



NJDEP SFY 2007 319(h) NPS Pollution Control and Management Grant (RP07-070)

Upper Paulins Kill Watershed Restoration Plan - Volume I
September 2012



Prepared By:

Ernest Hofer, PE
Watershed Specialist

Nathaniel Sajdak
Watershed Director

Eric VanBenschoten
Agricultural Outreach Specialist

WALLKILL RIVER WATERSHED MANAGEMENT GROUP - SUSSEX COUNTY MUNICIPAL UTILITIES AUTHORITY
34 South Route 94 Lafayette, New Jersey 07848
www.wallkillriver.org

Acknowledgements

The developed Watershed Restoration Plan for the Upper Paulins Kill Watershed was developed with significant services from North Jersey Resource Conservation and Development (NJRC&D) Council, the Sussex County Office of Geographical Information Systems Management (SCOGISM), Princeton Hydro LLC, The Land Conservancy of New Jersey (TLC), Natural Resource Conservation Service (NRCS) as well as input and support from many community contributors. The Wallkill River Watershed Management Group (WRWMG) wishes to acknowledge the following individuals and organizations for their help and valuable assistance in the development of the Upper Paulins Kill Watershed Restoration Plan:

- Nick Zripko of the New Jersey Department of Environmental Protection (NJDEP)
- Terri Romagna of the New Jersey Department of Environmental Protection (NJDEP)
- David McPartland of the New Jersey Department of Environmental Protection (NJDEP)
- David Kunz of the Sussex County Office of Geographical Information Systems Management (SCOGISM)
- Christine Hall, Grace Messenger, and Jen House of NJRC&D
- Michael Hartshore of Princeton Hydro LLC
- Tim Dunne, Evan Madlinger, and Fred Schoenagel of NRCS
- Bob Canace and Barbara Heskins Davis of TLC
- Alice Brees, Sussex County Division of Planning
- Joe Biuso, Sussex County Division of Facilities Management
- Anthony Valenti and Dr. Robert Larssen of the Sussex County Community College
- Participating Officials from Andover Township, Branchville Borough, Frankford Township, Fredon Township, Hampton Township, Lafayette Township, Town of Newton, and Sparta Township
- John Hatzelis of the Sussex County Municipal Utilities Authority (SCMUA)
- Board of Commissioners, Sussex County Municipal Utilities Authority

Acknowledgements are also due to Patricia Kehrberger and Brian George of HydroQual, Inc. for technical support and stream flow measurements, to Harvey Klein of Garden State Laboratories for analytical services, Jack Kinney of the SCMUA Administration Staff, and to John Nugent, Angelo Baron, and Joseph Kinney of the SCMUA Wastewater Treatment Facility for supplying the necessary stream instrumentation devices, calibration and laboratory support services.

Funding was provided by a Grant from the New Jersey Department of Environmental Protection (NJDEP) Division of Policy Implementation and Watershed Restoration and extensive in-kind services and support from the Sussex County Municipal Utilities Authority (SCMUA), the SCMUA Board of Commissioners, and North Jersey Resource Conservation and Development (NJRC&D) Council.

Profile of the Wallkill River Watershed Management Group



Profile of the Wallkill River Watershed Management Group (WRWMG)

In 1994, the Sussex County Board of Chosen Freeholders designated SCMUA as the lead agency to develop a Wallkill River Watershed Management Plan. As a result, in March 2000, the NJDEP awarded a contract to the SCMUA to facilitate the Wallkill River Watershed Management Project and bring together local stakeholders to work in partnership to develop a plan to insure the restoration, maintenance and enhancement of the waterways within the Watershed. Over the past twelve years, unique stakeholder partnerships have been established and a strong sense of stewardship towards the watershed has been generated. Most importantly, the stakeholders have formed the WRWMG which has become a key “watershed liaison” for Sussex County working to restore, enhance, and maintain the health of the local area surface and ground waters. The key roles of the WRWMG are to:

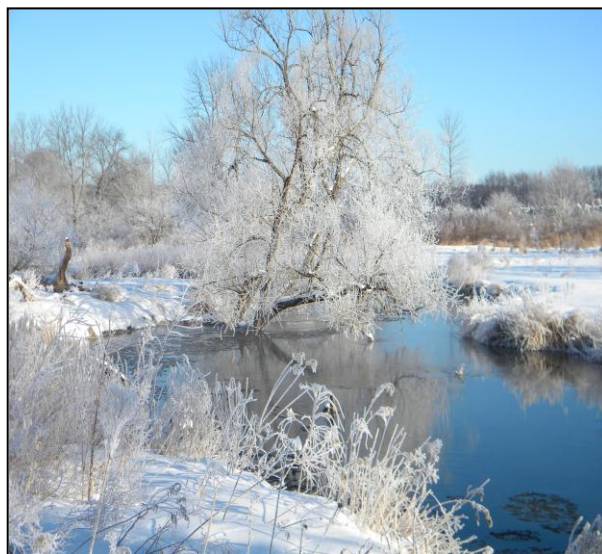
1. Raise watershed awareness and promote environmental stewardship
2. Generate stakeholder participation in watershed management initiatives
3. Conduct water quality monitoring of local watershed surface waters
4. Drive efforts for potential “on the ground” watershed restoration projects
5. Serve as a Watershed management and water quality liaison for the public residents, municipal officials, and county government organizations
6. Starting in mid-2005, the watershed program was expanded with NJDEP and NJRC&D concurrence to include watershed services for the Wallkill River Watershed, the Papakating Creek and Clove Brook Watersheds, and the Upper Paulins Kill Watershed

1. Executive Summary

1.1. Background

A Watershed Restoration Plan is presented that addresses a major portion of the Upper Paulins Kill Watershed, comprised of five HUC 14 sub-basins in their entirety and a portion of a sixth HUC 14. The headwaters of the Upper Paulins Kill are impaired waterways, designated as such for non-attainment of fecal coliform / *Escherichia coli* (*E.coli*) and, in a limited number of stream segments, total phosphorus (TP). Although the Upper Paulins Kill Watershed is comprised of nine HUC 14 sub-basins in total, the approved New Jersey Department of Environmental Protection (NJDEP) Grant included the lesser number of five and a portion of a sixth HUC 14 sub-basin in order to confine the work scope of the project and required funding level within manageable parameters. In actuality, a large portion of the developed Restoration Plan is applicable to all nine HUC 14 sub-basins.

The Upper Paulins Kill Watershed is one of two U.S. Geological Survey (USGS) HUC 11 Watersheds that comprise the Paulins Kill Watershed, which covers approximately 113,184 acres (176.85 square miles) in Sussex and Warren Counties. The Upper Paulins Kill Watershed within the scope of the Grant includes approximately 32,578 acres or 50.9 square miles of total area. The Watershed encompasses all or portions of the following municipalities: Andover Township, Branchville Borough, Frankford Township, Fredon Township, Hampton Township, Lafayette Township, Sparta Township, and the Town of Newton. In addition, approximately 24 acres within Sandyston Township fall within the Upper Paulins Kill Watershed.



The Plan details the background, conducted assessments and management measures necessary to achieve the desired pollutant reductions in order to meet the required NJDEP Surface Water Quality Standards (SWQS) for total phosphorus and fecal coliform / *E.coli*.

- Total Phosphorus (Upper Paulins Kill Watershed - approximately six HUC 14s): The total phosphorus (TP) reduction goals developed by the WRWVG with assistance from Princeton Hydro, LLC resulted in the following established Restoration Plan goal: Reduction of 6,329 pounds/year of TP, which is a 33.4% reduction in the estimated 2011 total TP loading of 18,950 pounds/year (8,614 kilograms/year). The targeted NJDEP SWQS is not to exceed 0.1 mg/l concentrations.
- Fecal Coliform / *E.coli* (Upper Paulins Kill Watershed – approximately six HUC 14s): A TMDL developed by the NJDEP specifies a reduction in fecal coliform / *E.coli* loading of 98% in order to achieve the desired SWQS. The targeted NJDEP SWQS for fecal coliform is that fecal coliform shall not exceed a geometric average of 200 counts/100 ml, nor shall more than 10% of the total samples taken during any 30-day period exceed 400 counts/100 ml. The SWQS for *E.coli* states that *E.coli* shall not exceed a geometric mean of 126 counts/100 ml or a single sample maximum of 235 counts/100ml.

In accordance with an approved NJDEP Quality Assurance/Quality Control Project Plan, the WRWMG collected additional chemical and *E.coli* data to augment that previously collected by NJDEP and USGS. Efforts by the WRWMG were supplemented by professional services provided by Princeton Hydro, LLC, HydroQual, Inc. and Garden State Laboratories. Findings confirmed that the total phosphorus exceedances were slightly to significantly above NJDEP Surface Water Quality Standards (SWQS): TP exceedance values ranged from 0.11 mg/l to 0.29 mg/l relative to the SWQS of 0.10 mg/l for streams.

As part of the Restoration Plan development process, the WRWMG conducted an extensive pollutant source-tracking survey to identify potential sources and causes for the TP and fecal coliform / *E.coli* impairments. Within the defined watershed boundaries, nonpoint pollution is the predominate issue of concern versus point source (end of pipeline). It was concluded that the genesis of key nonpoint sources of TP emanate as a result of erosion and sedimentation from stream banks, agricultural lands and undeveloped lands, improper/overuse of both agricultural and residential fertilizer applications, stormwater runoff from developed and undeveloped lands and roads, urban area sources (one specific area) and, to a lesser extent, septic systems. It was also concluded that the intensity of loading for a given period of time was strongly influenced by the severity of precipitation/storm events, particularly when rainfall exceeds one to two inches/day. Sources of attribution of fecal coliform and *E.coli* are wildlife, animal, and to a lesser extent, human. Utilization of available microbial source-tracking analytical approaches in order to differentiate among wildlife, animal, and human sources was considered, but since EPA had not officially approved the analytical methodology, NJDEP advised that this approach would be tabled for purposes of the present project and reconsidered in the future.



Streambank Erosion



Agricultural Runoff



Stormwater Road Runoff

Development of a holistic Management Plan that addresses the stated pollutant sources, mitigation of the impacts identified, and achievement of the desired goals is a complex and challenging undertaking that will require many years of concerted, targeted effort by the entire Watershed community. To begin the long-term journey to protect the Watershed's critical natural resources (e.g., stream water quality), proposed reduction strategies and implementation measures are developed to cover six priority site-specific and two deserving non-site-specific Restoration Plan implementation projects. Subsequent/collateral efforts are developed to address pollution reduction stream-related projects, in-lake treatment approaches, Watershed-wide projects/controls, urban projects/controls, and suggested municipal actions. As noted below, one of eight priority key implementation projects proposed for 2012 thru 2016 is the establishment of the WRWMG as a Watershed project-management-oriented entity to not only manage the identified implementation projects but also to provide a coordination and integration role addressing the necessary and critical Watershed project implementation efforts required by the WRWMG's partners. Experiences have shown that unless an entity is assigned to drive and track pollutant reduction pound by pound, month by month, one key farmer and/or community member at a time within a given large watershed area, ultimate success at achieving TMDL goals may prove elusive.

The Plan was developed with the following leadership behaviors in mind:

- Awareness of the entire Watershed community (recognizing that the farming/equine community is a significant part of the local economy)
- Teamwork (working with the right organizations, interacting at the right time with the right projects (strong focus on implementation-type projects) and with the right working processes)
- Speed (demonstrating a sense of urgency)
- Innovation (striving for continuous improvement)
- Performance / results oriented (setting, measuring, and achieving ambitious but achievable goals)
- Adaptive management style (dealing with challenges, change, successes, failures and annual funding / resource limitations)

1.2. Proposed Watershed and Site-Specific Implementation Projects for the Upper Paulins Kill Watershed:

Note: All proposed implementation projects address reduction of the targeted pollutants - total phosphorus, *E.coli*, and sediments

Project PK - A:

WRWMG Watershed Stewardship Program

- Budget requirement of \$91,741
- Identification of the WRWMG as a Watershed Plan implementation facilitator and coordinator of an Upper Paulins Kill Watershed Community Stewardship Program

Project PK - B:

WRWMG Agricultural Outreach and Assistance Program

- Budget requirement of \$143,674
- **Task A:** Development of an agricultural outreach and assistance program for the Upper Paulins Kill Watershed to identify agricultural BMP locations, provide conceptual design and specification packages, secure funding, and coordinate overall efforts to implement water quality improvement projects
- **Task B:** Implementation of a multi-dimensional agricultural stewardship program on multiple Upper Paulins Kill Watershed pilot project farms

Project PK - C (Phase I and 1A):

Riparian Restoration, Stormwater Filtering, and Goose Control at the Sussex County Homestead Complex

- Budget requirement of \$13,400
- Implementation of a riparian restoration project around both the small and large ponds at the Sussex County Homestead Complex off County Route 655 in Frankford Township. Project completed in 2010 and 2011 using NJRC&D funding sources for all materials.

Project PK - C (Phase II):

Riparian Restoration, Stormwater Filtering, and Goose Control at the Sussex County Homestead Complex

- Budget requirement of \$108,800
- Implementation of a riparian restoration, water quality improvement, and stormwater management projects at the Sussex County Homestead Complex off County Route 655 in Frankford Township (Phase I and Phase II)

Project PK - D:

Streambank Restoration along the Paulins Kill at East Clinton Street / Upstream Vicinity

- Budget requirement of \$246,650
- Implementation of streambank restoration, stormwater management, riparian buffer planting, and wetlands improvement projects along the Paulins Kill in the Town of Newton (Apartment Complex, Bus Garage, East Clinton Street, and near Memory Park)

Project PK - E:

Wetlands and Wildlife Habitat Enhancement along the Paulins Kill at Decker Road

- Budget requirement of \$64,400
- Improvement of water quality and wetlands enhancement (reduction of nutrients and excessive sediment losses), streambank stabilization, habitat improvement, and installation of diverse riparian buffers including shrubs and trees along the Paulins Kill at Decker Road in Lafayette Township. In as much as approximately 9,000 feet of stream length may require restoration, the project may be presented as a series of Phases over an extended period of time; Note: Funding will be sought using the NRCS WHIP and WRP assistance programs)

Project PK - F:

Lafayette Park Streambank Restoration and Stabilization Project

- Budget requirement of \$182,900
- Implementation of streambank restoration, streambank stabilization, and riparian buffer enhancement project along the Paulins Kill at Lafayette Park in Lafayette Township; (Note: Project augments riparian buffer plantings completed in 2007 using NJRC&D funding)

Project PK - G:

Implementation of a Watershed Restoration Project at Sussex County Community College

- Budget requirement of \$87,415
- Enhancement/implementation of riparian restoration and streambank stabilization in support of the Sussex County Community College's and the Town of Newton's Stormwater Management Plans and stream water quality initiatives

Project PK - H:


Stream Debris Removal and Streambank Stabilization along the Paulins Kill downstream from County Route 519

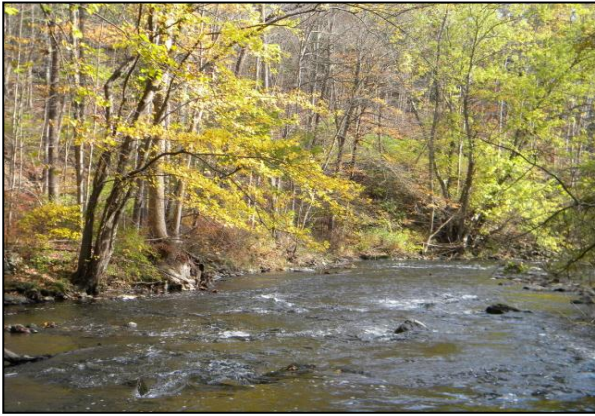
- Budget requirement of \$48,600
- Restoration of the natural stream flow through the stream channel located downstream of County Route 519 in Hampton Township by removing a significant woody debris dam composed of large tree trunks, root balls, litter, debris, and growing sediment islands. (Note: Removed trees and trunks will be reused in the stabilization of the severely eroded streambanks)

Total Budget Dollars for Projects PK-A thru PK-H: \$ 987,580.00

1.3. Implementation Schedule

Table 1: Implementation Schedule for Recommended Projects for 2012-2016 (Initial Phase of an overall timeline of 10 – 15 years with annual planned projects and pollution reductions

	Months	4	8	12	16	20	24	28	32	36	40
Task	Description	2									
Mobilization											
Project PK - A	Watershed Implementation Agent and Overall Plan Coordinator										
Project PK - B	Watershed Agricultural Outreach and Assistance Program										
Project PK - C	Water Quality Improvement at the Sussex County Homestead Complex (Frankford Twp.)		Phase I								
									Phase II		
Project PK - D	Water Quality Improvement at East Clinton Street (urban area) (Town of Newton)										
Project PK - E	Water Quality Improvement at Decker Road (Lafayette Twp.)										
Project PK - F	Water Quality Improvement at Lafayette Park (Lafayette Twp.)										
Project PK - G	Water Quality Improvement at the Sussex County Community College (Town of Newton)										
Project PK - H	Water Quality Improvement at Route 519 (Hampton Township)										
Title Block			Activity								
Implementation of the Upper Paulins Kill Restoration Site-Specific Projects											



1.4. Overview of the WRWMG's Proposed Short-term and Long-term Watershed Restoration Strategies and Initiatives to Achieve Targeted Surface Water Quality Standards 2012 - 2025

1.4.1. Watershed Level Strategies and Initiatives

- Provide centralized leadership, oversight, and coordination for the strategies, initiatives and watershed projects identified in the Restoration Plan.
- Implementation of a communication plan to advise/inform/drive water quality improvements through reduction of pollutant sources and establishment of Restoration Plan metrics for monitoring of Plan progress (strong focus on the use of a recently upgraded WRWMG website as a key means of communication)
- Arrange watershed contacts and undertake assessments directed at identifying and conceptualizing the next round of potential pollutant source reduction opportunities.
- As relating to agricultural and equine operations within the Watershed, through a joint cooperative partnership agreement between the WRWMG and USDA – Natural Resource Conservation Service (NRCS), the WRWMG will become a recognized and trusted local liaison for the agricultural community to help raise awareness about the importance of implementing agricultural best management practices (BMP's) and promoting conservation activities for purposes of improving water quality and the overall health of the watershed.
- Through close cooperation, communication, and coordination with NRCS, the WRWMG will identify, promote, and encourage agricultural stewardship activities and projects that will have water quality benefits and can be potentially funded by available Farm Bill programs. Such efforts will specifically include facilitating the updating of agricultural Conservation Plans and self-certified Animal Waste Management Plans (AWMPs) (to address agricultural farms and commercial/large hobby horse operations); foster relationships with local farmers to encourage them to actively seek the available services from NRCS (overcoming reluctance of some members to seek active support); provide guidance and monitoring of efforts to implement Conservation and AWMP Plans; provide specific guidance and technical assistance addressing the following key BMPs: conservation buffers, manure management, practice of prescribed grazing, animal exclusion from streams, and nutrient management for residential and commercial lawn care
- Identification, coordination, and implementation of streambank and riparian restoration projects, stormwater infiltration projects, farm water quality related BMPs, etc.
- Conduct stream flow monitoring using referenced USGS gage stations (relates to outreach efforts addressing stormwater infiltration projects, flooding issues, pollutant transport balances, etc.)

- Implementation of a Post-Monitoring Plan as presented in the Restoration Plan.
- Assessment and implementation of lake restoration projects to protect water quality within the headwaters of the Upper Paulins Kill Watershed (Fox Hollow Lake, Upper Lake Mohawk, Kemah Lake, Clearview Lake, etc.)
- Development of an invasive species identification and control plan

1.4.2. Municipality / Community Level Strategies and Initiatives

- Coordination of Watershed-wide efforts with County and Municipal departments (Town Councils, Planning Boards, Departments of Public Works, Open Space Committees, Environmental Commissions, etc.)
- Sponsorship of a winter road-maintenance seminar to address usage of deicers, grits, etc. and Best Management applications / equipment maintenance practices
- Sponsorship of a stormwater seminar to address effectiveness / non-effectiveness of present practices and foster consideration / acceptance of voluntary adoption of several Tier A guidelines by Tier B municipalities (all participating municipalities within the Upper Paulins Kill Watershed fall within the Tier B category except Andover Township and Sparta Township, which are classified as Tier A; Tier A guidelines are more extensive / restrictive than Tier B guidelines). (Note: Coordination of this action with NJDEP is recommended)
- Address the need for new ordinances in support of the Restoration Plan goals
- Identify and implement suitable implementation projects for the Town of Newton (HUC 14 - 02040105040060), which is considered as an urban area within a rural setting. Background: The impervious coverage of Town of Newton is approximately 26% as compared to less than 5% for the surrounding municipalities. The quality of the internal waterways is typically classified as Impacted Bordering Non-Supporting by use of the Impervious Cover Model (Reference: Urban Subwatershed Restoration Manual #4). This fact is to be considered in the design and implementation of restoration projects specific to the Town of Newton. All proposed projects to be reviewed, supported, and approved by a suitable representative from the Town of Newton.
- Offer one-on-one assistance to the watershed community regarding implementation of the recently approved NJDEP Fertilizer Control Bill (relates to the reduction of phosphorus and nitrogen nutrient sources from lawn maintenance practices to the Watershed waterways (alteration of fertilizer composition / ingredients); provide support and guidance regarding the recent EPA initiative addressing the implications of increasing nitrate levels in potable water supplies, particularly as found in shallow aquifers in the mid-west farming communities (EPA 2011)
- Development and implementation of various educational campaigns and programs to raise watershed awareness and solicit stakeholder/volunteer participation in watershed plan implementation initiatives
- With support of Rutgers Cooperative Extension Water Resources, foster, identify, and implement projects in support of Rutgers' Green Infrastructure Initiatives: Opportunities for Municipalities outreach program
- To augment current sediment control efforts, address road side ditch retrofitting and detention basin retrofitting to incorporate stormwater infiltration BMPs

- For both total phosphorus and fecal coliform/E.coli reduction, address septic system management and education; significant septic system designs have been demonstrated within the last several years, which offer the opportunity for improving septic water effluent quality (black leachate liquor to clear leachate liquor) while increasing the expected life of leach fields
- For water quality and conservation purposes, address a broad range of stormwater infiltration BMPs (e.g. Low Impact Development standards, stormwater infiltration measures, rain gardens, etc.)
- For aquifer protection, review, update, and, if necessary, develop wellhead protection polices and suitable ordinances restricting the type and quantity of chemicals, oils, lubricants, etc., that are permitted on semi-commercial or industrial manufacturing sites within defined distances from key potable water supply wells
- Assessment/evaluation/recommendation of open space land candidates for purchase by Federal, State, County, government agencies, municipalities, and various Land Trust organizations

1.5. Funding Sources:

- NJDEP SFY 2012 319(h) Implementation Grants
- Development of Conservation Plans (in-kind services from USDA – NRCS and Rutgers Cooperative Extension)
- Implementation of Conservation Plans: USDA and other sources (e.g., WHIP, WRP, CREP, CRP, EQIP, ICM, etc. Some funding/in-kind services from individual farmers/landowners may be required.
- In-kind services (e.g., County, municipalities, Sussex County Municipal Utilities Authority, Municipal Boards and Committees, etc.)
- Other sources to be identified / investigated (e.g., Dodge Foundation, private corporations, US Fish & Wildlife Service)
- Funding from the Pinchot Institute for Conservation - The Common Waters Fund

1.6. Post-Monitoring Plan:

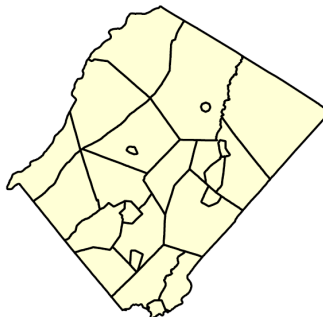
Considering that the Restoration Plan is to be implemented over a period of 10 to 20 years (primarily impacted by restricted annual funding levels), a Plan is presented that considers objectives, monitoring elements, management policies, monitoring metrics, resource needs, a communication plan, and management strategies best suited for overall management of long-term projects. The use of an adaptive management approach is strongly recommended in pursuing a cost-effective and efficient journey to achieve the desired goals of restoring and protecting the Upper Paulins Kill watershed sub-basins with respect to TP and fecal coliform / *E.coli*. Basically, the implementer is continuously testing assumptions, evaluating the effectiveness of prior decisions / actions, adapting and reacting to new information, and altering future plans based on the totality of current knowledge.



1.7. Contributing Plan Success Factors:

- Continued operation and maintenance of the USGS real-time monitoring flow station for the East Branch Paulins Kill at Garrison Road (USGS #01443280)
- Maintain close cooperation, communication, and coordination with the USDA-NRCS under the umbrella of the formal cooperative partnership agreement between the two organizations
- Sufficient resources of the Natural Resource Conservation Service, Rutgers Extension Cooperative, and the Soil Conservation District to support the Plan in a timely manner
- Availability of required program/project funding levels to match Plan requirements
- Monitor research findings relating to effective placement of Best Management Practices on agricultural properties and within the Watershed
- Receptivity and support of the Plan by the Watershed community

1.8. The goals of the Upper Paulins Kill Watershed Restoration and Protection Plan are consistent with the vision established in the Sussex County Strategic Growth Plan and the aims and goals of the Sussex County Agriculture Development Board:



1.8.1. Sussex County Strategic Growth Plan

- Protect and preserve environmentally sensitive areas
- Maintain and enhance surface and groundwater quality / water quantity
- Protect open space
- Encourage farmland preservation
- Protect the Upper Paulins Kill flood plain
- Protect and maintain the quality of life within the Upper Paulins Kill Watershed

1.8.2. Sussex County Agriculture Development Board

- Preserve both farmland and farmers
- Conservation of natural resources on farms
- Ensure clean and plentiful water
- Implement waste management and recycling
- Encourage farmland preservation
- Support and protect the Right-To-Farm Act (ordinances in place by all the participating municipalities within the Upper Paulins Kill Watershed)

1.9. Restoration Plan Development Funding

- A FY 2007 319(h) Nonpoint Source Pollution Control and Management Implementation Grant from the New Jersey Department of Environmental Protection and significant in-kind services from the Sussex County Municipal Utilities Authority (SCMUA) and the SCMUA Board of Commissioners provided funding for the development of the Upper Paulins Kill Watershed Restoration Plan.



