

# Natural Resources Profile

Town of Bloomsburg Comprehensive Plan

## Natural Resources by the Numbers

Total acreage of Bloomsburg	3,014	-
Acres of forest coverage / Percent of total land	454	15.1%
Acres of cautionary slopes (15-25%) / Percent of total land	316	10.5%
Acres of steep slopes (>25%) / Percent of total land	141	4.7%
Acres of potential wetlands as identified in the National Wetland Inventory / Percent of total land	37	1.2%
Acres located in the 100-year floodplain / Percent of total land	1,421	47.1%
Number of Natural Areas Inventory sites	4	-
Acres of Natural Area Inventory sites / Percent of total land	476	15.8%
Total acres impacted by the above sensitive features / Percent of total land	2,018	67.0%

## Introduction

The natural environment is an important part of Bloomsburg's community and an essential part of this comprehensive plan. Natural resources influence local development patterns and economic opportunities. The surrounding environment in which we live is dynamic, scenic, and seasonal, providing opportunities and challenges for community lifestyles. Natural features are specific to a location, connected to the surrounding region, and rooted in the greater scheme of nature and its cycles.

The identification and characterization of Bloomsburg's natural resources is an important part of the planning process. Delineation of these resources serves as a guide for future planning decisions, as natural features are costly, both financially and ecologically, to disregard. This profile identifies and describes these features and their associated impacts and opportunities. Approximately 67% of Bloomsburg's land contains sensitive environmental features as detailed in this profile and shown on Map 3: Environmentally Sensitive Features. Understanding the location and sensitivity of these areas will help ensure that future development takes place in a sustainable manner.

## Geology and Groundwater<sup>1</sup>

The geologic formations in the Bloomsburg area came from two primary periods, which formed the Devonian Red Sandstone and the Silurian Red and gray sandstone. The Devonian Red sandstone is formed from gray shale, black shale, limestone. It is often deposited in flagstone, silica sand, clay, and lime. Silurian Red and gray sandstone is formed from conglomerate, shale, and limestone. It is often deposited in lime and building stone. There are geologic hazard areas in the Town, specifically Karst Areas, where limestone, dolomite, or both are found at the surface. Layers are usually strongly folded and steeply dipping. Karst areas include economically important high-calcium limestones of the Kinzers, Annville, Benner, and Keyser Formations and the Cockeyville Marble, as well as the high-

<sup>1</sup> Columbia County Comprehensive Plan, 1993; Columbia County Soil Survey; PA Geological Survey Map 7, Geologic Map of PA, DCNR USGS; National Water Information System; and Columbia County NAI, 2004.

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magnesium dolomites of the Ledger Formation and the Cockeysville Marble. These areas can be hazardous because they are susceptible to sinkhole development. To date, no sinkholes have been documented by PA DEP in eMapPA.

Columbia County is underlain by thirteen different sedimentary rock groups. Common subsurface constraints to development include subsidence hazards caused by mine fires and mined areas. These constraints are only found in the southern areas of the County.

Groundwater quality problems reported in Columbia County include excessive iron and manganese, hydrogen sulfide, hardness, bacterial organisms from sewage, acid mine drainage, excessive nitrates, and petroleum products from underground storage tanks.

The groundwater in the Bloomsburg area is used for only a limited number of on-lot wells. The public water supply distributed to most properties is drawn from Fishing Creek by United American.

### Topography and Steep Slopes

Bloomsburg is situated in the fertile valleys of the Appalachian Mountains along the North Branch of Susquehanna River. To the south of the town are the Catawissa Mountains and to the north is the Nob Mountain Range. The town is located in Columbia County, a vast area that extends from the edge of the Allegheny Plateau in the north to the coal beds of the Appalachian Ridge and Valley Province in the south. The town's landscape is one of rolling hills and valleys interspersed with steep slopes.

Slopes with grades of 15 percent or greater are considered steep by municipal planning standards and are prone to higher erosion rates than lesser grades. If disturbed, these areas can yield greater sediment loads on streams. Very steep slopes, with grades over 25 percent, produce heavy soil erosion and sediment loading.

There are approximately 141 acres of land with steep slopes (greater than 25%) in the municipality of Bloomsburg. Most of the Turkey Hill Oxbow is classified as steep slopes. Approximately half of the land located in the northern area of Bloomsburg has steep slopes. The central and southern area of the town adjacent to Fishing Creek and the Susquehanna River, the nucleus and urban node of Bloomsburg, are not steeply sloped, which is where the majority of the development in the town has occurred.

The Town's zoning and development regulations provide no specific preservation of steep slopes areas; however, all planned development must be reviewed by the Columbia County Conservation District for appropriate erosion and sediment control.

Though erosion and runoff in steep slope areas are natural processes, development activities located in these areas can alter the gradients and upset the natural balance. However, by redirecting water runoff from buildings and impervious surfaces away from the face of steeper slopes, severe soil erosion and drainage problems can be avoided.

The four factors influencing soil erosion are vegetation, soil type, slope size and inclination, and the frequency and intensity of rainfall. On most surfaces, vegetative cover is the single most important erosion control factor. The more surfaces are covered with vegetation, the less runoff occurs. Vegetation absorbs the impact of rainfall to the soil surface.

On-lot sewage disposal systems are impractical to construct and maintain on very steep slopes because the downhill flow of the effluent is too rapid. Improperly treated effluent is likely to surface at the base of the slope, causing wet, contaminated seepage spots. If there is a layer of impervious material such as dense clay or rock under shallow soils, the effluent may surface on the slope and run downhill unfiltered, potentially contaminating surface waters.

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## Soils

There are twelve mapped soil associations in Columbia County.<sup>2</sup> The Chenango-Barbour-Pekin and Westmoreland-Litz Associations are present in Bloomsburg. The Chenango-Barbour-Pekin Association comprises alluvial terraces and floodplains with good productivity for farming and timber. The Westmoreland-Litz Association is well suited for agriculture due to high yield production but has also been used for community development. Both are well drained to poorly drained soils yet are moderately limited for on-lot septic systems.

Hydric soils are common in Columbia County and Bloomsburg and are defined by the National Technical Committee as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions.

The most prevalent soils found in the County exhibit moderate to severe limitations to development as characterized in the Columbia County Comprehensive Plan. As a result, development throughout the County is relatively concentrated in areas with fewer limitations, such as Bloomsburg.

Like many municipalities along the Susquehanna River, the majority of Bloomsburg's soils are classified as prime agricultural soils. Several Columbia County farmers have enrolled their farms in the Agricultural Security Area Program and 18 have preserved their farms through the County's Agricultural Conservation Easements Program. None of these is located in Bloomsburg, since these programs were established after much of Bloomsburg was developed.

## Surface Waters and Watersheds

Bloomsburg is located in the Upper Susquehanna-Lackawanna Watershed, hydrologic unit HUC02050107. Its local tributaries are Fishing Creek and Kinney Run.

### Surface Water Supply

The Susquehanna River corridor is susceptible to both frequent flooding and seasonal low water levels.

The Commonwealth of Pennsylvania's Code identifies water uses which shall be protected, and upon which the development of water quality criteria shall be based. They are listed and accompanied by their identifying symbols in Table 5-1. Potable water supply is the highest water supply standard and is also suitable for industrial, livestock, wild life, and irrigation.

### Surface Water Quality

Degraded surface waters in Columbia County include the Susquehanna River. Non-point sources of pollution are the most common including: sedimentation from cultivated and developed land along the river, runoff from roadways, pesticide runoff from agricultural fields, discharge of chemical pollutants and thermal pollution.

Toxins, excess nutrients and sediments from erosion are a few of the problems facing water quality in the Susquehanna and the Chesapeake Bay watersheds.

(<http://www.acb-online.org/pubs/projects/deliverables-153-3-2003.pdf>).

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<sup>2</sup> Columbia County Comprehensive Plan, 1993; Columbia County NAI, 2004; and USDA Columbia County Soil Survey.

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**Table 5-1 Pennsylvania’s Code of Protected Water Uses**

Symbol	Protected Use
<b>Aquatic Life</b>	
CWF	<i>Cold Water Fishes</i> —Maintenance or propagation, or both, of fish species including the family Salmonidae and additional flora and fauna which are indigenous to a cold water habitat.
WWF	<i>Warm Water Fishes</i> —Maintenance and propagation of fish species and additional flora and fauna which are indigenous to a warm water habitat.
MF	<i>Migratory Fishes</i> —Passage, maintenance and propagation of anadromous and catadromous fishes and other fishes which ascend to flowing waters to complete their life cycle.
TSF	<i>Trout Stocking</i> —Maintenance of stocked trout from February 15 to July 31 and maintenance and propagation of fish species and additional flora and fauna which are indigenous to a warm water habitat.
<b>Water Supply</b>	
PWS	<i>Potable Water Supply</i> —Used by the public as defined by the Federal Safe Drinking Water Act, 42 U.S.C.A.
IWS	<i>Industrial Water Supply</i> —Use by industry for inclusion into nonfood products, processing and cooling.
LWS	<i>Livestock Water Supply</i> —Use by livestock and poultry for drinking and cleansing.
AWS	<i>Wildlife Water Supply</i> —Use for waterfowl habitat and for drinking and cleansing by wildlife.
IRS	<i>Irrigation</i> —Used to supplement precipitation for growing crops.
<b>Recreation and Fish Consumption</b>	
B	<i>Boating</i> —Use of the water for power boating, sail boating, canoeing and rowing for recreational purposes when surface water flow or impoundment conditions allow.
F	<i>Fishing</i> —Use of the water for the legal taking of fish. For recreation or consumption.
WC	<i>Water Contact Sports</i> —Use of the water for swimming and related activities.
E	<i>Esthetics</i> —Use of the water as an esthetic setting to recreational pursuits.
<b>Special Protection</b>	
HQ	<i>High Quality Waters</i>
EV	<i>Exceptional Value Waters</i>
<b>Other</b>	
N	<i>Navigation</i> —Use of the water for the commercial transfer and transport of persons, animals and goods.

**Table 5-2 Surface Water Quality**

River/Stream	Designated Water Uses	Attained Water Use	Source of Impairment	Impaired Water Use
Susquehanna River	Warm Water Fisheries	Not available	Source Unknown - PCB; Source Unknown - Mercury	Fish Consumption
Kinney Run	Cold Water Fisheries	Not available		
Fishing Creek	Warm Water Fisheries	Aquatic Life Potable Water Supply	Source Unknown - Mercury	Fish Consumption
Tributary to Fishing Creek	Cold water Fisheries	Aquatic life		

Source: PA DEP eMap

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### Water Resource Organizations & Other Related Watershed Planning

Several regional organizations are focused on water resource protection for the Susquehanna River. However, there are no local water resource monitoring groups in the Bloomsburg area.

1. *Susquehanna River Basin Commission (SRBC)*

The 1970 Susquehanna River Basin Compact, adopted by Congress and the Pennsylvania, Maryland, and New York legislatures, established the Susquehanna River Basin Commission (SRBC). The mission of the SRBC is to enhance public welfare through comprehensive planning, water supply allocation, and management of the water resources of the Susquehanna River Basin. Moreover, the compact established comprehensive planning as one of the primary duties of the SRBC. Sections 3.3 and 4.1 of the compact require the formulation of a comprehensive plan for the immediate and long-range use, management, and development of the water and related land resources of the basin. SRBC's Comprehensive Plan, originally adopted on December 13, 1973, provides a basin wide strategy to serve SRBC and others in regard to the management of the water resources of the basin whereby the goals set forth in the compact, and such goals and objectives as may be determined by SRBC, may be effectively and efficiently achieved. The Commission also conducts specialized water resource planning projects as part of its responsibilities. An example of this is the development of a regional ground-water management plan.

2. *Susquehanna River Watch Inc.*

To stimulate and coordinate the planning, design, and development of projects that will create and raise the level of public awareness in preserving, protecting and revitalizing the valuable resources encompassed by the Susquehanna River, its tributaries and watershed; to unite community groups to bring concerted action to bear on selected priority projects; to help community members and groups engage in meaningful activity directed toward these goals; and to publish the achievements of these members and groups engage in meaningful activity directed toward these goals; and to publish the achievements of these members and groups in the community.

3. *Fishing Creek Watershed Association*

Starting in the headwaters, the FCWA has developed a remediation plan to reduce high acidity levels in the East Branch of Fishing Creek. The 1.8 million dollar plan consists of several alkalinity producing systems that will improve the water quality for fish and aquatic organisms. A substantial set of water quality data has been obtained throughout Fishing Creek over the past 10 years. At Kocher Park in Lightstreet, a highly degraded stream bank was restored about 6 years ago using Fluvial Geomorphology methods consisting of several large rock veins and streambank grading. Currently, some repair is needed on the bank and rock structures. A PA Growing Greener grant has been obtained and repair designs are being considered. The FCWA also partnered in the removal of the trussel dam downstream of Lightstreet. On top of the actual hands on projects, providing education to the public about watershed systems and protection has been a huge focus.<sup>3</sup>

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4. *Alliance for Aquatic Resource Monitoring (ALLARM)*

The Alliance for Aquatic Resource Monitoring (ALLARM), a project of the Environmental Studies Department at Dickinson College, partners with Pennsylvania communities and individuals who are working to protect and restore watersheds. Founded in 1986, ALLARM's

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<sup>3</sup> Email correspondence with Shon Robbins, June 2008.

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original mission was to study the effect of acid deposition on Pennsylvania's waterways. To that end, volunteer monitors have gathered data on a weekly basis at over 550 sites in 96 percent of Pennsylvania counties. This information, widely recognized as the most comprehensive database on pH and alkalinity of Pennsylvania streams, is used by conservation organizations as well as local and state government for policy development. In 1996, ALLARM expanded its focus and began to work with locally based groups to develop watershed-based water quality monitoring programs. The database is located online at <http://alpha.dickinson.edu/storg/allarm/index.htm>. Through Students Monitoring Aquatic Resources Together (SMART), the group assists school teachers in educating students about the environment. ALLARM's Technical Support Center works cooperatively with volunteer stream monitoring groups (see Citizens Volunteer Monitoring Program below) across Pennsylvania to identify the watershed issues specific to that community.

## Stormwater Management Planning - Act 167 Plans

The Pennsylvania Stormwater Management Act requires counties to prepare stormwater management plans. These plans document existing problem areas and provide general information on potential solutions. The mainstay of these plans is to establish storm water runoff control criteria for future development within the watershed.

A key objective of a stormwater management plan is to coordinate decisions of the watershed municipalities, therefore plans must be prepared in consultation with the affected municipalities. Once the plans have been approved by the PADEP, they are required to be implemented through municipal adoption of ordinance provisions consistent with the plan.

Historically, these plans were prepared on a watershed basis; however a countywide basis is now being encouraged by the Pennsylvania Department of Environmental Protection (PA DEP) in order to complete initial planning statewide. A stormwater management plan has been completed and approved for the Susquehanna River watershed through Columbia County. This plan was completed in 2003. Columbia County has not yet begun to prepare a stormwater management plan for the remainder of the county.

## Best Practices for Stormwater Management

Pennsylvania's Stormwater Best Management Practices (BMP) Manual provides guidance, options, and tools to protect water quality, enhance water availability and reduce flooding potential through stormwater management. The manual outlines methods to prevent or minimize stormwater problems through comprehensive planning and development techniques and mitigate any remaining potential problems by employing structural and non-structural BMPs. It addresses volume, peak rate and quality in principle and applies them to structural, non-structural, and integrated site design methods. The manual is available at PA DEP's Online Library.

## Rivers Conservation Planning

### Rivers Conservation Plan for the North Branch of the Susquehanna River

The Pennsylvania Rivers Conservation Program (RCP) has been developed by PA DCNR to conserve and enhance river resources (including creeks and

### Pennsylvania's Stormwater Best Management Practices

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- Foreword
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streams) through preparation and accomplishment of locally initiated plans. The program provides technical and financial assistance to municipalities and river support groups to carry out planning, implementation, acquisition and development activities. Rivers conservation planning has additional benefits in that completed rivers conservation plans help qualify conservation organizations and local governments for future funding.

The Rivers Conservation Plan for the North Branch of the Susquehanna River was completed in 2004. It inventoried land, water, biological and cultural resources within a 2-mile corridor centered on the upper portion of the North Branch namely the Great Bend region and the main stem from Sayre, Bradford County to Pittston, Luzerne County. The plan's recommendations emphasized:

- More park, recreational facilities and river access points
- Greater use of storm water management plans
- Greater use of erosion control practices
- Restoration, preservation, and interpretation of historic resources
- Development of eco-tourism
- Educational signage and events

Conservation and recreational development strategies have not been developed for the North Branch of the river from Pittston to Northumberland.

### Scenic Rivers and Water-based Recreation

Clean, abundant water supply is indeed essential for life. But in addition to consumptive uses, water plays a significant role in outdoor recreational activities. From fishing and boating to swimming and appreciation of scenic and wildlife features, waterways are an integral part of outdoor recreation.

#### The Susquehanna River Water Trail - North Branch

The Susquehanna River Trail - North Branch is 166 miles and extends from Sayre to Northumberland/Sunbury. It features meandering river cuts in the Endless Mountains and Wyoming Valley, river towns, Native American lookout points, and the remnants of the North Branch canal system. The North Branch of the water trail is managed in partnership by the Endless Mountains Heritage Region and the Pennsylvania Environmental Council with assistance from the Susquehanna Greenway Partnership. A paddler's map and guide is available from outfitters and other retailers throughout the region.

Benefits of water trails, as noted by the Susquehanna River Trail Association which manages the next southern water trail segment, include:

- Water trails help to promote the discovery of watershed wonders, which helps to build a river ethic in citizens.
- Trail guides, river exploration, and educational programming nurture a citizenry that will be more aware and knowledgeable about their river and its connection to the Chesapeake Bay.
- Water trails, especially those in urban areas, build new river constituencies and afford new and meaningful recreation opportunities to city residents, especially minority youth.
- The focus of empowering volunteers in resource stewardship is a valuable lesson with far reaching implications.
- Water trails are a great example of ecotourism, demonstrating a more sustainable approach to river recreation.

### Floodplains

Due to its location at the confluence of Fishing Creek with the Susquehanna River, flooding is a significant natural hazard to the Town of Bloomsburg. The flood that has a 1% chance of occurring each year is called the "base" flood. The land that the base flood would cover with water is called the 100 year floodplain. The 100 year floodplain in Bloomsburg includes the town park, municipal airport,

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approximately 400 homes, the Bloomsburg Industrial Park and the Fairgrounds. See Map 6 for the 100 year floodplain location.

The Federal Emergency Management Agency (FEMA) delineates the base flood elevation and flood hazard locations. The official flood stage (where flooding starts to cause property damage) is reached when the water level at the Bloomsburg gage on the Route 487 bridge exceeds a stage of 19 feet. This equates to 470 feet above sea level. The base flood is reached at a stage of 28 feet, or 479 feet above sea level at Route 487. When water reaches the base flood elevation, 1,421 acres of the Town lie under water.

### Flood History

The Town has experienced three floods higher than the base flood: 1904; Hurricane Agnes in 1972; and 2006. The Town has also experienced other floods that came within a foot of the base flood level in 1936 and 2004. Five floods since 1972 were within five feet of the base flood stage: in 1979, 1984, 1993, 1996 and 2005.

### Flood Damage<sup>4</sup>

Past flood events have resulted in extensive damages to structures and their contents and have threatened public safety. In addition, floods have disrupted major transportation systems, requiring closure of roads, railroads, and the municipal airport. Flood damages are attributable to overbank flooding from the Susquehanna River and to flooding along Fishing Creek, which is exacerbated by backwater flooding from the Susquehanna River. In the vicinity of Bloomsburg, the river has very little slope and has shallow banks. As a result, the river flows more slowly in this reach. When the Susquehanna River overflows its banks, it hinders normal discharge from Fishing Creek to the mainstream of the Susquehanna, resulting in backwater flooding on Fishing Creek. When the Susquehanna River and Fishing Creek simultaneously rise above flood stage, overbank flooding can cover up to 33 percent of the landmass within the Town of Bloomsburg's boundaries.

Failure to provide flood damage reduction measures could, in the predictable occurrence of a significant flood, contribute to the loss of life, as well as physical and environmental damage. Significant flooding can result in the overtopping of sewage treatment works, contamination of drinking water supplies and dispersion of hazardous, toxic or radioactive waste and dispersion of large quantities of solid waste.

### Bloomsburg's Efforts to Reduce Flood Damage

Bloomsburg was well established as a riverside community long before formal floodplain delineation and land use and development regulations were put in place. Therefore, most properties are not subject to current floodplain zoning regulations unless they are substantially improved and zoning cannot be considered independently as a long-term mitigation solution for flood damage reduction to existing structures.<sup>5</sup>

The Town's efforts to reduce damage from flood hazards include:

1. Floodplain management - Bloomsburg manages land use and development regulations for flood hazard areas. In 1974, Bloomsburg enacted its floodplain management ordinance to restrict intensive land uses and development from the floodplain.

<sup>4</sup> Town of Bloomsburg, Columbia County, Pennsylvania Flood Damage Reduction Project Final Integrated Feasibility Report and Environmental Impact Statement, U.S. Army Corps of Engineers, Baltimore District, April 2005.

<sup>5</sup> Ibid.

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2. Participation in the National Flood Insurance Program (see below) in order to make flood insurance available
3. Inspection and cleaning of the streets, channels and drainageways to reduce the chances that blockages will cause flooding
4. Acquisition of properties that are repeatedly flooded
5. Maintenance of a flood warning and response program
6. Implementation of a Hazard Mitigation Plan (2005).

### Flood Insurance for Property Owners

Bloomsburg has participated in the National Flood Insurance Program since 1974. Because the Town of Bloomsburg participates in the National Flood Insurance Program, local insurance agents can sell flood insurance policies backed by the federal government. In addition, the town is one of only 28 communities in Pennsylvania in the NFIP's Community Rating System, an incentive program with the NFIP that rewards communities with discounts on flood insurance policies based on pro-active steps the community takes to reduce flooding within its boundaries. For CRS participating communities, flood insurance premium rates are discounted in increments of 5 percent. Bloomsburg is rated as a Class 8 community, and flood insurance policyholders receive a 10-percent premium discount.<sup>6</sup>

### Proposed Flood Mitigation Project<sup>7</sup>

The Final Integrated Feasibility Report and Environmental Impact Statement analyzes the potential environmental consequences of implementing a flood damage reduction project in Bloomsburg, Pennsylvania. It investigates the feasibility of alternative plans to address problems and opportunities associated with flood damage reduction along the Susquehanna River and Fishing Creek in the Town of Bloomsburg. The recommended flood damage reduction plan is intended to provide an Agnes (440-year) level of protection from Susquehanna River flooding, and 100-year level of protection from Fishing Creek flooding. The proposed action, Alternative 4, would provide approximately 17,000 linear feet of earthen levee, and mechanically stabilized earth flood walls (14 feet above the existing ground surface), concrete floodwalls, railroad and road closure structures and roadway relocation to provide ramps over the line of protection, was identified as the preferred alternative.

Real estate acquisitions and easements would be required:

	Total Acquisitions	Total Acres
Fee Simple Acquisition (27 residential, 4 commercial, 1 trailer Park)	32	13.1
Perpetual Flood Protection Levee/Floodwall Easements (59 residential, 3 commercial)	62	31.3
Residential Flowage Easements	4	1.2
Temporary Work Area Easements (59 residential, 3 commercial)	62	9.4

The proposed action has a total average annual cost of \$2,583,200 and total average annual benefits of \$3,565,200, resulting in a benefit-cost ratio of 1.38 to 1 and average annual net benefits of \$982,000.

The fully-funded cost for design and construction of the flood protection system is \$46,239,000. The federal government share of the project's cost is and the non-Federal share of total first costs.

<sup>6</sup> Ibid.

<sup>7</sup> Ibid.

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<b>Flood Protection Project Costs</b>	
Federal Project Cost (65%)	\$30,055,350
Non-federal Project Cost (35%)	\$16,183,650
5% Cash (minimum)	\$2,311,950
Lands, Easements, Rights-of-Way, Relocations and Disposal/Borrow Areas	\$12,833,000
Cash Balance (up to 35%)	\$1,038,700
<b>Total Cost</b>	<b>\$46,239,000</b>

The Town intends to use local funds, private contributions and state assistance to fund the non-federal project cost.

In the event that hazardous substances are encountered during construction, additional mitigation costs may be required for proper disposal in response to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). These costs are estimated at \$895,600 and are the responsibility of the Town.

In addition, costs to operate, maintain, repair, replace, and rehabilitate the completed project, or functional portion of the project, including mitigation features, consistent with federal requirements would become the responsibility of the Town. These costs are estimated at \$185,300 per year.

Non-structural measures were considered among the alternatives in the study. Comprehensive buyout and relocation costs for approximately 425 structures in the 100-year floodplain would exceed \$80 million. Because this approach would not likely meet Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies nor National Economic Development guidelines and would have negative social and regional economic impacts, a floodplain buyout plan was removed from consideration.

The preliminary implementation schedule is based on information available to date, and is largely dependent on when the project is authorized in the Water Resources Development Act (WRDA). The estimated implementation schedule as provided in the report and estimated by the Town is as follows:

<b>Implementation Schedule</b>	<b>Per the 2005 Report</b>
Complete Feasibility Phase	December 2005
Project Construction Authorization (assumed to be provided in the Water Resources Development Act)	2005
Design Agreement Executed	Late 2005/ Early 2006
Plans and Specifications Development	2006-2008
Project Cooperation Agreement Executed	2008/2009
Real Estate Acquisition	2009
Section 215 Agreement Executed (if needed)	2008
Construction	2010-2013

### Community Impacts of the Proposed Flood Protection Project

The proposed flood protection project would result in temporary impacts as well as permanent “unavoidable adverse effect[s] on the community”:<sup>8</sup>

<sup>8</sup> Ibid.

## Alternative Approach to Flood Mitigation: Living in Harmony with a Dynamic Water System

In the past, efforts to reduce flood losses often relied on trying to control floodwaters, rather than encouraging people to avoid flood hazard areas. Yet, despite the expenditure of billions of tax dollars for "flood control" structures, such as dams, levees, and stream channelization, flood losses continued to rise. In addition, this structural approach frequently had adverse impacts on the natural resources and ecological integrity of our rivers and floodplains.

In recent years and as our scientific understanding of ecosystems grows, many communities have come to recognize that the floodplain environment is an important community asset with intrinsic natural functions. For example, the recognized benefits of a naturally functioning floodplain include the storage and conveyance of flood waters, the recharging of groundwater; the maintenance of surface water quality, and the provision of habitats for fish and wildlife. These areas also provide diverse recreational opportunities, scenic value, and a source of community identity and pride. Many communities have taken the initiative to create greenways, riverside parks, and other popular amenities. Clearly, the potential gains of transforming stream and river floodplains from problem areas into value-added community assets are substantial. Significantly, protecting the natural resources and functions of floodplains has proven to be effective in reducing flood losses as well.

In response to request from state and local officials, planners, engineers, property owners, and others for information on flood hazard mitigation methods that will preserve the integrity of floodplain systems, The Federal Interagency Floodplain Management Task Force prepared a guidebook, *Protecting Floodplain Resources*, to help in the development of a community action plan to protect and restore important floodplain resources and functions.

Rivers and their floodplains are dynamic and complex natural systems that can provide important societal benefits, both economic and environmental. By adapting to the natural phenomenon of flooding, rather than trying to control floodwaters, we can reduce the loss of life and property, protect critical natural and cultural resources, and contribute to the sustainable development of our communities. In towns and cities across the nation, protecting and restoring floodplain resources will enhance the quality of life for this and future generations into the 21st century, and beyond.

Throughout the brief history of floodplain management in the U.S., three themes have emerged. The first is the story of our evolving understanding of the complexity of natural resource functions. The second is our recognition of limitations on our ability to control floods. And the third -perhaps the most important -is the story of shifting responsibility. Although the burden of flood hazard protection was accepted by the federal government earlier in this century, we have come to recognize that the most sensible, least costly approach to, flood hazard protection may have less to do with dams and disaster relief and more to do with land-use patterns within floodplains and the contributing watershed. In the U.S., most land-use decisions are made at the local level. This means that there must not only be a renewed emphasis on community responsibility for preventing flood losses, but also for stewardship of the valuable natural functions associated with floodplains.

*"Rivers were here long before man, and for untold ages every stream has periodically exercised its right to expand when carrying more than normal flow. Man's error has not been the neglect of flood control measures, but his refusal to recognize the right of rivers to their floodplain..."*  
*Engineering News-Record, 1937*

Adapted from *Protecting Floodplain Resources: A Guidebook for Communities*, FEMA 268, 1996.

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- The alignment of the flood protection under Alternative 4 would require the permanent removal of an estimated 22 residences, three commercial structures, one County building, and the relocating of a trailer park.
- Approximately 11.5 acres of farmland designated as Prime Farmland or Additional Farmland of Statewide Importance would be permanently converted to non-agricultural use.
- Approximately 0.69 acres of existing Fishing Creek stream bottom habitat would be manipulated and altered for placement of riprap. This impact will be offset by a mitigation project consisting of a fish passage project at Boone's Dam in lower Fishing Creek.
- Permanent, unavoidable adverse effects would occur to the visual resources. Views that currently include Fishing Creek from Bloomsburg or Fernville would be unavoidably obscured by the levee/floodwall system. Views from Fishing Creek (typically from recreational users) would be diminished, as would views from within the Fairgrounds property.

### Wetlands<sup>9</sup>

The US Fish and Wildlife Service has classified approximately 1,952 acres as wetlands in Columbia County of which 37 acres of wetlands are found in Bloomsburg. Wetlands typically include swamps, marshes, bogs, and other similar areas. Wetlands help to moderate stormwater runoff, are natural water storage areas, and provide a special habitat for many species. Wetlands are important to the environment and are designated areas to be avoided when developing land.

Laws, such as the Federal Clean Water Act and similar state and local laws have led to the enforcement of wetland protection. In Pennsylvania, the U.S. Army Corps of Engineers and the Pennsylvania Department of Environmental Protection strictly regulate development in wetland areas. Therefore, any development of these areas is subject to both federal and state permitting processes. Furthermore, municipal ordinances may also outline provisions to help protect wetlands. Bloomsburg's Subdivision and Land Development Ordinance does have a Drainage and Stormwater Management Section, with provisions for water run-off. The Zoning Ordinance has a Residential Conservation District, yet does not specifically note provisions for watersheds.

In Bloomsburg, there are several areas where wetlands are located. The largest wetland is in the northern portion of the municipality in the Turkey Hill Oxbow near Fishing Creek, as mentioned in the NAI. This oxbow of Fishing Creek occurs between the forested slopes of Turkey Hill and I-80. The hemlock - hardwood slopes have several skunk cabbage seeps that feed the floodplain wetlands below. The extensive wetlands are forested wetlands, shrub swamps, graminoid openings and areas of open water, as well as the floodplain of the former creek bed. During high water events, the oxbow serves as an overflow channel of Fishing Creek, becoming flooded with water. During dry spells, the oxbow will dry down to the isolated deeper open water areas. This fluctuating water level provides the conditions for an interesting type of habitat for a variety of plants and animals.

Several smaller wetlands are concentrated together and located in the south western portion of Bloomsburg in the 100-year floodplain located between Fishing Creek and the Susquehanna River. These wetlands are noted in the NAI.

### Vegetation and Wildlife<sup>10</sup>

The vegetation in Columbia County has been summarized in the Columbia County NAI, 2004. Oak species comprise the Appalachian Oak Forest, which is the dominant vegetation type in the uplands of

<sup>9</sup> US Fish and Wildlife Service; Columbia County Comprehensive Plan, 1993; and Columbia County NAI, 2004.

<sup>10</sup> Columbia County NAI, 2004.

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Columbia County.<sup>11</sup> White Oak (*Quercus alba*), Northern Red Oak (*Quercus rubra*), and Chestnut Oak (*Quercus montana*) dominate the upland forest communities along with an array of other hardwood species. Hardwood associates such as Scarlet Oak (*Quercus coccinea*), Black Birch (*Betula lenta*), Red Maple (*Acer rubrum*), Black Gum (*Nyssa sylvatica*), Hickory (*Carya* sp.), American Beech (*Fagus grandifolia*) and Tulip Poplar (*Liriodendron tulipifera*) are the major associates within an Appalachian Oak Forest.<sup>12</sup> The understory of Appalachian Oak Forests typically consists of Mountain Laurel (*Kalmia latifolia*), low sweet blueberry (*Vaccinium angustifolium*), Lowbush blueberry (*Vaccinium pallidum*), Black Huckleberry (*Gaylussacia baccata*), Witch Hazel (*Hamamelis virginiana*), and other species. A good example of an Appalachian Oak Forest in Columbia County includes the forested slopes of Catawissa and Nescopeck Mountains, which are located to the south of Bloomsburg, across the Susquehanna River.

The diverse vegetation, mix of soils, and climate in Pennsylvania provides for a healthy habitat that enables a variety of species and vegetation to thrive. This combination is what makes this region unique. Even residential areas in Bloomsburg are home to several common mammals including, whitetail deer, woodchuck, striped skunk, Eastern cottontail, Eastern red squirrel, Eastern gray squirrel, raccoon and Eastern chipmunk. Along Fishing Creek, physical evidence of beaver activity has been observed (e.g. branches with bark stripped and gnaw marks).

Birds common along Fishing Creek include great blue herons, Canada geese, and mallards. In dense riparian thickets and adjacent to wetlands in the Fairgrounds, gray catbirds, yellow warblers, red-winged blackbirds, common yellowthroat and song sparrow are common summer residents. The mowed areas of the Fairgrounds are frequently utilized as grazing areas for summer resident Canada geese. In the residential area of the Town, mourning dove, house sparrow, rock dove, blue jay and American robin have been observed.<sup>13</sup>

Reptiles likely represented within Bloomsburg include spring peeper, bullfrog, American toad, Eastern garter snake, northern water snake, snapping turtle and wood turtle. The numbers and health of the reptiles in an area is an important indicator of the overall quality of the environment.<sup>14</sup>

Bloomsburg's location near the confluence of Fishing Creek and the Susquehanna River gives residents access to both the cool water stocked sections of Fishing Creek upstream of Light Street, as well as the varied warmwater/coolwater fishery in the creek's lower end and in the Susquehanna River.<sup>15</sup>

Columbia County is home to over 342 species of fish, amphibians, reptiles, birds, and mammals. Of these 342, seven species are listed as endangered and four species are listed as threatened. Two of the endangered species include the Bald Eagle and the Peregrine Falcon. The Susquehanna River is a popular migration corridor for a variety of bird species. Except for the occasional transient species, no federally listed endangered, threatened, or candidate species under U.S. Fish and Wildlife Service (USFWS) jurisdiction are known to exist in Bloomsburg. In addition, no State listed endangered or threatened species of birds or mammals are known to exist within the Town and no State Game Lands are located close enough to anticipate any impacts.<sup>16</sup>

## Scenic Features and Vistas<sup>17</sup>

<sup>11</sup> The Pennsylvania Atlas, 1982.

<sup>12</sup> The Pennsylvania Atlas, 1982.

<sup>13</sup> Bloomsburg Integrated Feasibility Report & Final Environmental Impact Statement, 2005.

<sup>14</sup> Ibid.

<sup>15</sup> Bloomsburg Integrated Feasibility Report & Final Environmental Impact Statement, 2005.

<sup>16</sup> Ibid.

<sup>17</sup> Columbia County NAI, 2004 and Columbia County Comprehensive Plan, 1993.

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Located between Fishing Creek and the Susquehanna River, surrounded by water and mountains, Bloomsburg is a scenic place to live. Natural resources are abundant and wildlife is as diverse as the landscape. Forested areas and the diverse terrain make it an attractive place for the outdoor enthusiast.

### 1. *Fishing Creek*

Fishing Creek is a cold limestone stream filled with deep pools and fast runs of water making it a scenic and important environmental resource for Bloomsburg. The Creek is supported by cold limestone springs and tributaries making it one of the most popular fishing areas in central Pennsylvania.

### 2. *The Susquehanna River*

The Susquehanna River provides a habitat for many natural resources and is a significant migration corridor, in addition to a major water resource in the area making it a significant natural, recreational, and scenic asset in the Town. The river is identified as a priority scenic river candidate in the Columbia County Comprehensive Plan.

### 3. *Turkey Hill Oxbow*

The Turkey Hill Oxbow consists of extensive wetlands including forested wetlands, shrub swamps, and areas of open water, as well as the floodplain of the former creek bed. The fluctuating water level provides the conditions for an interesting type of habitat for a variety of plants and animals.

### 4. *Espy Bog*

The Espy Bog consists of the lake and the wetlands sandwiched between the Town and Route 11. There is good plant and animal diversity in this area making it a significant natural and scenic feature. Runoff from the adjacent railroad and Rt-11 represent a continued influence of non-point source pollution on the Espy Bog habitat. Residential and commercial developments currently surround the wetlands. Changes in the hydrology of the site, such as dams or draining, would severely reduce the quality of this habitat.

### 5. *Columbia County Covered Bridges Tour*

In January 2001, citizens in Columbia County officially developed the Columbia County Bridges Association. The group formed to recognize the importance of covered bridges as a public treasure to be enjoyed and available to the public and to realize their importance to tourism. The Columbia County Covered Bridges Tour passes through Bloomsburg at the Rupert Bridge. Covered bridges are scenic and provide beautiful frames to view natural scenery. The Rupert Bridge is located on Township Route 449, near Route 42 between the Town of Bloomsburg and Montour Township, spanning Fishing Creek. The Bridge was built in 1847 and named for the gentleman who established a ferry to cross the river and opened his home to resting travelers.

## Findings

- Bloomsburg's identity is influenced by the area's rolling topography, its agriculturally productive soils, the native oak forest, its riverside and creekside location, and the wildlife associated with these habitats.
- Proximity to forested areas and waterways allows for recreational and tourism opportunities in the great outdoors.
- Bloomsburg could support agricultural preservation efforts in the county to protect local land for food production. This support could be political advocacy or financial in nature.
- Approximately 67% of Bloomsburg's land contains sensitive environmental features such as floodplains, wetlands, steep slopes and natural areas that can be negatively impacted by development.

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- Both Fishing Creek and the Susquehanna River contain mercury and the river, PCBs. Sources are not known but are believed to be located upstream as the impaired classification extends upstream beyond the Pennsylvania-New York border. The river carries these pollutants downstream, through many other riverside communities, to the Chesapeake Bay and the Atlantic Ocean.
- Fishing Creek and the Susquehanna River flood frequently. Much of the Town lies within the 100 year floodplain and is affected. When the Susquehanna River overflows its banks, it hinders normal discharge from Fishing Creek to the mainstream of the Susquehanna, resulting in backwater flooding on Fishing Creek. When the Susquehanna River and Fishing Creek simultaneously rise above flood stage, overbank flooding can cover up to 33 percent of the landmass within the Bloomsburg's boundaries.
- The Town has instituted systems for early warning, evacuation, and damage reduction. With the assistance of state and federal governments, it intends to construct a flood protection system consisting of floodwalls, levees, and railroad and road closure structures to provide a specified level of protection. The proposed flood protection system will require the removal of an estimated 22 residences, three commercial structures, one County building, and the relocating of a trailer park; the conversion of 11.5 acres of quality to non-agricultural use, as well as physical and visual obstruction to the river and creek.
- Until the proposed flood protection system is complete, floodplain management including forested vegetation and stream bank stabilization, where needed, would minimize flood damage, prevent water pollution by filtering runoff, and protect stream bank and wetland habitat.
- Pennsylvania's Stormwater Best Management Practices (BMP) Manual provides guidance, options, and tools to protect water quality, enhance water availability and reduce flooding potential through stormwater management.
- In the event that construction of the flood protection system becomes unfeasible, the Town, in conjunction with its state and federal agency partners, should consider a comprehensive approach to living in harmony with the area's dynamic waterways that includes enforcement, relocation, acquisition, in-place elevation of structures, barriers, and both wet and dry floodproofing measures. "No adverse impact" is one model for such an approach; information is available from the Association of State Floodplain Managers, <http://www.floods.org>.

# Natural Resources Profile

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