibility, which includes birds and mammals only.

No Impact Anticipated

PNDI records indicate species or resources of concern are located in the vicinity of the project. However, based on the information you submitted concerning the nature of the project, the immediate location, and our detailed resource information, the PGC has determined that no impact is likely. Therefore, no further coordination with the PGC will be necessary for this project at this time.

This response represents the most up-to-date summary of the PNDI data files and is valid for one (1) year from the date of this letter. An absence of recorded information does not necessarily imply actual conditions on site. Should project plans change or additional information on listed or proposed species become available, this determination may be reconsidered.

Should the proposed work continue beyond the period covered by this letter, please resubmit the project to this agency as an "Update" (including an updated PNDI receipt, project narrative and accurate map). If the proposed work has not changed and no additional information concerning listed species is found, the project will be cleared for PNDI requirements under this agency for an additional year.

This finding applies to impacts to birds and mammals only. To complete your review of state and federally-listed threatened and endangered species and species of special concern, please be sure that the U.S. Fish and Wildlife Service, the PA Department of Conservation and Natural

Resources, and/or the PA Fish and Boat Commission have been contacted regarding this project as directed by the online PNDI ER Tool found at www.naturalheritage.state.pa.us.

Sincerely,

Olivia A. Braun
Environmental Planner
Division of Environmental Planning & Habitat Protection
Bureau of Wildlife Habitat Management
Phone: 717-787-4250, Extension 3128
Fax: 717-787-6957
E-mail:OBraun@state.pa.us

A PNHP Partner

OAB/oab

cc: Librandi Mumma, PGC
File

Pennsylvania Fish & Boat Commission

established 1866

Division of Environmental Services
Natural Diversity Section
450 Robinson Lane
Bellefonte, PA 16823-9620
(814) 359-5237 Fax: (814) 359-5175

IN REPLY REFER TO:
SIR# 35660

February 1, 2011

SUSAN MYEROV
HERITAGE CONSERVANCY
85 OLD DUBLIN PIKE
DOYLESTOWN, PA 18901

RE: Species Impact Review (SIR) - Rare, Candidate, Threatened and Endangered Species
NEWTOWN CREEK WATERSHED CONSERVATION PLAN
NEWTOWN Township, BUCKS County, Pennsylvania

Dear Ms. MYEROV:

I have examined the map accompanying your recent correspondence, which shows the location for the above-referenced project. Based on records maintained in the Pennsylvania Natural Diversity Inventory (PNDI) database and our own files, two threatened or endangered species are found near the watershed in Bucks County and could potentially occur within suitable habitats in the Newtown Creek watershed.

The eastern redbelly turtle is one of Pennsylvania's largest native aquatic turtles. This turtle species is known to inhabit relatively large, deep streams, rivers, ponds, lakes and marshes with permanent water and ample basking sites. Eastern redbelly turtles are restricted to the southcentral and southeastern regions of the Commonwealth. The existence of this turtle species is threatened by habitat destruction, poor water quality, and competition with aggressive non-native turtle species that share its range and habitat (e.g., red-eared slider, *Trachemys scripta elegans*).

The eastern spadefoot toad (*Scaphiopus h. holbrookii*, state endangered) is an elusive toad species with a rather unusual life history. This toad species prefers sandy or other soft loamy, pliable soils that it uses for burrowing. Unlike the American toad (*Bufo americanus*) and Fowler's toad (*Bufo woodhousii fowleri*), the spadefoot toad is a sporadic breeder, breeding in temporary pools only when the proper environmental conditions develop (steep barometric drops accompanied by heavy rainfall). Breeding intervals may span several years (up to six) before the proper conditions take place. Eggs hatch in as little as two days and tadpole larvae may fully metamorphose within two weeks.

I hope you will find this information useful. Thank you for your interest in threatened and endangered species conservation.

Sincerely,

Christopher A. Urban, Chief
Natural Diversity Section

CAU/KDG/mr

pennsylvania
DEPARTMENT OF CONSERVATION
AND NATURAL RESOURCES

BUREAU OF FORESTRY

February 7, 2011

PNDI Number: 21121

Susan Myerov
Heritage Conservancy
85 Old Dublin Pike
Doylestown, PA 18901
FAX: 215-345-4328 (hard copy will not follow)

Re: Newtown Creek Watershed Conservation Plan
Newtown Twp, Newtown Borough, Bucks County

Dear Ms. Myerov,

Thank you for your submission of the Pennsylvania Natural Diversity Inventory (PNDI) Environmental Review Large Project Number **21121** for review. PA Department of Conservation and Natural Resources screened this project for potential impacts to species and resources of concern under DCNR's responsibility, which includes plants, terrestrial invertebrates, natural communities, and geologic features only.

No Impact Anticipated

PNDI records indicate no known species or resources of concern are located within the Newtown Creek Watershed boundary. However, our records do indicate that species or resources of concern are located in the vicinity of the project area. To aid in your planning, here is a list of species that are known approximately 2-3 miles away from the boundary of the watershed. No impact is anticipated and no action is being requested; this is for your information only:

Scientific name	Common Name	PA Current Status	PA Proposed Status
Andropogon glomeratus	Bushy Bluestem	Tentatively Undetermined	Rare
Bartonia paniculata	Screw-stem	Not Currently Listed	Rare
Gentiana saponaria	Soapwort Gentian	Tentatively Undetermined	Endangered
Juncus biflorus	Grass-leaved Rush	Tentatively Undetermined	Threatened
Panicum longifolium	Long-leaf Panic-grass	Tentatively Undetermined	Endangered
Carex crinita var. brevicrinis	Short Hair Sedge	Endangered	Endangered

This response represents the most up-to-date summary of the PNDI data files and is valid for one (1) year from the date of this letter. An absence of recorded information does not necessarily imply actual conditions on-site. Should project plans change or additional information on listed or proposed species become available, this determination may be reconsidered. Should the proposed work continue beyond the period covered by this letter, please resubmit the project to this agency as an "Update" (including an updated PNDI receipt, project narrative and accurate map).

PNDI Number: **21121**

This finding applies to impacts to DCNR only. To complete your review of state and federally-listed threatened and endangered species and species of special concern, please be sure the U.S. Fish and Wildlife Service, PA Game Commission, and the Pennsylvania Fish and Boat Commission have been contacted regarding this project as directed by the online PNDI ER Tool found at www.naturalheritage.state.pa.us.

Sincerely,

Rebecca H. Bowen

Rebecca H. Bowen, Environmental Review Manager FOR Chris Firestone, Wild Plant Program Mgr.
Ph: 717-772-0258 ~ c-rbowen@state.pa.us

2011-0338

HERITAGE CONSERVANCY

Preserving our Natural and Historic Heritage

ACCREDITED LAND TRUST ACCREDITATION COMMISSION

85 Old Dublin Pike
Doylestown, PA
18901-2489

(215) 345-7020
(215) 345-4328 Fax

www.heritageconservancy.org

letter of transmittal

To: US Fish and Wildlife Service Endangered Species Biologist 315 South Allen Street, Suite 322 State College, PA 16801	Date: **1/11/2011** Job Number: 33018
From: Susan Myerov, Senior Planner Heritage Conservancy 85 Old Dublin Pike Doylestown PA 18901	Project: Newtown Creek Watershed Conservation Plan

We Are Sending You ☒ **Delivering In Person** ☐

Copies	Date	No.	Description	Code
1	1/11/2011		PNDI Review Form for Newtown Creek Watershed	

These Are Transmitted As Checked Below (code):

A ☐ For approval	E ☐ Approved	I ☒ For review and comment
B ☐ For your use	F ☐ Approved as noted	J ☐ Submit ___ copies for distribution
C ☐ As requested	G ☐ Revise and submit	K ☐ For your files
D ☐ RETURN after review	H ☐ Not approved	L ☐ Other

Remarks:
Please find attached PNDI Project Planning & Environmental Review Form and USGS Topographic map showing project boundary for the Newtown Creek Watershed Conservation Plan. Please feel free to contact me at 215-345-7020 if any questions.

Thank you.

Susan Myerov

U.S. FISH AND WILDLIFE SERVICE
Pennsylvania Field Office
315 South Allen Street, Suite 322
State College, Pennsylvania 16801-4850

No federally listed species under our jurisdiction is known or likely to occur in the project area. This determination is valid for two years. Should project plans change, or if additional information on listed species become available, this determination may be reconsidered.

_____, Supervisor 2/10/11