EXECUTIVE SUMMARY

Little Chiques Creek Watershed Rivers Conservation Plan

Prepared for
The Mount Joy Borough Authority

by

ARRO **and** LandStudies

October 2005

DCNR

This project was financed in part by a grant from the Community Conservation Partnerships Program, Keystone Recreation, Park and Conservation Fund, under the administration of the Department of Conservation and Natural Resources, Bureau of Recreation and Conservation.

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Rivers Conservation Plan

The Little Chiques Creek Watershed Rivers Conservation Plan is a project of the Mount Joy Borough Municipal Authority, financed in part by a grant from the Community Conservation Partnerships Program, Keystone Recreation, Park and Conservation Fund, under the administration of the Department of Conservation and Natural Resources, Bureau of Recreation and Conservation. The creation of the Conservation Plan was administered by an intermunicipal steering committee and executed by ARRO Consulting, Inc. and LandStudies, Inc.

The Little Chiques Creek Watershed Conservation Plan is not a mandate but rather a guide – a tool to help local and regional planners as they guide short- and long-term growth in the watershed. The Conservation Plan focuses on water resources, both surface and ground, provides insight into their current status, and includes recommendations for future use, management, and protection.

Goals

The primary goals of the Conservation Plan are to:

- identify ways to meet the environmental standards set by state agencies;
- identify the interests of landowners while protecting their property rights; and
- determine the recreation needs of the public through a mail survey and identify ways to fund these projects.

The intermunicipal steering committee also agreed upon two secondary but related goals, which are to:

- identify the opportunities for environmental education for adults and youth; and
- preserve the ecological resources in the watershed while improving water quality.

To meet those goals, it was necessary to research, map, and analyze existing features and conditions within the watershed. Also necessary was the gathering of public opinion from landowners and from decision-makers associated with business and industry, education, agriculture, and municipal government.

Mapping & Analysis

The maps that were generated, analyzed, and included in the Plan include:

- **Geology** – the underlying bedrock throughout the watershed;
- **Soils** – a breakdown between hydric (frequently inundated) and prime agricultural soils;
- **Topography** – areas with slopes greater than 25 percent;
- **Water Resources** – assessed stream reaches, historical and existing dams, documented wetlands, and floodplains (with well-field locations taken into consideration but not documented for public consumption);
- **Open Space and Recreation** – recreational, agricultural, and forested areas, as well as an area identified by the Pennsylvania Natural Diversity Inventory as habitat for a species of special concern (which was taken into consideration but not fully documented for public consumption);
- **Existing Zoning** – residential, agricultural, commercial, industrial, conservation, and urban growth boundaries;
- **Future Land Use** – residential, agricultural, commercial, industrial, and conservation/institutional; and
- **Special Protection Areas** – Clean and Green farms, agricultural security areas, and preserved farms.

Community Input

Public opinion was generated through Key Person Interviews, a Landowner Survey Questionnaire, and public and landowner meetings. Information and opinions gathered were taken into account as the recommendations were created.

The Conservation Plan is divided into four sections: The Setting, The Framework, Community Input, and Action Plan – Recommendations. The Setting takes a look into the past, to provide an understanding of why things are the way they are in the watershed. The Framework and Community Input are the direct results and ensuing discussion of the research and analysis that formed the heart of the Conservation Plan. Action Plan provides the recommendations – the "guideposts" – for future planning: what can be done, and who can do it. Specific projects along with funding sources and cost estimates are described in this section to help initiate the process of watershed-based planning and conservation.

1. **The Setting** provides:
    - Land-Use History – relevant background on land use contributing to existing conditions; and
    - Resulting Problems – conditions created by historical land use and their role in future planning.

2. **The Framework** contains:
    - What We Learned – presentation, discussion, and analysis of the eight maps generated to show specific aspects of the watershed, including Land Resources, Water Resources (includes preliminary Stream Assessment), Recreation and Open Space Resources, and Land Use (includes information on zoning ordinances and regional comprehensive plans).
    - Summary – a discussion of the concerns and opportunities revealed by the research and analysis.

3. **Community Input** provides:
    - discussion and data resulting from a series of Key Person Interviews and from a Landowner Survey Questionnaire sent to all households with land spanning or abutting a stream channel within the Little Chiques Watershed.

4. **Action Plan – Recommendations** includes:
    - a final discussion of the larger ideas to be taken from the results of the research and analysis, broken down into categories related to their application:
        - Regional / Watershed,
        - Municipal,
        - Stormwater Management,
        - Land Development,
        - Water Supply and Disposal, and
        - Education.
    - recommended initial projects to help reach the goals of providing improved water resources, improved recreational and educational opportunities for the watershed community, and protection of landowner interests, along with potential funding sources and estimated costs.

1. THE SETTING

Land-Use History

The Little Chiques Creek Watershed, in the northwestern section of Lancaster County, comprises portions of Mount Joy Borough, East Donegal Township, Mount Joy Township, and Rapho Township. The upper two-thirds of the watershed remains primarily in agriculture, while the bottom third contains the watershed's population center, Mount Joy Borough. Here, land use is a combination of residential, commercial, industrial, and agricultural.

For the purposes of the Conservation Plan, the history of land use in the watershed is the salient point of interest, because historical land use is the primary shaper of existing

conditions in the watershed today. Little Chiques Watershed is in an overall state of evolutionary flux because of early historical impacts to the watershed. Those impacts, described briefly below, are not unique to the Little Chiques Watershed; rather, they are typical of most watersheds in the Piedmont region of the United States.

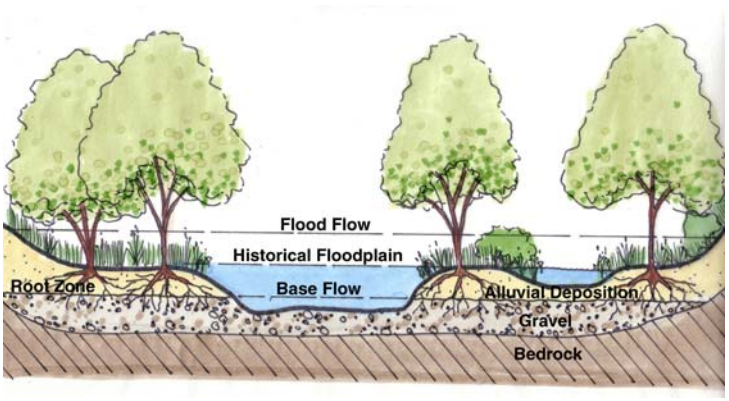
Like much of the landscape in the Middle Atlantic states, particularly in the Piedmont region, the pre-settlement (before the early 1700s) landscape in the Little Chiques Creek watershed was mostly forested. Many small, shallow streams meandered through the valley bottoms, with closely connected floodplains composed of peaty, organic, highly porous materials and many wetland areas. Stream beds were gravel, and surface water and groundwater were closely connected in these shallow channels and floodplains.

Shallow, meandering stream channels, connected floodplains, porous floodplain materials, and wetland plants and root systems – all functioned interactively with groundwater, and the entire system stored, filtered, and infiltrated high flows from the channel and surface flows from higher elevations. This stable system provided clean water, groundwater recharge, controlled flooding, and diverse habitat for aquatic and streamside plants and animals.

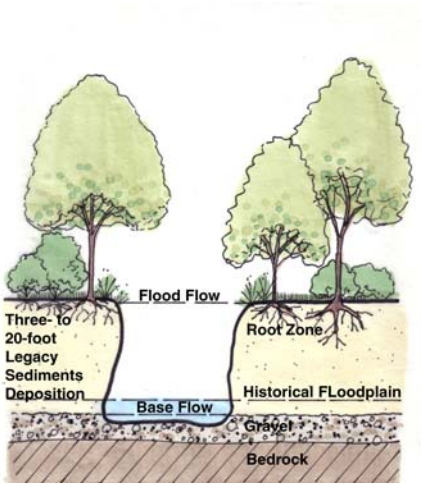
By the early 1700s and continuing into the mid 1900s, a time known as the post-settlement, or agricultural, period, the landscape began to change. Working westward, settlers cleared and worked the land for timber, agriculture, and settlement. Massive erosion resulted, sending untold tons of fine sediments down into the stream and river valleys, including those in the Little Chiques Creek watershed. The concurrent proliferation of mills and dams along every stream and tributary served to catch the eroding sediments, where they accumulated and buried original gravel stream beds and porous floodplains under many feet of less permeable, inorganic fines (fine-textured soils) and clays. Functioning wet floodplains became dry terraces.

By the mid-1900s, land-use practices had improved and much of the erosion into the valleys ceased. Dams fell into disrepair or were removed. The result was that water that had been ponded behind the dams and was sitting on sediment beds many feet thick began to flow more rapidly again. The flows began to cut down through the sediments, but the adjacent terraces were left where they were. That process, which is still continuing, has produced the streams we see today in the watershed, and throughout the Piedmont region.

Water flows through high, straight, bare banks, and only the highest flows escape from the channel. These unnaturally high flow forces erode both the sediment banks and the channel beds, sending too much water, too much sediment, and too many nutrients, which are attached to the soil particles in the banks, to downstream receiving waters. Groundwater, in many cases, no longer enters the channel but actually flows *under* the perched, sediment-filled bed.



Stable, pre-settlement stream and floodplain systems were characterized by: a low floodplain in close contact with surface water in the stream channel, allowing for frequent inundation of the floodplain during high flows; riparian vegetation with roots zones in contact with ground water that enabled groundwater denitrification through root uptake; and a channel bed composed of cobble and gravel, which helped protect the underlying bedrock from erosive flow forces.



Stream channels are eroding or have eroded back down through sediments that collected behind mill dams, leaving their alluvial terraces high above the current base flow water elevation, and disconnecting riparian root systems from groundwater flows. The processes of frequent floodplain inundation, which relieves in-channel stresses, groundwater infiltration through porous floodplain material, and nitrogen removal from groundwater through root systems are lost under these conditions that are prevalent today throughout the Piedmont region of the United States.

Resulting Problems

Land clearing, stream relocation and straightening, milldam construction, stream crossings, and other human activities and encroachments have left us with unstable streams working their way through thick beds of "legacy sediments." Urbanization has added the problems of increases in impervious surfaces, with roads, parking lots, driveways, and roofs replacing meadows and forests.

We are left with the resulting problems of reduced base flows and higher water temperatures in stream channels, in the absence of contributing groundwater; streams perched on impermeable sediments, no longer able to percolate through gravels to provide groundwater recharge; surface waters being sent downstream in quantities and velocities that are too high; wetlands perched on impermeable sediments instead of sitting close to groundwater where they are more fully functional; and wetlands that have been drained or filled for alternative land uses.

These, then, are the conditions that municipalities must consider as they formulate plans and strategies for the future of their communities. Understanding how our watershed arrived at these conditions can help shine a light on how to proceed.

2. THE FRAMEWORK

What We Learned

► Land Resources:
Geologically, the watershed is divided into thirds: resistant sandstone in the upper third, softer shale in the middle, and limestone in the lower third. Limestone geology underlies prime agricultural soils as well as the most developed portion of the watershed. Much of the drainage in this karst geologic portion of the watershed is subterranean; water travels through underground streams and caves. Steep slopes tend to lie primarily in the northern portion of the watershed, contributing areas not suitable for either farming or development.

► Water Resources:
Detailed groundwater studies are recommended, but until further studies are conducted and for the purposes of this report, it is assumed that the limestone-geology areas around Mount Joy Borough provide the most significant groundwater recharge and supply potential. Groundwater protection strategies are especially important in this area.

Little Chiques Creek Stream Assessment
The main stem of Little Chiques Creek originates in the vicinity of the United Zion Campground near the Lancaster/Lebanon County line. From the Lancaster County line to its confluence with Chiques Creek between Marietta and Columbia, the main stem is 22.45 miles long. The Little Chiques Creek Watershed, which comprises approximately 45 square miles, includes four major tributaries: Back Run and Brubaker Run entering from the east in Rapho Township, and Stauffer's Run and an unnamed tributary entering from the west in Mount Joy Township. Little Chiques Creek, in turn, is a tributary to Chiques Creek, the waters of which flow into the Susquehanna River between Marietta and Columbia and, ultimately, into the Chesapeake Bay at Havre de Grace, Maryland.

The Pennsylvania Department of Environmental Protection (PADEP) assessed nearly half of the main stem – 11.1 miles (303d ID 970722-1115-SAW), from its confluence with Chiques Creek upstream to the confluence with an unnamed tributary (PADEP

stream code 07954) – and, in 1998, added Little Chiques Creek under State Water Plan 07G to its 303d list of impaired streams. The source of the impairment, according to the 303d list, is nutrients and siltation from agriculture. The stream is listed as a medium priority.

Additionally, the Total Maximum Daily Load (TMDL) assigned to Chiques Creek, also known as Chickies Creek, applies to Little Chiques Creek as a subwatershed of Chiques Creek. The TMDL sets a ceiling on the pollutant loads that can enter a waterbody so that the waterbody will meet water quality standards. Nonpoint sources of pollution are listed as nutrients and siltation from agriculture and urban runoff/storm sewers. The DEP Information Sheet on the "TMDL for Chickies Creek Watershed" indicates "All of the pollution in the Chickies Creek Watershed comes from non-point sources (NPS) of pollution. The pollutants come primarily from overland runoff." It is LandStudies' position that pollutants (sediment and phosphorus compounds) in the watershed also derive from a largely overlooked source – the stream banks, themselves, as described earlier.

Like many other streams in the Piedmont Physiographic Region of the Mid-Atlantic States, Little Chiques Creek and its tributaries have been severely affected by post-settlement agricultural and industrial activities, which have contributed to the scenario of stream instability much in evidence today.

Maps from the 19th century (Bridgens, 1864; Scott, 1824) document at least 22 milldams associated with Little Chiques Creek. The main stem alone contained at least 13 dams varying in height from four to 30 feet, three of which still exist in or near Mount Joy Borough. In addition, another existing dam, just downstream of the confluence of Little Chiques and Chiques creeks, is close enough to Little Chiques to exert an influence over its morphology.

Dams, utility and transportation crossings, channelization (straightening) and relocation have put and continue to keep the watercourses in the watershed in a state of flux. Very little of the creek bed or floodplain is at or near historical elevations. The stream beds will evolve to the historical bed elevations over time, if allowed. The existing terraces will be removed through erosion, undercutting and collapse, and replaced at a much lower elevation. This lower elevation may be as much as three to 15 feet lower than the existing elevation. The floodplain cover does not matter. Tree, shrubs, grass, and so forth will be removed and typically replaced with invasive or unwanted species. Utility crossings, culverts, and walls that are founded on material higher than the existing bed elevations will continue to be undermined and susceptible to scour.

There is no simple solution to successfully restoring Little Chiques Creek and its tributaries. A list of goals and objectives for the short- and long-term must be defined. Determining those goals and objectives will require intermunicipal cooperation to avoid mutually exclusive plans. For example, projects to protect infrastructure can negate projects to restore trout habitat or even provide cleaner water. And having a goal of improving water quality for human recreation is different than for fish rearing or

spawning. The overall recommendation is to set up those goals while possibly providing initial improvements on a headwater tributary such as Back Run or an area closer to the main stem headwaters, where smaller-scale projects can help ease the sediment load being carried into Little Chiques Creek and ultimately to the Chesapeake Bay.

► Recreation and Open Space Resources:
Six sites have been designated as "special places" because of their long-standing status as noted sites or structures within the watershed's population center – historical or scenic areas important to community life. The recommendation is to continue to protect and enhance these places whenever and wherever possible. The sites noted are:

- The view of the rural landscape from Pleasure Road at the future Florin Hill development;
- The Cove historical recreation area and former bird sanctuary*;
- Little Chiques Park*;
- Central Hotel / Bube's Brewery (privately owned);
- Mount Joy Memorial Park (site of former Mount Joy Elementary School); and
- Stone Bridge, on Pinkerton Road*.

* Specific projects have been recommended for these sites.

Biological Features
The Pennsylvania Natural Diversity Inventory (PNDI) identified one area that either contains or did contain a species of special concern (rare, threatened, or endangered). The site is noted on one of the report's GIS maps, but it is the policy of PNDI to refrain from disseminating for public consumption further information on the species itself or the key details of its habitat.

Forest cover in the Little Chiques Creek watershed is present but not abundant because of the preponderance of land in agricultural use. Particular attention should be paid throughout the watershed to preserving forested stands and expanding them when and where possible, especially when and where there is opportunity to link one forested corridor with another.

Areas identified as floodplains, wetlands, and steep slopes are not conducive to farming or development, but they do present ideal opportunities for resource protection. By linking areas isolated by historical change, a natural corridor can be re-established. Natural corridors can then accommodate pedestrian trails, where public access is permitted, to connect cultural resources, such as historical districts, with recreational uses and communities.

► Land Use:
To foster intermunicipal cooperation in terms of future planning that supports the goals delineated for the Watershed Conservation Plan, a policy inventory was taken with regard to ordinances related to zoning, subdivision and land development, and stormwater management for the municipalities in the watershed. Also, comprehensive plans were reviewed with respect to their relationship to the watershed.

Summary

The first step in determining how best to manage the water resources of the Little Chiques Creek watershed is to determine the major issues in the relationship between the resources and the use of the land. The analysis identifies and describes specific concerns and available opportunities associated with Land Resources, Water Resources, Recreation and Open Space Resources, and Land Use.

► Land Resources Analysis:
The limitations of geology, soils, and topographic features shape the related issues and opportunities of the land within the watershed.

Concerns	*Opportunities*
Malfunctioning Septic Systems	Natural Features Discourage Development
Sinkhole Potential	Projected Growth Areas
Groundwater Contamination	Existing Corridors
Increase in Sinkhole Activity	Water Supply
Loss of Prime Agricultural Soils	

► Water Resources Analysis:
Because of the size of the watershed and the complexities of the inter-relationship between private and public interests, a list of the goals and objectives for the short- and long-term management and treatment of stormwater runoff into the streams of the Little Chiques Watershed must be defined and prioritized.

Concerns	*Opportunities*
Stream Instability	Stream and Floodplain Restoration
Encroachments	Stormwater Management BMPs
Water Quality	Public Education
Increased Impervious Cover	Protected Corridor in Urban Setting
Reduced Area for Flooding	
Thermal Pollution	
Increased Water Demand	
Hazardous Waste	
Combined Sewer Overflows	
Loss of Critical Aquifer Recharge Areas	

► Recreation and Open Space Resources Analysis:
Open space and recreational opportunities can incorporate multiple objectives in restoring a watershed. By linking natural areas isolated by historical change, a natural corridor can be re-established. Natural corridors can then accommodate pedestrian trails, where public access is permitted, to connect cultural resources, such as historical districts, with recreational uses and communities. Protection or establishment of open space should be prioritized where multiple objectives or concerns are considered.

Concerns	*Opportunities*
Landscape Connectivity	Riparian Corridors Exist
Invasive Plants	Parks and Recreation Uses Relate to Natural Areas
Intensive Farming Practices	Public and Private Opportunities
Lack of Trails	

► Land-Use Analysis:
Results of an Ordinance Audit Form for each municipality were compiled into an Ordinance Overview for Water Quality Issues that illustrates the status of each municipality with respect to water quality. The overview provides a baseline to compare what is being done to manage water resources on a local level, and it provides a resource for municipalities to identify areas of weakness and refer to actions taken in other watershed communities.

Concerns	*Opportunities*
Impervious Cover	Parking
Open Space Protection	Resource Conservation
Public Water Supply	Farmland Preservation
Stormwater Management	Agricultural Management
Karst Geology Issues	Wellhead Protection
Natural Resource Protection	Land Development Review
Sewer and Water	Water Supply Feasibility
Sprawl	

3. COMMUNITY INPUT

Key Person Interviews

Fifteen persons from business and industry, education, large-acreage landowner, and municipal sectors were interviewed about issues that affect the short- and long-term decisions municipal planners make about the use, management, and protection of natural resources that cross municipal boundaries within the watershed.

Their top three environmental priorities included: waste disposal, trash and littering; drinking water quality and quantity; and soil erosion and sediment/pollutant runoff into streams. They expressed concern that landowners would not participate in any projects that hinted of government intrusion. The interviewees identified hiking and biking trails that link together other recreational locations as the recreational facility most lacking in the watershed.

Landowner Survey Questionnaire

Eighty-two questionnaires (21 percent) were returned from landowners whose property spans or abuts any stream in the Little Chiques Watershed.

More than half own land that is actively farmed, and of those, 85 percent indicated that they employ best management practices on their farms.

Projects most likely to be accepted by landowners on their property include stream and floodplain restoration, native tree and shrub planting, invasive plants control, and native wetland plants installation. Activities most accepted included birdwatching, hiking, and fishing. Snowmobiling and biking were the least favored activities on private land.

Respondents overwhelmingly (more than two-thirds) consider as "very important" the improvement of water quality in local streams, protection of farmland and open space from development, increased use of agricultural BMPs, and protection of drinking water quality. More than half also rated as "very important" the preservation of wildlife habitat, long-range planning to guide future growth, the use of zoning to guide the *quality* of development, and increased cooperation in planning between municipalities and school districts and among municipalities. Encouraging streamside recreational and educational opportunities was considered the least important of the nine issues listed.

Discussions at landowner meetings confirmed that public access, especially hiking and biking trails, through active farmland is not a good idea for either the public or the farmers, although they did support the idea of hiking/biking trails that connect existing recreational areas around the population center of Mount Joy Borough.

4. ACTION PLAN - RECOMMENDATIONS

The five goals of the Little Chiques Creek Watershed Rivers Conservation Plan are inter-related and inter-dependent. Each goal involves aspects of water quality, water quantity, and protection of existing natural resources. For land managers to successfully implement the goals and recommendations set forth, it is critical that the evaluation and recommendations provide both direction and flexibility. The final recommendations are presented in two ways. The first is a "toolbox" format that allows flexibility depending on the particular strengths or weaknesses of the responsible local government or organization. The toolbox allows the municipality or watershed association to select and implement various tools as their budget or need allows. The second is a discussion of specific recommended projects, along with potential funding sources and estimated costs, where applicable. This format prioritizes the most easily implemented projects, because in many cases several factors are already in place to facilitate the process.

Little Chiques Creek Watershed
Project Goals

- Identify ways to meet the environmental standards set by state agencies;
- Identify the interests of landowners while protecting their property rights;
- Determine the recreation needs of the public.
- Identify opportunities for environmental education for adults and youth;
- Preserve the cultural and ecological resources in the watershed while improving water quality.

Toolbox

The Toolbox provides a concise look at various tools, along with their descriptions, associated activities, the source of the tools, who can use them, and their priority for watershed-based planning.

The tools are grouped under several categories so that they can be easily identified and used by municipalities, the Little Chiques Creek Watershed Association, the school districts, and private landowners, which allows for maximum use and flexibility according to interest, need, and ability.

Some examples of the tools included in the Toolbox include:

Regional
Open Space Land Acquisition, Groundwater Study, and Stream Assessment;

Municipal
Water Recycling, Construction in High-Density Karst Locations, and Rural Resource Areas;

Stormwater Management
Watershed Assessment to Determine Regional Stormwater Management Locations, Stormwater Management BMP Management Authority, and Stormwater Retrofit Strategies;

Land Development
Model Legal Agreement for Shared Parking, Green Building Technology, and Management of Existing Vegetation;

Water Supply and Disposal
Interconnection of Nonpublic Water and Sewage Systems, Aquifer Test Requirements, and Well Construction Standards;

Education
Environmental Education, Natural Landscaping, and Managing Land Adjacent to Streams and Waterways.

Projects

Land-use analysis and landowner input contributed to the placement of recreation-oriented projects and linkages in and around the watershed's population center (Mount Joy Borough and vicinity) while targeting conservation corridor considerations to the upper, more uniformly agricultural sector of the watershed.

The Conservation Plan recommends that application be made for funding for a Watershed Implementation Plan, which would include:

- a detailed assessment of stream channels throughout the Little Chiques Watershed, along with recommendations for restoration;
- an investigation of agricultural practices that contribute pollutants; and
- an identification of areas that employ streambank fencing and other BMPs.

A stream assessment also is included as one of the tools in the Toolbox at the Regional / Watershed level.

The Projects section also discusses the future prospects of stream and floodplain restoration projects, particularly in the headwaters of the main stem, where three contiguous landowners have already expressed their willingness to participate.

Specific Project Sites:

Priority

Confluence of Brubaker Run and Little Chiques Creek
Assessment and recognition of private property loss through severe and ongoing erosion.

The Cove
This historical recreation site is already slated for restoration under a joint venture of Mount Joy Township and the Mount Joy Sportsmen's Association, and a preliminary plan has been created. Recommendations related to the highly unstable condition of Little Chiques Creek in this area advise keeping infrastructure near the stream channel to a minimum to avoid unnecessary loss over the coming decades as landforms along the Creek change. Stream health is also an issue here, as this site is part of the area regularly stocked by the Pennsylvania Fish and Game Commission.

Little Chiques Park
The recommendation is to create a master plan for combined recreation and environmental education objectives that are focused on the water resources, keeping the stream condition in mind as a plan is created.

Donegal School District Property
(former Ezra Engle farm, Pinkerton Road)
A portion of this diverse parcel presents an excellent opportunity for the Donegal School District to collaborate with neighboring municipalities to develop a master plan for an environmental education site for both school students of all ages as well as the general public. Stream, floodplain, wetland, and upland woods are all available in a concise continuum.

Stone Bridge *(Pinkerton Road)*
We recommend that a master plan be developed to enhance this area traditionally used for parking and streamside fishing. The plan could include such amenities as a discrete, stabilized area to park several cars, minimal seating (benches and perhaps a table), a trash can, installation of native plants suitable for the site, and any other features that would help keep the area stable and clean for both the landowner and users. The area could easily be maintained by Watershed Association volunteers, or by a local school, church, Scouting, or civic group. The landowner has indicated his interest in allowing this project to be designed and implemented with his ongoing approval.

Pedestrian Trail
Mount Joy Borough already is in the early stages of developing a pedestrian "loop" to link public recreation areas in and around the Borough. A trail that ties into that loop could extend down to Little Chiques Creek via Jacob Street and the edge of the Sewage Treatment Facility property, with the potential to extend along Little Chiques Creek to as far downstream as Pinkerton Road.

Potential

Wenger Feeds Parking Lot - Porous Paving Monitoring
Wenger Feeds retrofit and upgraded an existing parking lot within their distribution facility site in Mount Joy Borough. As part of this upgrade, a porous paving "swale" was installed along with access to the drainage pipe at the bottom of the subsurface swale. This access provides a rare opportunity to monitor, over time, the porosity and performance of this porous asphalt swale. A prepared protocol and a technique for seasonal monitoring are available. A flow meter will need to be purchased to perform this task.

Vulnerable Dams *(Cove & Main Street areas)*
As noted in the Stream Assessment, the dam near the Cove has been breached and is deteriorating. The downstream dam, also known as Sico Dam, appears to be in better condition. We make no recommendation about the maintenance or removal of either of these dams, except as follows:

Officials at some time in the future will need to make an educated decision about the two dams. If they are both left in, they will need to be maintained. If the option to remove is selected, we recommend the removal of only one dam because of the substantial gradient difference that would need to be addressed by the removal of both dams. The full Conservation Plan provides additional details associated with maintaining or removing a dam.

Rapho Township Park
The master plan for this site is being or has already been developed. The recommendation for the site is merely to maintain an awareness of the park's proximity to a tributary to Little Chiques Creek and to the overall stream system. Future amenities and installations should be designed to allow optimal permeability for groundwater recharge and to avoid any negative affect on nearby surface water resources.

Former Grandview Elementary School
This site, now the property of Mount Joy Borough, contains surface water that has been ditched as well as possible wetland areas. As plans for developing this open space continue to be refined, those water resources should be taken into account through enhancement as natural features within the site or, minimally, through their protection from any negative effects of site development.

AVAILABILITY

The full report is available for downloading in portable document format (PDF) at the Little Chiques Creek Watershed Association's web site (www.littlechiqueswatershed.com).

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Community Input

Public opinion was generated through Key Person Interviews, a Landowner Survey Questionnaire, and public and landowner meetings. Documentation from the Interviews and Questionnaire are included in the Plan, under Section 3, Community Input, as discrete entities in the Plan. Information and opinions gathered through public and landowner meetings were taken into account as the Recommendations presented in Section 4 were created.

The Conservation Plan is divided into four sections: The Setting, The Framework, Community Input, and Action Plan – Recommendations. The Setting takes a look into the past, to provide an understanding of why things are the way they are in the watershed. Sections 2 and 3 are the direct results and ensuing discussion of the research and analysis that formed the heart of the Conservation Plan. The final section provides the recommendations – the "guideposts" – for future planning: what can be done, and who can do it. Specific projects along with funding sources and cost estimates are described in this section to help initiate the process of watershed-based planning and conservation.

1. **The Setting** provides:
    - Land-Use History – relevant background on land use contributing to existing conditions; and
    - Resulting Problems – conditions created by historical land use and their role in future planning.

2. **The Framework** contains:
    - What We Learned – presentation, discussion, and analysis of the eight maps generated to show specific aspects of the watershed, including Land Resources, Water Resources (includes preliminary Stream Assessment),

Recreation and Open Space Resources, and Land Use (includes information on zoning ordinances and regional comprehensive plans).

- Summary – a discussion of the concerns and opportunities revealed by the research and analysis;

3. **Community Input** provides:
   - discussion and data resulting from a series of Key Person Interviews and from a Landowner Survey Questionnaire sent to all households with land spanning or abutting a stream channel within the Little Chiques Watershed.

4. **Action Plan – Recommendations** includes:
   - a final discussion of the larger ideas to be taken from the results of the research and analysis, broken down into categories related to their application:
     - Regional / Watershed,
     - Municipal,
     - Stormwater Management,
     - Land Development,
     - Water Supply and Disposal, and
     - Education.
   - recommended initial projects to help reach the goals of providing improved water resources, improved recreational and educational opportunities for the watershed community, and protection of landowner interests, along with potential funding sources and estimated costs.

1. THE SETTING

1. THE SETTING

A. LAND-USE HISTORY

Understanding the historical land use in the watershed is key to understanding current conditions, especially along stream corridors, and helps shed light on future planning. Historical land use also is discussed under Little Chiques Creek Stream Assessment in Section 2.

General Watershed Description

The Little Chiques Watershed lies primarily in the northwestern section of Lancaster County (see *Figure 1-1*) and, within Lancaster County, comprises portions of four municipalities: Mount Joy Borough, East Donegal Township, Mount Joy Township, and Rapho Township. Throughout the upper two-thirds of the watershed, the main stem forms the boundary between Mount Joy and Rapho townships. Except for a short length through Mount Joy Borough, Little Chiques main stem constitutes the western border of Rapho Township. Detailed information on the watershed stream channels is included in the Stream Assessment, Section 2.

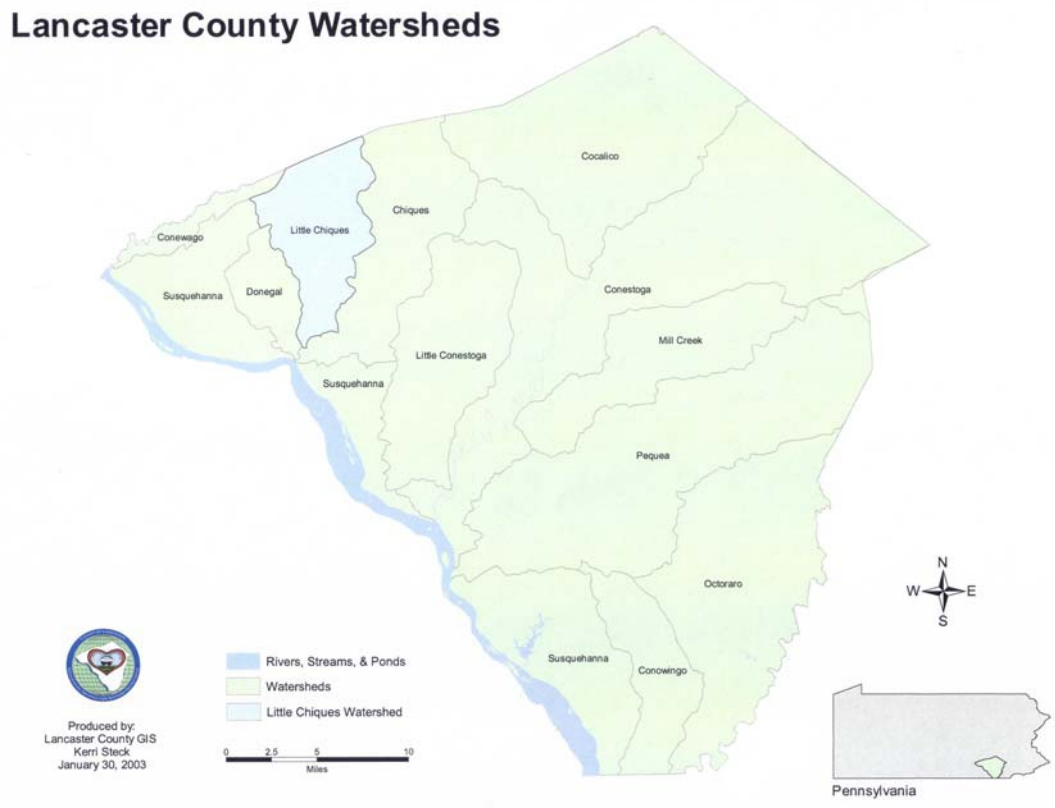


Figure 1-1. Little Chiques Watershed relative to all other Lancaster County watersheds.

Little Chiques Watershed can be divided into two regions: the upper two-thirds, which lies north of Route 283; and the lower third, which lies south of Route 283. The majority of the upper two-thirds of the watershed remains in its historical land use – agriculture. The lower third contains the watershed's population center, Mount Joy Borough, and is the site of the majority of residential and commercial development within the watershed. Agricultural land use is prevalent in the lower third of the watershed as well, but unlike in the upper two thirds, agriculture is just one part of a more diverse land-use mixture.

A cultural history of the watershed is included in *Little Chiques Creek Watershed Restoration Plan* (Gish, 2002). For the purposes of the Conservation Plan, the history of land use in the watershed is the salient point of interest, because historical land use is the primary shaper of existing conditions in the watershed today. Little Chiques Watershed, as described more fully under the Stream Assessment in Section 2, is in an overall state of evolutionary flux because of early historical impacts to the watershed. Those impacts are described below and are not unique to the Little Chiques Watershed; rather, they are typical of most watersheds in the Piedmont region of the United States.

Pre-Settlement Conditions

Before European settlers arrived in the Middle Atlantic Region of the United States, the landscape was dominated by forests of mixed hardwoods, conifers, and a variety of woody and herbaceous flora, from mountain peaks down to the valleys and streams and rivers. In the stream and river valleys – including those watersheds in the Susquehanna River Valley – the floodplains were wide and fairly flat. Floodplain soils were thin, peaty, and loamy – rich with organic material and highly porous, allowing abundant infiltration of surface water, which then percolated down to groundwater supplies. In these valleys, groundwater flowed near the floodplain surface, contributing to the base flow of the streams. (Base flow is the typical flow rate for a given stream at a particular time of year.) The floodplain surface typically rose about a foot above the base flow water surface elevation.

The typical pre-settlement scenario, then, looked something like this (see *Figures 1-2 and 1-7A*): relatively narrow stream channels meandered through the lower elevations of the valleys. Channel flows intersected with groundwater during times of high base flows, and recharged groundwater during drought or normal base flow conditions. Low, frequently inundated floodplains consisted of porous, well-vegetated soils. Root systems throughout the floodplain reached down to groundwater and stream bed elevations. The root zone protected the small stream banks from erosion and provided a large surface area for pollutant removal from groundwater and surface water. Floodplains served as a major recharge area for surface flow because of their porous material that held and gradually infiltrated flood flows from the channel as well as overland flows.

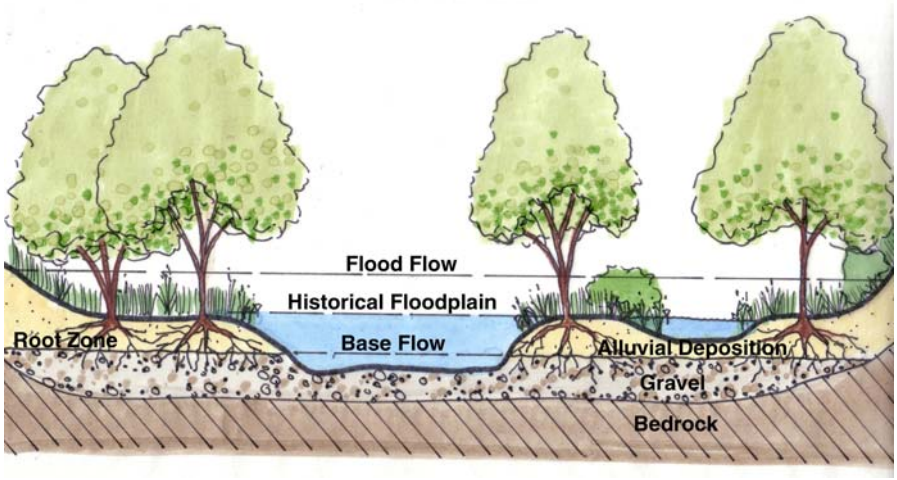


Figure 1-2. Stable, pre-settlement stream and floodplain systems were characterized by: a low floodplain in close contact with surface water in the stream channel, allowing for frequent inundation of the floodplain during high flows; riparian vegetation with roots zones in contact with ground water that enabled groundwater denitrification through root uptake; and a channel bed composed of cobble and gravel, which helped protect the underlying bedrock from erosive flow forces.

This scenario is nature's design for a fully functioning stream system that holds its stability while helping control storm flow and purifying water supplies. The constant interaction among the various components – surface water, groundwater, soil, and vegetation – is what is required to allow a stream channel, its floodplain, and the attendant wetland pockets to provide the benefits of a fully functional system. And this, no doubt, is how stream channels and floodplains in the Little Chiques Watershed must have looked and functioned before European settlers arrived and began to alter the landscape.

Early Historical Impacts

During settlement and on through rapid urbanization, from the 18th century up through the first half of the 20th century, much of the vegetation disappeared through land clearing for timber, agriculture, commerce, and settlements. Massive erosion from upland slopes into stream and river valleys ensued (see *Figures 1-3 and 1-7B*). To make it easier for farming and other human activities, meandering stream channels were moved from the lowest elevations in the valley centers to higher elevations at valley edges, and in the process usually were straightened.

Figure 1-3. Early loggers worked their way through Pennsylvania and other states, denuding hillsides and causing massive erosion into stream and river valleys.

Mill dams were built on stream channels throughout the Piedmont by the thousands. Lancaster County documents more than 400 grist mill dams alone (see *Figure 1-4*). As described under the Stream Assessment in Section 2 and shown on the *Existing Conditions* map at the end of Section 2, stream channels in the Little Chiques Watershed were affected by the construction of at least 22 dams, four of which still exist.

Behind the dams, water ponded and its flow velocity slowed down. All the eroded sediments and pollutants (phosphorus attaches to soil particles) that had moved into the valleys accumulated behind the dams and on the floodplains between the dams (see *Figure 1-5*). Stream channel beds and floodplains grew artificially high, perched on the fine-grained eroded materials. Elevated channel beds and floodplains were no longer closely connected to groundwater supplies; therefore, flows were composed predominantly of surface water runoff, with temperatures far exceeding that of the groundwater.

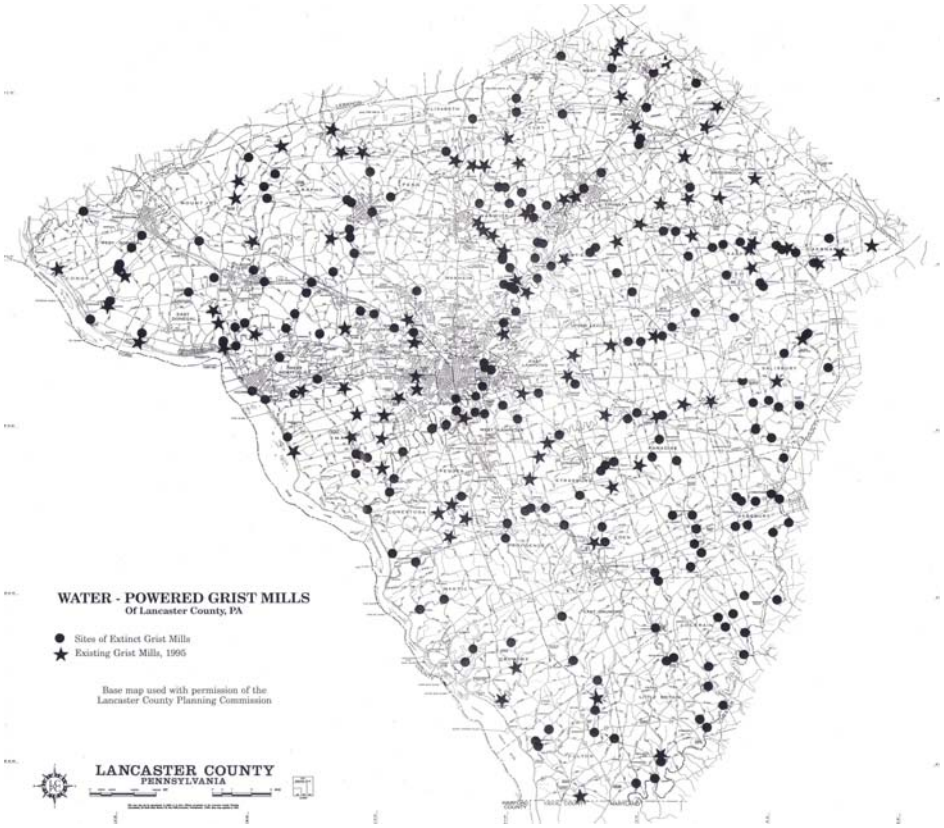


Figure 1-4. Extinct and existing grist mill locations throughout Lancaster County (Lord, 1996).

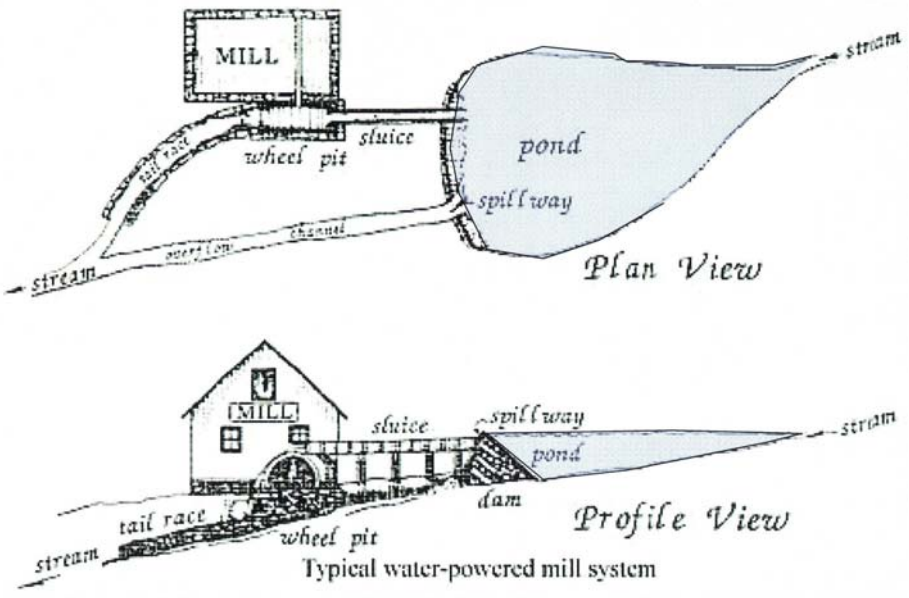


Figure 1-5. Plan and profile views make it easy to see how water slowed down and ponded behind dams and allowed sediments to build up behind the dams.

Vegetation changed because of the disconnect. Wetland systems were created not because of their proximity to groundwater but because they sat on dense, fine, nearly impervious sediments perched high above the stream bed and groundwater. No longer could those wetland plants extend their root systems into the groundwater to remove the nitrogen compounds.

Subsequent Impacts

As dams were removed or fell into disrepair – a condition that continues today – stream channels began to work their way down through the accumulated sediments, also known as "legacy sediments," toward their historical elevations, leaving the artificially elevated floodplain behind and becoming more and more "detached" from the floodplain (see *Figures 1-6 and 1-7C*). In reality, the floodplain became more accurately a terrace, with dense, fine-grained sediments rather than porous, peaty, organic soils, and with quite a different plant community.

Channel beds have cut too deeply through the sediments to allow any but the very highest flows to escape from the channel. Flow forces in the channel, therefore, are excessive and erosive, carrying stream bank sediments and attached pollutants downstream, undercutting banks and causing them to collapse, creating ongoing tree falls and resulting debris jams in waterways. Where the channels have reached pre-settlement stream bed levels, flows now recharging the groundwater have higher concentrations of nitrates and other soluble pollutants.

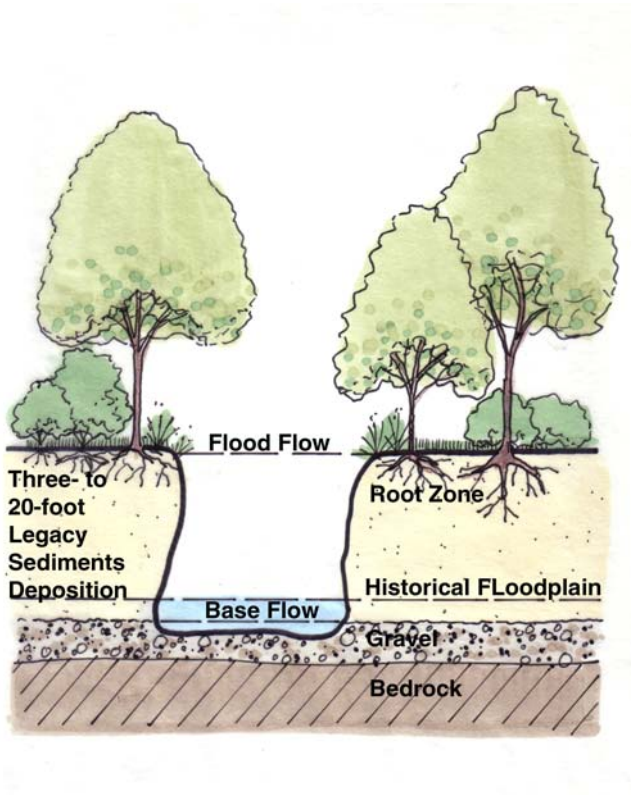


Figure 1-6. Stream channels are eroding or have eroded back down through sediments that collected behind mill dams, leaving their alluvial terraces high above the current base flow water elevation, and disconnecting riparian root systems from groundwater flows. The processes of frequent floodplain inundation, which relieves in-channel stresses; groundwater infiltration through porous floodplain material, and nitrogen removal from groundwater through root systems are lost under these conditions that are prevalent today throughout the Piedmont region of the United States.

The various components of a stream system can no longer interact properly. Stream banks and beds are eroding as they seek their proper elevation and location within the channel valleys. Phosphorus attached to the sediments along the banks is carried downstream with the eroded sediments. Nitrogen uptake by plants in the historical floodplain no longer occurs. Overland flows from stormwater enter the stream instead of the floodplain, where they were once stored, filtered, and percolated through the soil. Normal stream flows now have higher temperatures, because groundwater now intersects the stream bed only infrequently.

Impacts of Urbanization

Land use associated with residential, commercial, and industrial development is the number one source of increased impervious cover. In addition to the various impacts to our stream and floodplain systems in the watershed brought about by land clearing, stream relocation and straightening, milldam construction, stream crossings, and other human activities and encroachments, the Little Chiques Watershed – particularly the lower third – also has been affected by increasing urbanization and with it, a sharp increase in impervious surfaces, with roads, parking lots, driveways, and roofs replacing meadows and forests.

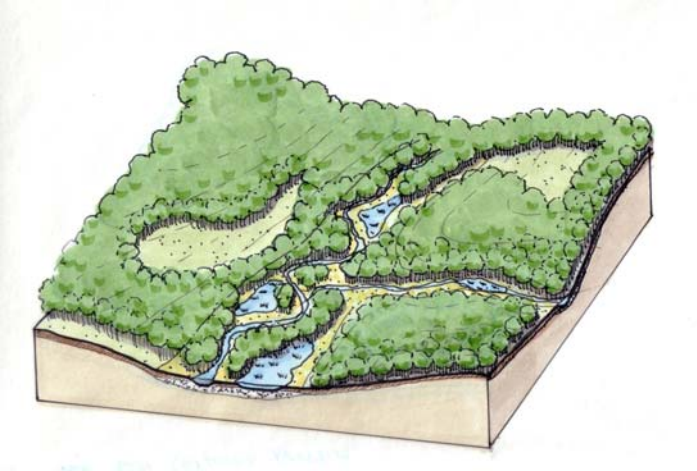
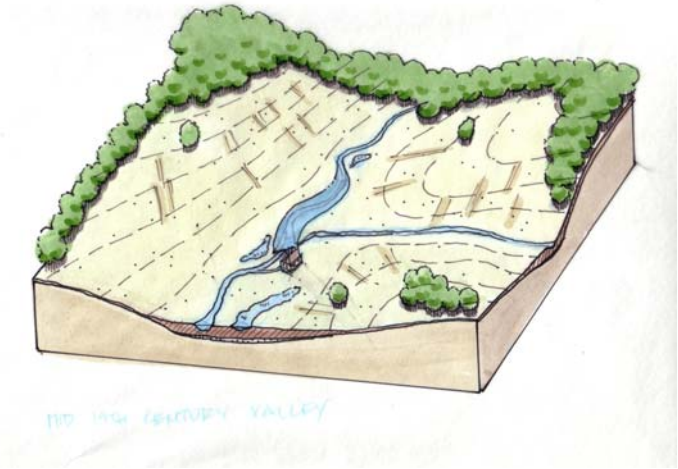
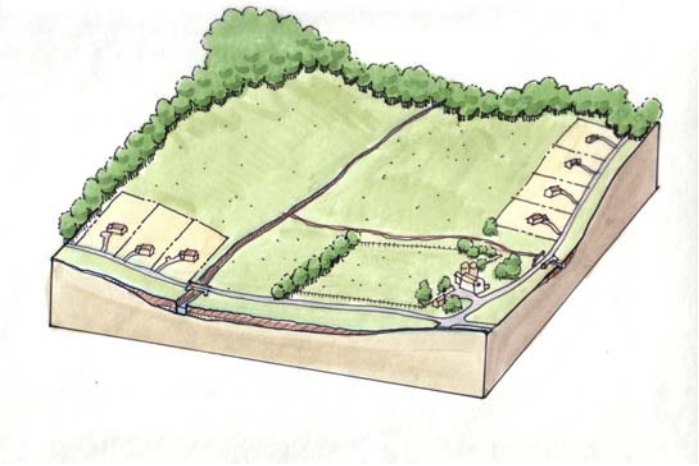


Figure 1-7A, B, C.
A cross section of a stream valley much like that of the Little Chiques Watershed depicts:

(A) multiple, meandering streams flowing through wide, forested floodplains in shallow channels with gravel and cobble beds near groundwater elevations;



(B) the results of historical land clearing and farming activities, including erosion into the stream valley, disappearance of many wetlands, and streams and floodplains elevated on eroded sediments, no longer in frequent and direct contact with groundwater; and



(C) the landscape much as it looks in modern times, with straightened, and often relocated, streams cutting down through sediments, and forests replaced by farm fields, developed areas, and paved surfaces.

B. RESULTING PROBLEMS

A summarized review of the functions and benefits of a stable, natural stream channel and floodplain system helps set the stage for a discussion of the watershed-wide problems that result when the components of a stream system become disconnected from each other. Here, then, are the functions and benefits of a properly functioning stream system:

- a channel at proper elevation and with stable dimensions (width and depth), profile (stream bed elevation), and pattern (path of flow) to minimize evolutionary movement either vertically or laterally and to be able to receive groundwater;
- a pool-and-riffle sequence flowing over a gravel or cobble channel bed to help provide habitat for desired aquatic species;
- a floodplain low enough to receive more routine flows, thereby reducing excessive and erosive flow forces in the channel at the site and downstream;
- a floodplain low enough to allow root systems to interact with groundwater, providing denitrification of the groundwater and effective stabilization of the stream banks;
- a floodplain wide and flat enough and composed of the proper earthen materials to absorb and hold overland or flood flow while allowing the flow to percolate through to groundwater; and
- a plant community adapted to frequent inundation that will provide suitable habitat for riparian wildlife and whose root systems will provide nitrate and phosphate removal from surface and/or groundwater.

Because the Little Chiques Watershed, like many watersheds in the region, has been negatively affected by the historical impacts described above, planners must take into account the problems that have resulted. The reader will notice that the recurring theme with these problems is that overland flows and flood flows are not apportioned appropriately between groundwater recharge and downstream flow to receiving waters. Groundwater recharge via the floodplain is greatly reduced – infiltration is minimal where infiltration potential is high – and downstream conveyance is greatly increased, resulting in more frequent and severe nuisance flooding in inappropriate areas. Here, then, are some of the problems associated with historical stream system impacts that need to be recognized and addressed within the watershed:

Reduced base flows

Groundwater, which was the principal source of a stream's base flow, currently flows well below the stream bed *(*see *Figure 1-8)*. Seeps and springs that originate from the hillsides previously entered the porous floodplain, recharging the groundwater and base flow; now they directly enter stream systems or ponds perched on dense, fine-grained floodplain sediments.

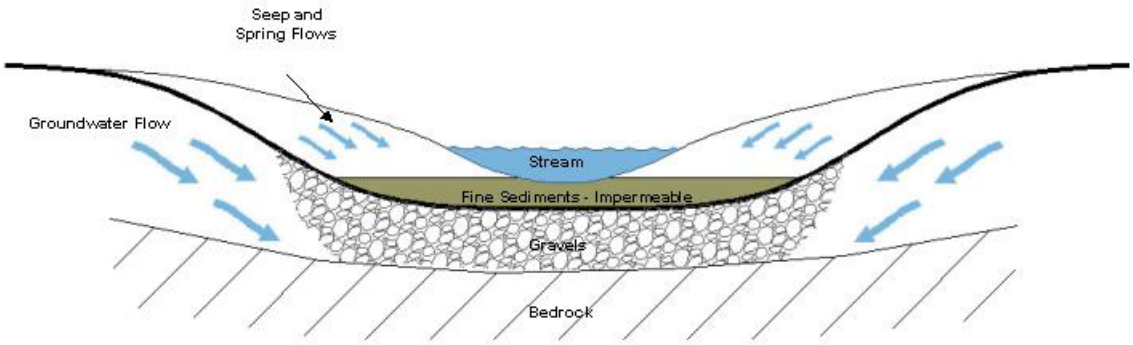


Figure 1-8. Reduced base flow results when streams are perched above groundwater flows.

Losing streams with perched systems

Stream beds located at their historical, natural cobble or gravel bed elevations allow interaction between surface water and groundwater. As upstream flow or flow from the adjacent floodplain enters these areas, a certain amount percolates through the gravels to groundwater. These "losing" streams *(*see *Figure 1-9)* are an important source of groundwater recharge.

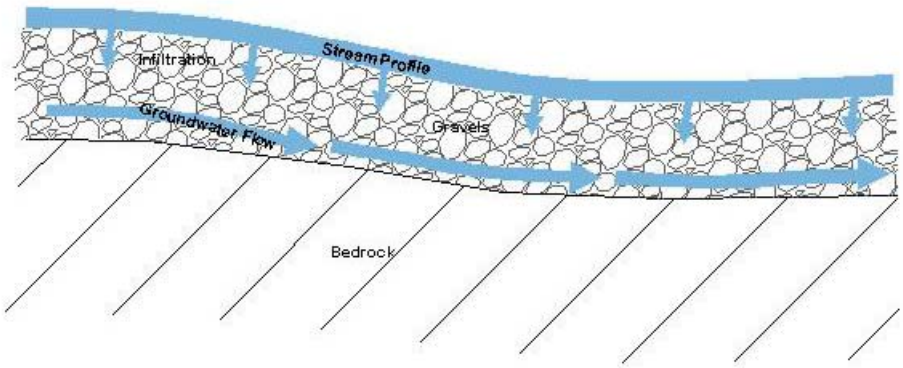


Figure 1-9. Losing streams percolate some of their surface flow down to groundwater through porous gravel beds.

On the other hand, streams perched on less porous legacy sediments or streams historically relocated to a site higher along the valley on bedrock are not capable of recharging the groundwater, because entire flows are quickly transported downstream rather than partially infiltrated through porous bed material.

Filled floodplains and perched wetlands

Filled floodplains now separate vegetation and wetlands from groundwater systems because of much thicker, less permeable layers of dense sediment *(*see *Figure 1-10).* Root systems are not deep enough to provide conveyance channels to groundwater levels. Historical or restored floodplains, which are attached to the channel and are flooded many times per year, provide a more constant and wide variety of food sources and habitat to the aquatic and riparian resources along the streams. Functional floodplains also provided large surface areas of porous organic soils that can store significant volumes of water and provide significant groundwater recharge. Today's sediment-filled "terraces" have minimal storage and surface water is either (1) ponded on thick dense soils and then removed by evaporation and transpiration or (2) quickly conveyed via the channel or through the floodplain into downstream receiving waters, causing increased flood flows and surface water elevations.

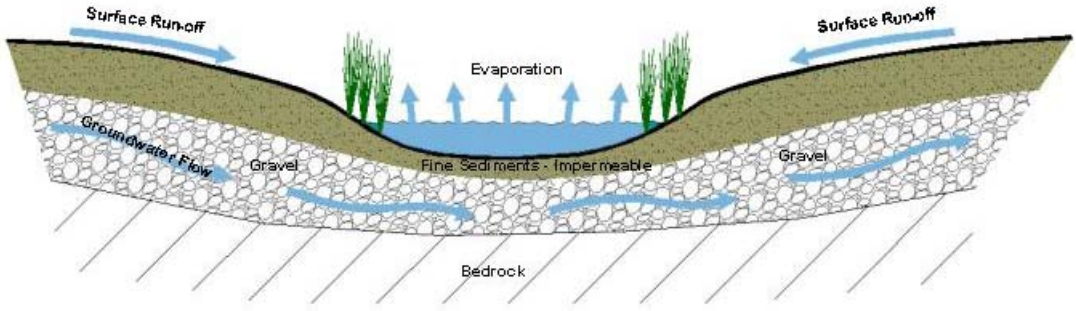


Figure 1-10. Wetland perched on less permeable, dense sediments.

Perched streams

Stream reaches with beds located at a natural cobble or gravel bed elevation are located where groundwater is always a source of base flow to the stream, except, possibly, under the most severe drought conditions. When flow from upstream is not available (during dry or moderate drought conditions, for example), groundwater seeps into the channel pools and riffles, providing a constant source of cold, clean water to aquatic life. During precipitation events, floodplains through these reaches then provide significant water storage in the soils, which is then available for recharge to the groundwater.

On the other hand, streams wholly perched on beds of fine sediments and clays (see *Figure 1-11*) cannot provide a source of constant base flow, which results in ephemeral streams (streams that flow only in response to local precipitation events) that do not support a healthy aquatic community. The floodplain no longer acts as a principal groundwater recharge area. Instead, the channel bed and floodplain consist of dense sediments that quickly convey flows to the downstream receiving waters with minimal groundwater recharge.

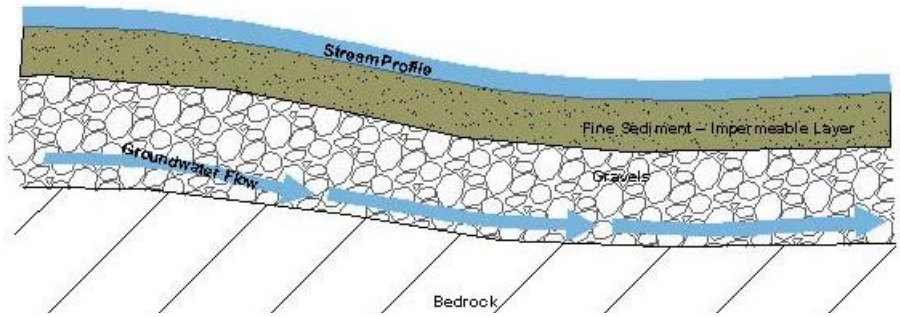


Figure 1-11. Streams perched on dense sediments send all their surface waters downstream and do not contribute to groundwater recharge.

Filling and destruction of functioning wetland systems

Post-settlement erosion and current land-use impacts also have reduced or removed the functions of wetland systems not directly attached to the natural floodplain or adjacent to streams. In a healthy, functional system, surface waters flow into these wetland areas, providing storage, pollutant removal, and, in many locations, significant groundwater recharge (see *Figure 1-12*). These wetland areas often include the headwaters, which, rather than having distinct stream channels, were historically characterized by large riparian wetlands that removed pollutants from the surface waters and recharged the groundwater and aquifers that provided the base flow to streams farther down the valley. The results of the most recent impacts include ditching and impermeable layers that significantly increase the conveyance of surface waters while dramatically reducing the infiltration and treatment potential of these systems.

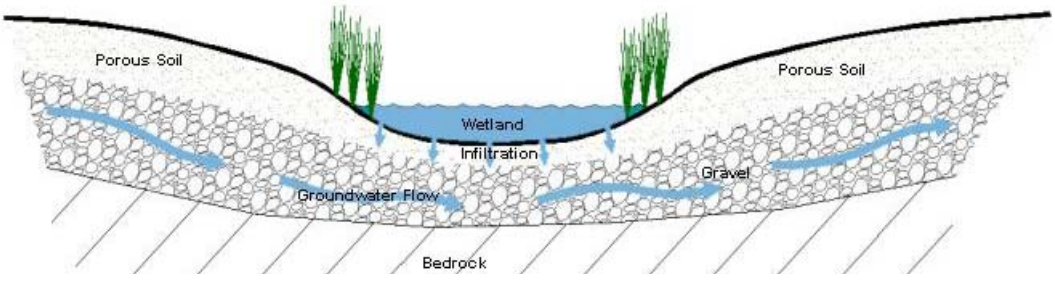


Figure 1-12. Functional wetland, where surface water provides groundwater recharge.

Stream impacts

Pre-settlement streams meandered across the valley at low velocities and with additional stream length that intersected the groundwater at different locations. The historical and recent alteration of stream systems through straightening and relocation has reduced stream length, increased flow velocities, reduced travel time, and reduced or removed the interaction with the groundwater. Channel bank and bed erosion, pollutant loadings, and flood flows and elevations have increased. As the stream and floodplain continue to evolve to pre-settlement conditions, the result will be long-term sediment and pollutant increases to the streams; removal of the existing riparian vegetation; removal of the historic gravels that once protected bedrock and served as a valuable resource to aquatic life, removal of the pre-settlement floodplain, including the seed bed and organic, peat-like floodplain material; increased debris jams; and increased flood elevations. The resultant stream systems may include significant stream reaches with beds of fine-grained sediments or bedrock and floodplains with a high sand content and invasive vegetation.

These conditions are, to a great extent, observable today throughout the Little Chiques Watershed, as documented in the Stream Assessment in Section 2.

Increased Impervious Cover

As a result of contemporary urbanization, the increase in impervious cover results in some of the same problems created by legacy sediments: reduced surface areas that should be infiltrating stormwater and flood flows and filtering those waters in the process. Additionally, because these flows are not infiltrating through porous surfaces, they are carried downstream, leaving the aquifer and creating a surfeit of surface flow downstream.

2. THE FRAMEWORK

A. WHAT WE LEARNED

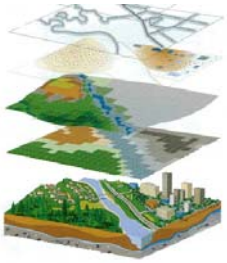
B. SUMMARY

2. THE FRAMEWORK

A. WHAT WE LEARNED

The Little Chiques Creek watershed is a diverse collection of land types, consisting of the forested, boulder-strewn headwaters region; the deep cut valleys of the middle shale region; and the rolling farmland and population centers associated with the limestone valley. With such diversity and rapid change, how does one make informed land management decisions?

Geographic Information Systems (GIS) addresses the need for suitably organized land management decisions. GIS tools are computerized mapping programs that analyze geographic data from infinite perspectives. Layers of information are combined and analyzed in a single map and often offer new and enlightening perspectives. Such custom maps allow users to organize data, examine relationships, and make sound decisions regarding the use and application of management goals for large areas.



The Maps

Eight custom maps showing various related mapping layers have been generated for this project. All eight maps are included in this section. The decision as to what is shown on each map was based on objectives such as how the map represents the goals of the project and its legibility – does the map present information in a way that is useful?

The Categories

The analysis categories – Land Resources, Water Resources, Recreation and Open Space Resources, and Land Use – are used to explain the interrelationship of related data. Data include the maps as well as other study-related resources such as the stream assessment and an assessment of cultural resources. These organizational categories are used to determine patterns unique to this watershed. This information will assist land managers and planners with making informed decisions regarding water resource management.

Analysis Categories and Related Data

Land Resources
Map 1 Geology
Map 2 Soils
Map 3 Topography

Water Resources
Map 4 Water Resources
Stream Assessment

Recreation and Open Space Resources
Map 5 Open Space and Recreation
Cultural Resources
Biological Features

Land Use
Map 6 Existing Zoning
Map 7 Future Land Use
Map 8 Agricultural Protection Areas

1. Land Resources

Land Resources were studied using the Geology, Soils, and Topography maps. The interrelation of these three maps helps identify landform patterns that contribute to how we live on the land.

Geology - Map 1

Mapping Layers
- Limestone
- Dolomite
- Sandstone
- Shale
- Quartz conglomerate
- Diabase

Description

The watershed contains various sedimentary formations, each with unique characteristics. The northernmost edge of the watershed, known as the Gretna Hills, consists of a mixture of sandstone and diabase. This area is strewn with large basalt boulders, making it difficult to farm or develop. The most sizable forest stands in the watershed are found in this area.

The majority of the watershed is divided into almost equal thirds. The upper third is underlain by a fairly resistant sandstone; the middle third, a softer shale; and the lower third, limestone. The sandstone region is characterized by shallow valleys and stream systems. In the softer shale area, the water has cut much deeper valleys, creating deep gorges and steeper hillsides. Limestone underlying the lower third of the watershed is the basis for some of the best farmland in the nation, for which Lancaster County is known. Much of the drainage in this limestone, or karst, geologic area is subterranean. Water travels through underground streams and caves and empties into streams via springs and sinks.

Soils (Map 2)

Mapping Layers
- Prime Agricultural Soils
- Hydric Soils

Description

For purposes of this study, the multiple soil types were combined into two distinctive categories that directly influence how the land may be used and, ideally, are restricted from development because of their importance. Prime agricultural soils, deepest and best for farming, and hydric – wet – soils, difficult to farm and not permitted to be developed. These two soil categories, where they occur with other important resources (hydric soils in floodplains or prime agricultural soils in dry stream valleys) help identify critical areas for conservation.

Topography (Map 3)
Mapping Layers Slopes greater than 25 percent

Description
If this map were overlain on Map 2 – Soils, the relationship between steep slopes (dark brown) and soils that are neither prime agricultural nor hydric (white) would be readily apparent. The topography map, too, confirms the dramatic difference in landform between the northern and southern halves of the watershed. Land with slopes greater than 25 percent is difficult to farm and develop. Therefore, the occurrence of steep slopes in the same areas as other important resources, such as riparian corridors or floodplains, can be used to help identify critical areas for conservation.

Limestone
Dolomite
Sandstone
Shale
Quartz conglomerate
Diabase

LEBANON COUNTY
LANCASTER COUNTY

MOUNT JOY TOWNSHIP
RAPHO TOWNSHIP
EAST DONEGAL TOWNSHIP
BOROUGH OF MOUNT JOY

Little Chiques Creek
Chiques Creek
Donegal Creek

750 745 745 730 660 665 645 705 705 685 845 705 635 615 620 650 625 615 630 640 600

76
283

Map 1: Geology

Municipal Boundaries
Watershed Boundary
Parcels
Waterbodies
625 Local High Points

N

Little Chiques Creek Watershed Assessment

0 4,500 9,000 Feet

1 inch equals 4,500 feet

AREA OF DETAIL

LEBANON COUNTY
LANCASTER COUNTY
Little Chiques Creek Watershed

This project was financed in part by a grant from the Community Conservation Partnerships Program, Keystone Recreation, Park and Conservation Fund, under the administration of the Department of Conservation and Natural Resources, Bureau of Recreation and Conservation.

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ARRO The ARRO Group, Inc.

Prime Agriculture Soils
Hydric Soils

LEBANON COUNTY
LANCASTER COUNTY

MOUNT JOY TOWNSHIP

RAPHO TOWNSHIP

BOROUGH OF MOUNT JOY

EAST DONEGAL TOWNSHIP

Little Chiques Creek
Chiques Creek
Donegal Creek

76
283

Map 2: Soils

Municipal Boundaries
Waterbodies
Watershed Boundary
Parcels

N

Little Chiques Creek Watershed Assessment

0 4,500 9,000
Feet
1 inch equals 4,500 feet

AREA OF DETAIL
LEBANON COUNTY
LANCASTER COUNTY
Little Chiques Creek Watershed

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ARRO
The ARRO Group, Inc.

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Contours
Slope > 25%
625 High Points

LEBANON COUNTY
LANCASTER COUNTY

MOUNT JOY TOWNSHIP
RAPHO TOWNSHIP
EAST DONEGAL TOWNSHIP
BOROUGH OF MOUNT JOY

Chiques Creek
Donegal Creek
Little Chiques Creek

Map 3: Topography

Municipal Boundaries
Waterbodies
Watershed Boundary
Parcels

N

Little Chiques Creek Watershed Assessment

0 4,500 9,000
Feet
1 inch equals 4,500 feet

AREA OF DETAIL
LEBANON COUNTY
LANCASTER COUNTY
Little Chiques Creek Watershed

This project was financed in part by a grant from the Community Conservation Partnerships Program, Keystone Recreation, Park and Conservation Fund, under the administration of the Department of Conservation and Natural Resources, Bureau of Recreation and Conservation.

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2. Water Resources

This study attempts to analyze the functional elements of the watershed and the interrelationship of land use, surface water, and groundwater. The surface water resources were mapped, including wetlands, streams, ponds, and floodplains. A stream assessment was completed along representative reaches throughout the watershed. This cursory assessment provides a snapshot of what is happening along the stream corridor and is a reflection of the overall health of the watershed. Information on groundwater quality and quantity is more difficult to identify without more intensive groundwater studies. Available information, including the Revised Pump Test Plan – Development of Water Supply Well, dated April 30, 2004, and a meeting with Mr. Kevin Herr, Mount Joy Borough Authority, was reviewed to determine general patterns of subsurface water systems and their relationship to surface activities. Until further studies may be completed, and for purposes of this study, we have made some broad assumptions that the limestone-geology areas surrounding Mount Joy Borough provide the most significant groundwater recharge and supply potential. Groundwater protection strategies will be focused on this area. More detailed groundwater and critical aquifer recharge area assessments need to be completed to more fully understand the status of the water supply.

Water Resources (Map 4)

Mapping Layers
- Wetlands
- Floodplains
- Streams
- Ponds
- Wellhead Protection and Recharge Areas
- Limestone Geology - groundwater source and recharge potential

Little Chiques Creek Stream Assessment

See page 20.

Description

Water is the most fundamental – and volatile – component of the watershed system. Historically, water changes the form of the land through its constant movement. Water resources available in the watershed include both surface water (streams, rivers, wetlands, and ponds) and groundwater (the subsurface water supply). Even though we cannot see the groundwater, we are directly affected by its quality and quantity.

Extinct Dam
Existing Dam
Assessed Reaches
NWI Wetlands
Floodplains

Reach 7
Creek Road Reach
Reach 9
Reach 8
Reach 6
Reach 5
Back Run Reach
Reach 4
Reach 3
Reach 2
Reach 1

LEBANON COUNTY
LANCASTER COUNTY
MOUNT JOY TOWNSHIP
RAPHO TOWNSHIP
BOROUGH OF MOUNT JOY
EAST DONEGAL TOWNSHIP
Little Chiques Creek
Chiques Creek
Donegal Creek
76
283

Map 4: Water Resources

Municipal Boundaries
Watershed Boundary
Parcels

N

Little Chiques Creek Watershed Assessment

0 4,500 9,000
Feet
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Little Chiques Creek Stream Assessment

The main stem of Little Chiques Creek originates in the vicinity of the United Zion Campground near the Lancaster/Lebanon County line. From the Lancaster County line to its confluence with Chiques Creek between Marietta and Columbia, the main stem is 22.45 miles long. The Little Chiques Creek Watershed, which comprises approximately 45 square miles, includes four major tributaries: Back Run and Brubaker Run entering from the east in Rapho Township, and Stauffer's Run and an unnamed tributary entering from the west in Mount Joy Township. Little Chiques Creek, in turn, is a tributary to Chiques Creek, the waters of which flow into the Susquehanna River between Marietta and Columbia and, ultimately, into the Chesapeake Bay at Havre de Grace, Maryland.

The Pennsylvania Department of Environmental Protection (PADEP) assessed nearly half of the main stem – 11.1 miles (303d ID 970722-1115-SAW), from its confluence with Chiques Creek upstream to the confluence with an unnamed tributary (PADEP stream code 07954) – and, in 1998, added Little Chiques Creek under State Water Plan 07G to its 303d list of impaired streams. The source of the impairment, according to the 303d list, is nutrients and siltation from agriculture. The stream is listed as a medium priority.

Additionally, the Total Maximum Daily Load (TMDL) assigned to Chiques Creek, also known as Chickies Creek, applies to Little Chiques Creek as a subwatershed of Chiques Creek. The TMDL sets a ceiling on the pollutant loads that can enter a waterbody so that the waterbody will meet water quality standards. Nonpoint sources of pollution are listed as nutrients and siltation from agriculture and urban runoff/storm sewers. The DEP Information Sheet on the "TMDL for Chickies Creek Watershed" (see Appendix) indicates, "All of the pollution in the Chickies Creek Watershed comes from non-point sources (NPS) of pollution. The pollutants come primarily from overland runoff." It is LandStudies' position that pollutants (sediment and phosphorus compounds) in the watershed also derive from a largely overlooked source – the stream banks, themselves, as described below.

Like many other streams in the Piedmont Physiographic Region of the Mid-Atlantic States, Little Chiques Creek and its tributaries have been severely affected by post-settlement agricultural and industrial activities. Historical rapid land clearing and timber harvesting, poor land-use practices, transportation crossings, and the imposition of numerous milldams along water courses for various industrial uses all have contributed to the scenario of stream instability much in evidence today.

Historical Impacts on Little Chiques Creek and Its Tributaries

Maps from the 19th century (Bridgens, 1864; Scott, 1824) document at least 22 milldams associated with Little Chiques Creek (see *Existing Conditions* map at the end of this section. The main stem alone contained at least 13 dams varying in height from four to 30 feet, three of which still exist in or near Mount Joy Borough: one north of the

Borough, upstream of the old waterworks near the area commonly called The Cove; one downstream of Little Chiques Park in the Borough; and one south of the Borough, off Longenecker Road and directly east of the Koser Road/Pinkerton Road intersection. In addition, another existing dam, just downstream of the confluence of Little Chiques and Chiques creeks, is close enough to Little Chiques to exert an influence over its morphology.

Three dams are documented to have existed in the Back Run subwatershed – one on Back Run itself and one each on two of its unnamed tributaries. Three dams existed on Brubaker Run, and a fourth existed on Snyder Run, a tributary to Brubaker Run. Finally, historical maps show a dam on Stauffer's Run, entering the main stem from the west, near Quarry Road in Mount Joy Township.

In addition to the 22 documented dams that have affected or are affecting the streams in the watershed, it is highly likely that additional dams associated with irrigation or watering areas for livestock and other uses existed that were never documented. Given the mobile nature of early logging operations, when timber mills and their associated dams were often used for only a decade or less before they were destroyed or abandoned, it is probable that most of these types of ephemeral structures did not become part of the historical record. Based on historical documentation, it is estimated that dams directly created ponded conditions on a minimum of five miles of stream on the Little Chiques main stem.

Many sections of waterways throughout the watershed also were moved and/or straightened in the course of agricultural activities, road building, and development. Road crossings are abundant on Little Chiques and its tributaries, and both the existing railroad and the former trolley line crossed or cross the main stem near Route 230 at the eastern end of Mount Joy Borough. All of these activities and structures had or continue to have an influence on the condition of the stream channels.

Little Chiques Creek, just like numerous other streams in this part of the country, currently is adjusting to or evolving from the most recent impacts, including dam removals, stream channel relocations, floodplain encroachments, waterway crossings, and straightening and dredging.

Land-use practices, both historical and current, also are affecting the chemical composition of the stream. During the Agricultural Period, manure, fertilizer, human waste, and byproducts from the different mill operations were discharged into the Little Chiques Creek. Elements such as phosphorus attached to the soils eroding from the hillsides, settled behind the milldams and in the floodplains. Today, as the stream bed degrades and the stream banks erode and collapse, the pollutant loads attached to the soils and stored in the recently formed terraces are being released into the waters. Current agricultural practices, inadequate sewage facilities, and uncontrolled runoff from development have been identified as common supplements to the discharge of pollutants into streams in this region.

Current Conditions of Little Chiques Creek and Its Tributaries

For the purposes and scope of the Conservation Plan, the assessment of Little Chiques Creek and its major tributaries was not a complete morphological assessment but rather a spot assessment, gathering data from historical records, in-stream inspection, and stream-side observation of selected locations (see *Existing Conditions* map at the end of this section). These assessments were conducted on August 10, September 7, October 22, and October 27, 2004. Additional site visits for photodocumentation in other areas of the watershed were undertaken in January and February 2005.

Little Chiques Creek and its major tributaries are in the early stages of adjustment or evolution. Overall, the bed elevation is typically still perched above the historical bed elevation (that prior to European settlement). The bed material is a mixture of fine sediment – clays, silts, and sands – with a local input of broken, degrading bedrock and gravel from small tributaries and valley slopes (see *Figure 2-1*).

Figure 2-1.
Degrading bedrock, derived from excessive flow forces within the entrenched channel, is part of the sediment load in Little Chiques Creek. (The mechanical pencil in the middle of the photo provides scale.)

With the previous bed controls being removed or destroyed through high flow events, the channel bed is downcutting to an elevation near the historical bed elevations. The floodplains, which had been ponded areas behind dams, are now three to 10 feet higher than the channel bed. The in-channel shear stresses (erosive pressure on bed and banks caused by the force of the flow) and flow velocities are much higher than those needed to cause erosive conditions. Higher flows remain in the entrenched channels, significantly increasing velocities and shear stresses, rather than moving frequently into the floodplain where those forces can be dissipated.

The vegetation and root systems, even in the forested areas, are too high above the stream bed to protect the channel banks from eroding. Debris jams as a result of tree fall increase the localized rate of erosion.

As a matter of explanation, the rate of erosion is dependant on the percent of fines (fine material) and cohesive material on the banks and in the bed. When the stream bed degrades (cuts down) to the historical floodplain or channel bed elevation, the rate of erosion increases dramatically. This happens because the organic loamy material and gravel, which is the material of the historical channel bed and floodplain, is much more erodible than the more cohesive materials that have recently deposited. When these erodible materials are washed away, it creates a situation of massive bank failure and slumping and lateral migration (sideways movement) of the stream channel. The frequent tree falls that occur along the forested portions of the stream are typical results of historical bed and floodplain erosion undercutting the high banks.

The stream system is trying to restore itself to a more sinuous pattern on a more uniform bed material (historical gravels) while developing, in the process, a floodplain that is more similar in elevation to the historical elevation. Recent development and additional runoff may increase the frequency and level of peak flows, which will increase the rate of erosion and stream evolution. Hoof shear from unrestricted cattle access to the stream banks will also increase the rate of erosion (see *Figure 2-2*).

Figure 2-2. These cattle along Back Run, a tributary to Little Chiques Creek, have free access to the stream channel.

Local Observations

Locations of assessed reaches are shown on the *Existing Conditions* map at the end of this section.

Reach 1

The first in-stream visual assessment was conducted beginning at the confluence of Little Chiques and Chiques creeks (see *Figure 2-3*) and working upstream along the old Johnson Mill Road off Drager Road, where Drager Road makes a 90-degree bend. (The former Johnson Mill Road is now a dead-end gravel road.) Historical and contemporary man-made impacts are in evidence along this reach, including the remnants of the old trolley line crossing, and bed and bank armoring to protect utilities. The armoring in the vicinity of the confluence, at the Route 23 bridge crossing, provides bed control in this area. At the Drager Road bridge crossing, riprap has been installed as protection against scour. There is a short, steep riffle and long pool area here, which is a typical feature caused by man-made impacts (see *Figure 2-4*).

Figure 2-3.
Confluence of Little Chiques (left channel) and Chiques (right channel) creeks, looking upstream, near the intersection of Drager Road and Route 23 (Marietta Pike).

Figure 2-4.
Drager Road bridge crossing near mouth of Little Chiques, showing steep riffle pattern upstream of bridge.

The bed in this area is probably still artificially high. Gravel is part of the bed composition but there is no evidence of gravel in the banks. That situation indicates that the gravel here is not the gravel of the historical bed elevation but rather gravel that has entered from upstream and dropped out as a result of the slowed backwater behind the confluence with Chiques Creek. Upstream of the Drager Road crossing, along Johnson Mill Road, the stream bed is closer to its historical elevation, and in some places

degraded below historical elevation, down to bedrock (see *Figure 2-5*). Historical records show the prior existence of a milldam at the upper end of the gravel road; it is not uncommon to find that stream beds below milldams were either armored with large rock or boulders or allowed to degrade to the bedrock.

Figure 2-5. Looking upstream along Johnson Mill Road (far right), where the stream bed appears to be near or below its historical elevation.

Reach 2

The assessment began at the Pinkerton Road crossing, commonly known as Stone Bridge, which was constructed in 1883. The bridge sits at such an obviously odd angle to the stream that the evidence is strong for this section of stream having migrated to the west during the past century (see *Figure 2-6*). Moving upstream from Pinkerton Road, at the top of a long riffle, the stream banks become high and the stream bed becomes silty. The banks are terraced at equal heights on both sides, suggesting a downstream cause of backwater some time in the past. Bridgens' 1864 Atlas, indeed, indicates the presence of a gristmill downstream from this area, the dam for which would have created the backwater conditions.

Figure 2-6.
A proper alignment between channel and bridge opening would show the stream flowing toward the bridge from the lower left-hand corner of the photograph. The acute angle of approach in the existing condition suggests that the channel may have migrated from its original path.

Farther upstream, the bed has degraded down to bedrock and the sediment banks farther upstream grow to at least five feet high in the vicinity of the current Groff Farm and Golf Course property. The instability along the Groff Farm property is particularly evident even farther upstream, in an area that was photographed but not assessed (see *Figures 2-7A* and *2-7B*).

Figure 2-7A. Downstream end of a mid-channel island, looking upstream, with high alluvial bank visible on left.

Figure 2-7B. The upstream end of the mid-channel island is filled with fallen trees and deposited sediments.

An existing, privately owned dam is located upstream of Reach 2, northwest of the 90-degree bend in Longenecker Road along the Arthur Reist property (see *Figure 2-8*). That dam was not inspected as part of this assessment.

Figure 2-8.
This privately owned dam (center of photo), is one of three still in existence on Little Chiques Creek and is maintained by the landowner. Longenecker Road is in the foreground.

Reach 3

The assessment was conducted from the vicinity of the Mount Joy sewage treatment facility to just upstream of the Longenecker Road crossing (see *Figures 2-9* and *2-10*). Given the terrain, it is possible that this part of the stream might have been moved toward Longenecker Road, to the bedrock outcropping, from the fields now part of the sewerage plant and the adjacent farm. Much of the stream bed in this area is composed of boulders and silt, from the energy of the flow beating against the bedrock wall.

Figure 2-9.
Looking downstream from below the Longenecker Road bridge crossing. Longenecker Road can be seen immediately adjacent to the stream channel on the far left. Note riprap material on the left bank as an attempt to minimize bank erosion. Also note along the right bank the leaning trees, which will eventually fall and create debris jams.

Figure 2-10.
Looking upstream to the Longenecker Road bridge crossing.

Reach 4

The assessment began at Main Street, Route 230, in Mount Joy Borough and extended upstream through Little Chiques Park, across Route 772, and through the area known as the Cove and the old Mount Joy Waterworks site to the upstream dam near the Mount Joy Sportsmen's Association property.

In addition to the railroad bridge and the Main Street bridge crossings at the downstream end of the reach, there are, in rapid succession moving upstream, a utility crossing and an existing dam known as Sico Dam (see *Figures 2-11* and *2-12*). Groundwater outflow was noted along the left bank at the dam.

Figure 2-11.
Sico Dam in
Mount Joy Borough.

Figure 2-12.
Looking upstream from Sico Dam, the ponded backwater behind the dam is obvious.

Little Chiques Park

Just upstream, near Little Chiques Park, the creek flows along bedrock on the left bank (see *Figure 2-13*). The bed itself is composed of fines (fine sediments), silts, and clays. The Creek in this area is in an aggrading (up-building) rather than degrading (down-cutting) state, as sediment continues to drop out in the slowed water behind Sico Dam. The fines from this area will continue to work their way downstream over time.

Figure 2-13. Looking upstream, bedrock along left bank of Little Chiques Creek in the vicinity of Little Chiques Park

At the northern bend of the oxbow that forms the park boundary, a small, unnamed tributary enters Little Chiques Creek (see *Figure 2-14*). Following that tributary upstream, there is evidence of a historical pond, spillway, and race. This entire section of the tributary appears to have been channelized into a ditch. The tributary appears to flow under Lefever Road, from the Elmtree Development site, with its origins above the Route 283 - Route 772 intersection.

Just upstream of the confluence of the unnamed tributary with Little Chiques Creek, Little Chiques hugs along the right bank, which is protected with bedrock. There is spotty armoring along the banks. Geologically, the channel should be meandering through the center of the valley and not pinned against the valley wall. Frequently streams were relocated along the valley wall so the entire floodplain could be used for crops or pasture. The stream would then cut across the valley at the property line along the opposite valley wall.

Moving upstream, in the vicinity of Pine Street and approaching the Route 772 bridge crossing (see *Figure 2-15*), the slope of the channel increases, the stream banks are cut higher, and the bed material is larger. The absence of this larger material in the banks, however, indicates that the source of the material is local or being carried in from upstream, rather than representing the historical bed elevation. Stream flow has poor alignment with the bridge, sending the force of the water into and eroding the left bank on the downstream side of the bridge.

Figure 2-14. Unnamed tributary, originating above the Route 283 - Route 772 intersection, shown at its confluence with Little Chiques Creek in Little Chiques Park.

Figure 2-15. Route 772 Bridge Crossing, looking upstream.

Cove/Mount Joy Waterworks

The section of stream that runs along Cove Road, moving northwest from the Route 772 bridge crossing, has a bed composition of coarse sand. The stream in the area of the Cove is in an aggrading condition; fines are falling out as the stream widens and the flow energy lessens. The former concrete pedestrian crossing has fallen into the creek bed (see *Figure 2-16*) because the stream channel has widened, and that collapsed crossing exerts a grade control.

This portion of the Little Chiques main stem, in particular, is actively evolving, and the process will accelerate as the concrete pedestrian crossing continues to crumble. At the upstream limit of this reach, the dam is deteriorating and already has been breached (see *Figures 2-17* and *2-18*). The deterioration of this structure, along with the downstream deterioration of the concrete crossing structure, will lead to an increased sediment supply, an increased channel slope, and an increased rate of change (evolution) in the channel throughout this section of Little Chiques Creek. It is important to note that the failure or removal of the grade controls (pedestrian crossing and dam) allows Little Chiques Creek to evolve to the elevation of its historical gravels. This level is necessary to provide long-term stability and high-quality aquatic habitat.

This reach of the Little Chiques Creek main stem represents the downstream portion of the Creek that is stocked by the Pennsylvania Fish and Game Commission (see *Existing Conditions* map at the end of this section.

Figure 2-16. Former concrete pedestrian walkway at the Cove, now collapsed into the stream bed because of lateral migration of the channel, provides grade control.

Figure 2-17. Deteriorating dam at the upper end of the Cove area.

Figure 2-18. The Little Chiques Creek channel has breached the dam, shown here along the left bank. Debris jams created by fallen trees are common occurrences throughout Little Chiques Creek and indicate a substantial amount of lateral erosion and stream bank undercutting.

Reach 5

This assessment was conducted in the vicinity of the former Risser's Mill (see *Figure 2-19*), near the intersection of Risser's Mill and Mount Pleasant roads. Downstream from the location of the former covered bridge, which was destroyed by fire in 2002, the stream bed sits on clay, with a small area of exposed bedrock. The stream flows along bedrock but it is migrating toward the center of the valley. At the site of the bridge abutments the culvert angle sends the water into the left bank, but the migration of the stream is to the right floodplain, which will create an acute bend in this area. This reach is also perched above the historical bed elevation, with significant lateral migration predicted in the near future.

Figure 2-19.
The Risser's Mill site provides a vivid example of sediments that collected in the floodplain behind milldams. The person standing by the bank in the bottom center of the photo provides a sense of scale.

Reach 6

The assessment was conducted from Milton Grove Road to approximately 1,000 feet upstream of Meadowview Road. Near Milton Grove Road a utility crossing controls the bed in the area of the gabion wall. That grade control will prevent the bed from degrading to its historical elevation. Just upstream the bed elevation appears to be close to the historical bed elevation. (Trenches or test pits are typically necessary to verify the historical bed elevation.) The bank here contains gravel and organic material near the water surface, indicating that the current water surface is flowing near the elevation of the historical floodplain.

Approximately 1,000 feet downstream of the Meadowview Road bridge crossing, the stream bed is controlled by bedrock, and the channel flows along the left valley slope. Given these conditions, the stream will migrate toward the pasture along the right bank (see *Figure 2-20*). The stream bed here is perched above its historical elevation, and it is trying to move off the bedrock along the valley wall.

The Brubaker Run tributary has its confluence with Little Chiques Creek within this reach. The area of the confluence, which is in close proximity to the Meadowview Road bridge crossing referenced above, is showing signs of considerable erosion and instability

as a result of the numerous historical and more recent impacts to the stream channels in this vicinity (see *Figure 2-21*).

In the area upstream of the Meadowview Road bridge, which is improperly aligned with the stream flow, stream banks along Little Chiques Creek are as much as seven to eight feet above surface water elevations (see *Figure 2-22*). Bed conditions are degraded and filled with silts and fines. Riffles in this area have beds composed of fractured bedrock. The stream flows along a hillside, suggesting that the stream channel was straightened and relocated from its original meandering pattern throughout the center of the valley.

Figure 2-20.
Looking upstream, between Milton Grove Road and the Meadowview Road bridge crossing over Little Chiques Creek, the channel will continue to erode the right bank as it migrates off its current location along bedrock.

Figure 2-21.
Active erosion and deposition are evident at the confluence of Brubaker Run with Little Chiques Creek, along Meadowview Road in Rapho Township.

Figure 2-22.
Little Chiques Creek, viewed looking upstream of the Meadowview Road bridge crossing.

Creek Road Reach

A streamside visual assessment was conducted on this reach, which lies south of Treetop Country Club in Mount Joy Township, along Creek Road, and extends upstream from just north of Cold Spring Road, across Colebrook Road, to the west of Camp Road. This part of the channel lies fairly high in the headwaters of the main stem, but even here the channel is entrenched and exhibits an artificially high alluvial floodplain (see *Figures 2-23* and *24*).

Figure 2-23.
Upper region of Little Chiques Creek, lying south of Treetop Country Club along Creek Road.

Figure 2-24.
Little Chiques Creek, between Treetop Country Club and the Camp Road bridge crossing, looking downstream. The stream was probably moved to the edge of the slope along the left bank, an elevation slightly higher than the lowest part of the valley in this area. Even during a high flow, shown here, the water remains in the incised and entrenched channel, exerting excessive flow forces on the bed and banks.

Reach 7 Headwaters

The final in-stream assessment of the main stem of the Little Chiques Creek was conducted in the headwaters, in a forested area in the vicinity of the United Zion Campground near the Lancaster/Lebanon County line. Colluvial material (large pieces of eroded bedrock) was present at the downstream end of the reach (see *Figure 2-25*). Moving upstream, however, that material was not present, which is probably a more accurate snapshot of the historical stream condition.

Farther upstream the channel becomes incised in an old-field forested area (see *Figure 2-26*). Stream banks up to a foot high or more are composed of alluvial material (finer materials resulting from historical erosion into stream valleys).

Water temperatures in the headwaters are sufficiently cold and the water sufficiently clean to sustain wild trout. With historical impacts such as previous straightening and post-settlement deposition, the shear stress becomes too high too frequently to allow the proper-size gravels to remain in place during spawning. Appropriate gravels are present here and there along the sides, but the force of the flow moves them out of the middle of the channel where they need to be.

Figure 2-25. Colluvial material in channel bed in Little Chiques headwaters near the Lancaster/Lebanon County line.

Figure 2-26. The topmost headwaters of Little Chiques Creek flow through a channel that has incised itself down through a foot or more of alluvial floodplain material in this secondary-growth forest.

Reach 8

Brubaker Run is one of the four main tributaries to Little Chiques Creek. The assessment included a section of the tributary from below the Meadowview Road bridge crossing near Echo Valley Road to several hundred feet above the crossing. The bed is perched, and the stream channel in this area was straightened. The water in this tributary is noticeably colder than that in the main stem. It is highly possible that Brubaker Run flourished as a native trout stream hundreds of years ago, before the time of European settlement. Stream banks are high and typical of the alluvial banks in the area. The sharp, angular material observed toward the downstream section is coming from exposed, degrading, colluvial material along the banks (see *Figure 2-27*).

The section of the reach that lies downstream of the Meadowview Road crossing exhibits conditions more like those observed in the Little Chiques Creek main stem (see *Figure 2-28*).

Brubaker Run is carrying a high sediment load downstream to the main stem.

Figure 2-27.
Colluvial material observed in downstream section of Reach 8, in Brubaker Run.

Figure 2-28.
Sections of Brubaker Run are deeply incised with high, eroding banks, similar to conditions found through the Little Chiques main stem.

Reach 9

The upper region of Brubaker Run, from Colebrook Road upstream to Shumaker Road, is similar to the upper end of Reach 8 and flows through open pasture (see *Figure 2-29*).

Figure 2-29.
Channelized stream near the headwaters of Brubaker Run.

Back Run Reach

Back Run was visually assessed from streamside rather than in-stream. This major tributary to Little Chiques Creek flows generally in a southwesterly direction through agricultural bottomlands (see *Figure 2-30*). The majority of the tributary exhibits the same characteristics observed in the upper section of Reach 8, Brubaker Run. In both tributaries, cattle have free access to the stream banks and channels, the channels are incised and were straightened or moved in numerous areas, and sediment loads being carried to the main stem are abundant.

Figure 2-30.
A typical section of Back Run shows a stream that is incised, with eroding stream banks, and flowing through open pasturelands.

Conclusions

As noted above, there have been and continue to be numerous impacts on the natural flows and elevations of Little Chiques Creek and its tributaries. Dams, utility and transportation crossings, channelization (straightening) and relocation have put and continue to keep the watercourses in the watershed in a state of flux. Very little of the creek bed or floodplain is at or near historical elevations. The stream beds will evolve to the historical bed elevations over time, if allowed. The existing terraces will be removed through erosion, undercutting and collapse, and replaced at a much lower elevation. This lower elevation may be as much as three to 15 feet lower than the existing elevation. The floodplain cover does not matter. Tree, shrubs, grass, and so forth will be removed and typically replaced with invasive or unwanted species. Utility crossings, culverts, and walls that are founded on material higher than the existing bed elevations will continue to be undermined and susceptible to scour.

There is no simple solution to successfully restoring Little Chiques Creek and its tributaries. The success of any improvements to Little Chiques Creek depends on the natural evolutionary or man-made changes upstream and downstream. Any other controlling factors such as bridges and culverts, utility crossings, or dam removal must be assessed to determine future impacts on desired improvements. For example, removing the breached and deteriorating dam above the Cove will, among other results, create a substantial headcut (upstream-directed channel bed erosion, which leads to an increased rate of bank erosion) beginning downstream in the vicinity of Little Chiques Park.

Assuming that all conditions, either natural or man-made, influencing the rate of stream evolution were to remain unchanged (an unrealistic assumption), it could take two or more centuries for the waterways of the Little Chiques Creek to become stabilized. But conditions do change. Stream corridor and floodplain restoration projects speed up the evolutionary process toward stability; bank and bed armoring slows it down. Bridges, culverts, and dams deteriorate. Human activities of all kinds impinge on the stream system. Development increases pressure on water resources both for consumption and waste discharge.

A list of goals and objectives for the short- and long-term must be defined. Determining those goals and objectives will require intermunicipal cooperation to avoid mutually exclusive plans. For example, projects to protect infrastructure can negate projects to restore trout habitat or even provide cleaner water. And having a goal of improving water quality for human recreation is different than for fish rearing or spawning. With such a large watershed to study and improve, the overall recommendation is to set up those goals while possibly providing initial improvements on a headwater tributary such as Back Run or an area closer to the main stem headwaters, where smaller-scale projects can help ease the sediment load being carried into Little Chiques Creek and ultimately to the Chesapeake Bay.

A detailed assessment of Little Chiques Creek and its tributaries must be completed to provide a prioritization of improvements and to ensure that any proposed improvements will survive additional impacts or improvements upstream or downstream.

3. Recreation and Open Space Resources

The recreational resource analysis identifies opportunities for active recreation, especially trails and destination points for parks and environmental education opportunities. For the purposes of this study, we will use this information to help link cultural and biological resources into an interconnected, multi-purpose open-space system that benefits both the watershed environment and the community.

Open Space and Recreation (Map 5)

Mapping Layers	Recreation
	Agricultural
	Forest
	Special Species Habitat - PNDI
	Utility Towers – Easements

Cultural Resources (Special Places)

Six "special places" are noted on the *Existing Conditions* map, at the end of this section, because of their long-standing status as noted sites or structures within the watershed's population center – historical or scenic areas important to community life. The recommendation is to continue to protect and enhance these places whenever and wherever possible. Recommended projects for three of the six sites are described in Section 4.

The sites noted are:

- The view of the rural landscape from Pleasure Road at the future Florin Hill development;
- The Cove historical recreation area and former bird sanctuary*;
- Little Chiques Park*;
- Central Hotel / Bube's Brewery (privately owned);
- Mount Joy Memorial Park (site of former Mount Joy Elementary School); and
- Stone Bridge, on Pinkerton Road*.

* Sites of recommended projects (see Section 4).

Biological Features

The Pennsylvania Natural Diversity Inventory (PNDI) identified one area that either contains or did contain a species of special concern (rare, threatened, or endangered). The site is noted on Map 5 – Open Space and Recreation, but it is the policy of PNDI to refrain from disseminating for public consumption further information on the species itself or the key details of its habitat.

Forest cover in the Little Chiques Creek watershed is present but not abundant because of the preponderance of land in agricultural use. Particular attention should be paid throughout the watershed to preserving forested stands and expanding them when and where possible, especially when and where there is opportunity to link one forested corridor with another.

Description

The existing land cover says a great deal about how the land has been used and altered over time. The rivers and streams that flow through the watershed have shaped the communities and land-use patterns we are comfortable with today. In many cases, these changes have isolated people from the natural landscapes. By analyzing these patterns of change we can begin to look for opportunities to reconnect communities, and people, to the land. One example of an opportunity to reconnect the landscape is where land that is impossible or difficult to farm or develop has been protected. These types of undevelopable land – floodplains, steep slopes, wetlands, etc – have a lesser economic value but are a potential gold mine for resource protection. By linking natural areas isolated by historical change, a natural corridor can be re-established. Natural corridors can then accommodate pedestrian trails, where public access is permitted, to connect cultural resources, such as historical districts, with recreational uses and communities.

Recreational
Agricultural
Forest
Species Special Habitat

LEBANON COUNTY
LANCASTER COUNTY
76
MOUNT JOY TOWNSHIP
RAPHO TOWNSHIP
Fairview Elementary
Matersonville Elementary
Wolgemuth Park
Little Chiques Creek
RAPHO TOWNSHIP
MOUNT JOY TOWNSHIP
283
283
Borough Park
SICO Park
Grandview Elementary
BOROUGH OF MOUNT JOY
Lions Club Pool
RAPHO TOWNSHIP
Westview Park
Seller Elementary
R& J Memorial Baseball Field
Donegal High School
EAST DONEGAL TOWNSHIP
Donegal Creek
Little Chiques Creek

Map 5: Open Space and Recreation

Municipal Boundaries
Waterbodies
Watershed Boundary
Parcels

N

Little Chiques Creek Watershed Assessment

0 4,500 9,000
Feet
1 inch equals 4,500 feet

AREA OF DETAIL
LEBANON COUNTY
LANCASTER COUNTY
Little Chiques Creek Watershed

This project was financed in part by a grant from the Community Conservation Partnerships Program, Keystone Recreation, Park and Conservation Fund, under the administration of the Department of Conservation and Natural Resources, Bureau of Recreation and Conservation.

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4. Land Use

Existing Zoning (Map 6)

Mapping Layers
- Residential
- Agricultural
- Commercial
- Industrial
- Conservation
- Other
- Urban Growth Boundaries

Description

The overwhelming majority of the watershed is zoned agricultural with most residential development adjacent to Mount Joy Borough and the historical east/west transportation corridor. Industrial development is located within the urban growth boundary. Most of the area within the urban growth boundary is developed.

Zoning Ordinances

The ordinances, including zoning, subdivision and land development (SDLO), and stormwater management (SWM), for all of the municipalities in the watershed area were reviewed. A list of ordinances, a status of their updates, and other related information are included on the Policy Inventory (see *Table 2-1*).

Table 2-1. Policy Inventory

Municipalities in Study Area - Little Chiques Creek Watershed					
	County	**Zoning**	**SLDO**	**SWM**	**Comp Plan**
East Donegal Township	Lancaster	10-Oct-02	10-Apr-97		Donegal Region - Official Comprehensive Plan
Mount Joy Borough	Lancaster	12-Jul-99	14-Sep-92		Donegal Region - Official Comprehensive Plan
Mount Joy Township	Lancaster	2/1/2005 - hardcopy	1996 - hardcopy		Elizabethtown Region Strategic Comprehensive Plan - 1997
Rapho Township	Lancaster	10/21/2004 - website	2000 - hard copy at LCPC	in SLDO	Manheim Central Regional Comprehensive Plan - 1993
South Londonderry Township	Lebanon	No Ordinance and Lebanon County Planning Department does not enforce	Has own SLDO		

Future Land Use (Map 7)
Mapping Layers Residential
Agricultural
Commercial
Industrial
Conservation

Description
Most of the changes to existing zoning occur adjacent to Mount Joy Borough and also to a few parcels in the headwaters area of the watershed. More conservation –type zoning is projected in the headwater areas and Industrial and Residential uses have been reduced.

Regional Comprehensive Plans
There are three separate regional comprehensive planning efforts within the Little Chiques Creek watershed. The following lists the three plans and the municipalities in the watershed involved in each of the plans. The following is a description of these plans and their relationship to the watershed.

Elizabethtown Region Strategic Comprehensive Plan
Includes: Mount Joy Township

The Elizabethtown Region Strategic Comprehensive Plan is currently being updated. A draft of the update, dated March 1, 2004 was reviewed.

Relationship to the Little Chiques Creek Watershed
The goals to Protect, Conserve and Preserve Important Natural Resources and to Protect and Preserve Agricultural Areas for Agricultural Use support the goals for the Little Chiques Creek watershed. Various objectives and strategies are presented in the plan. Specific considerations with respect to the watershed are:

Objective R1 Ensure that the region's natural features are properly conserved and managed, including ensuring that development fully respects the natural features of each site.

- The natural features identified may be considered as part of the Conservation Corridor proposed as part of the Little Chiques Creek Watershed Conservation Plan.

- It is important to consider the connectivity of the open space and natural features, and to encourage preserving and/or creating connections wherever possible.

Objective R2 Preserve permanent open space through clustering, mandatory dedication, conservation easements and other appropriate methods.

- prioritize Conservation Corridors as dedicated open space within condensed developments.
- consider management of open space and strategies for managing them.

Objective R3 Maintain a rural character in the majority of Mount Joy Township and West Donegal Township, with an emphasis on preserving areas that are not suited for construction.

- consider preservation and enhancement of Conservation Corridors to improve visual character with trees.

Objective R4 Protect the quantity and the quality of groundwater and surface waters

- consider a groundwater study to identify stressed areas and aquifer recharge areas. Use this information to identify ways to improve the sustainability of the water supply through increased recharge, conservation measures, etc.

- consider a detailed stream assessment to determine locations for restoration and floodplain improvements that improve water quality

Objective R5 Protect and conserve unique natural heritage areas

- prioritize natural heritage areas as part of the Conservation Corridor system.

Objective R6 Ensure careful management of stormwater runoff

- consider a watershed assessment to determine locations for regional stormwater management opportunities

- consider hydrogeologic investigations for karst areas for any land development proposed on sites with high-density karst.

Manheim Central Regional Comprehensive Plan
Includes: Rapho Township

The Manheim Central Regional Comprehensive Plan was written and adopted in 1993, after extensive community discussion and participation. The three participating municipalities within the study area include Penn Township, Manheim Borough, and Rapho Township. It was the first regional comprehensive plan in Lancaster County to incorporate urban growth boundaries, and it encompassed the entire Manheim Central School District. The school district was

an active participant in the Plan. In 2000, a Strategic Update to the Comprehensive Plan was adopted by the three municipalities and the school district.

Relationship to the Little Chiques Creek Watershed
The Manheim Central Regional Comprehensive Plan supports the efforts of the Little Chiques Creek Watershed through encouraging the protection and conservation of prime agricultural soils, farming, and natural resources. The following implementation strategies outlined in the Manheim Central Regional Comprehensive Plan are encouraged to be implemented with respect to the Little Chiques Creek Watershed Conservation Plan:

- Revise Zoning Ordinance to implement future land use;
- Commission a public water supply study;
- Prepare a Comprehensive Recreation and Open Space Plan; and
- Reexamine the urban growth boundary together with the County and, if needed, amend it.

See Regional and Municipal Planning Strategies in the Toolbox, Section 4. The following specific tools may be considered in an update:

- Include Conservation Corridors where delineated as priority natural resource protection areas.

- Prioritize an assessment of the groundwater supply and use this information for planning future development and zoning districts

Donegal Region Comprehensive Plan
Includes: Mount Joy Borough
East Donegal Township

Relationship to the Little Chiques Creek Watershed
The Donegal Region Comprehensive Plan supports the goals for the Little Chiques Creek watershed through encouraging the protection and conservation of prime agricultural soils, farming, and natural resources. It also supports with specific recommendations wellhead and source water protection and floodplain protection.

- any Groundwater Study or Stream Assessment completed for the watershed should consider identified contaminated groundwater flows and how they impact adjacent wells and the overall water supply.
- any update to the Donegal Region Comprehensive Plan should consider including identified wellhead protection areas and high quality waters / scenic rivers as priority conservation corridors.

Agricultural Protection Areas (Map 8)

Mapping Layers
- Preserved Farms
- Farm Easements
- Agricultural Security Areas

Description

Much of the farmland within the study area is enrolled in ACT 319 or has been designated as an Agricultural Security Zone. Neither of these protection measures precludes future development. Farm Easements, where shown, do limit development.

Residential
Agricultural
Commercial
Industrial
Conservation
Other
Urban Growth Area
Utility Towers

LEBANON COUNTY
LANCASTER COUNTY
76
MOUNT JOY TOWNSHIP
RAPHO TOWNSHIP
Little Chiques Crk
283
BOROUGH OF MOUNT JOY
EAST DONEGAL TOWNSHIP
Donegal Creek
Little Chiques Creek
Chiques Creek

NOTE: Zoning for Lebanon County was assumed Agricultural for this map.

Map 6: Existing Zoning

Municipal Boundaries
Waterbodies
Watershed Boundary
Parcels

N

Little Chiques Creek Watershed Assessment

0 4,500 9,000
Feet
1 inch equals 4,500 feet

AREA OF DETAIL
LEBANON COUNTY
LANCASTER COUNTY
Little Chiques Creek Watershed

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Residential
Agricultural
Commerical
Industrial
Conservation/Institutional
Urban Growth Boundary

Information Not Available

LEBANON COUNTY
LANCASTER COUNTY

76

MOUNT JOY TOWNSHIP

RAPHO TOWNSHIP

Little Chiques Creek

283

BOROUGH OF MOUNT JOY

Information Not Available

EAST DONEGAL TOWNSHIP

Donegal Creek

Chiques Creek

NOTE: The data on this map was acquired from Lancaster County GIS, and graphically approximates the future land use of the watershed.

Map 7: Future Land Use

Municipal Boundaries
Waterbodies
Watershed Boundary
Parcels

N

Little Chiques Creek Watershed Assessment

0 4,500 9,000 Feet

1 inch equals 4,500 feet

AREA OF DETAIL

LEBANON COUNTY
LANCASTER COUNTY
Little Chiques Creek Watershed

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Clean and Green Farms
Agricultural Security Areas
Farms Preserved

LEBANON COUNTY
LANCASTER COUNTY
76
MOUNT JOY TOWNSHIP
RAPHO TOWNSHIP
283
Little Chiques Creek
BOROUGH OF MOUNT JOY
EAST DONEGAL TOWNSHIP
Donegal Creek
Chiques Creek

Map 8: Special Protection Areas

Municipal Boundaries
Waterbodies
Watershed Boundary
Parcels

N

Little Chiques Creek Watershed Assessment

0 4,500 9,000
Feet
1 inch equals 4,500 feet

AREA OF DETAIL
LEBANON COUNTY
LANCASTER COUNTY
Little Chiques Creek Watershed

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B. SUMMARY

The first step in determining how best to manage the water resources of the Little Chiques Creek watershed is to determine the major issues in the relationship between the resources and the use of the land. This section describes in detail the specific issues associated with each Analysis Category (Land Resources, Water Resources, Recreation and Open Space Resources, and Land Use), as well as some available opportunities.

1. Land Resources Analysis

The geology of the watershed determines how the land changes over time and how it can be used today. The limitations of geology, soils and topographic features shape the related issues and opportunities of the land within the watershed.

Concerns

Malfunctioning Septic Systems

Limitations of shale-based soils for water supply and septic suitability – especially in the northern half of the watershed.

Sinkhole Potential

High sinkhole potential exists in the limestone valley where growth is targeted.

Groundwater Contamination

Groundwater resources are vulnerable to contamination in the densely developed karst areas of the lower third of the watershed, because pollutants can rapidly enter the water source through the characteristic fissures, cracks, and sinkholes associated with the limestone geology.

Increase in Sinkhole Activity

Changes in drainage patterns and permeability from existing and future development increase the risk of sinkhole failures and formation. Much of the sinkhole activity in and around Mount Joy Borough has occurred in the last 20 years and is increasing in occurrence.

Loss of Prime Agricultural Soils

Prime Agricultural Soils are the most contiguous in the locations with the most development potential.

Opportunities

Natural Features Discourage Development
The steep slopes and ridge-and-valley characteristics of the northern half of the watershed fragment and limit the farming and development potential of this area. Steep slopes protect the stream corridor from development or agricultural uses.

Projected Growth Areas
Soils and gently sloping land conducive for development are in urban growth areas adjacent to the existing Borough, where the water supply is abundant and the primary transportation corridors exist. This is consistent with the Lancaster County Growth Management Update.

Existing Corridors
A natural system of interconnecting land ridges (steep slopes) is available in the northern half of the watershed

Water Supply
Limestone geology provides a good water supply in the area where most development exists and is projected to occur.

2. Water Resources Analysis

Watersheds collect and transport water at many different scales, from areas as large as a valley to areas as small as a single neighborhood's drainage area. Urban areas drain rooftops, lawns, and streets and convey this water to the closest stream. This process of water run-off through urban areas is known as Stormwater Management. The general purpose of collecting and discharging stormwater runoff is to prevent flooding in our communities. Until recently, little attention has been paid to the treatment of this run-off being discharged directly into streams and how this run-off affects the stability of the stream system. Because of the size of the watershed and the complexities of the inter-relationship between private and public interests, a list of the goals and objectives for the short- and long-term must be defined and prioritized.

Concerns

Instability of Streams
Little Chiques Creek and its tributaries are moving and changing. Degradation of the watershed system from this movement will continue until the stream is stabilized.

Encroachments
Human interference is effecting the change. Removal or maintenance of utility crossings, bridges, dams, etc., will either speed up or slow down the process.

Water Quality
Pollution from agricultural, residential, and construction run-off is contaminating the water resources. The fractures and cracks associated with karst geology provide direct conduits for pollution into groundwater.

Increased Impervious Cover
Increases in impervious cover are reducing recharge and increasing run-off

Reduced Area for Flooding
Floodplains have been filled over time.

Thermal Pollution
Thermal pollution is a problem; ponds and lack of vegetative buffers contribute to thermal pollution.

Increased Water Demand
Increased demand for water from both residential and industrial sources is expected.

Hazardous Waste
Improper disposal of hazardous substances such as oil, cleaning supplies, and paint and the improper use of pesticides, fertilizers, and herbicides is a threat to the water supply.

Combined Sewer Overflows
Aging sewer facilities that carry both stormwater and wastewater (combined sewer overflow - CSOs) overwhelm sewage systems and result in stream contamination.

Loss of Critical Aquifer Recharge Areas
Loss of critical aquifer recharge areas because they have not been identified affects the sustainability of the water supply.

Opportunities

Restoration Opportunities
Landowners have expressed interested in providing opportunities for stream and floodplain restoration on their properties. The watershed holds potential areas for restoration to reduce pollution, sediment loads, and downstream flooding while increasing infiltration and groundwater recharge.

Stormwater Management BMPs
Improved methods of controlling urban run-off to protect the stream and water quality are being considered in some of the municipalities in the study area.

Public Education
Opportunities are available for public education about water resource protection

Protected Corridor in Urban Setting
The Little Chiques Creek stream corridor adjacent to the Borough of Mount Joy has a relatively contiguous mature riparian buffer.

3. Recreation and Open Space Resources Analysis

Open space and recreational opportunities can incorporate multiple objectives in restoring a watershed. By linking natural areas isolated by historical change, a natural corridor can be re-established. Natural corridors can then accommodate pedestrian trails, where public access is permitted, to connect cultural resources, such as historical districts, with recreational uses and communities. Protection or establishment of open space should be prioritized where multiple objectives or concerns are considered.

Concerns

Landscape Connectivity
Forest stands of more than five acres are rare in the watershed. Forest fragmentation and abundant land clearing have eliminated hedgerows and riparian buffers, and thus biologically diverse and sufficiently connected wildlife habitat and travel/migration corridors.

Invasive Plants
Improper management and the introduction of non-native exotic plant species are threatening the forest and native plant communities within the watershed.

Intensive Farming Practices
Intensive farming practices have eliminated some species (ground nesting birds) and contributed to a decrease in biodiversity. Intensive commercial farming operations use much larger quantities of water then do conventional farms.

Lack of Trails
Few interconnected trails are available to allow for non-vehicular means of traveling throughout the watershed. Recreational and cultural resources are disconnected.

Opportunities

Riparian Corridors Exist
Some continuous corridors are in place along the Little Chiques Creek, especially in the lower half of the watershed.

Parks and Recreation Uses Relate to Natural Areas
Existing parks and recreation uses relate to some of the natural resource corridors. Many of the existing parks in Mount Joy Borough are adjacent to Little Chiques Creek.

Both Public and Private Opportunities
Numerous public land holdings are available along the stream corridor. Private opportunities, including golf courses and church camps, provide opportunities to link open space.

4. Land-Use Analysis

After completing an Ordinance Audit Form for each of the municipalities, the information was compiled into an *Ordinance Overview for Water Quality Issues* (see Appendix) as a quick reference that illustrates the status of each municipality with respect to water quality**.**

An overview of ordinances for the watershed study area is important for two reasons:

- It provides a baseline to compare what is being done to manage water resources on a local level.

- It provides a resource for municipalities to identify areas of weakness in various categories or standards. The overview can be used as a resource to determine which other local municipality has successfully implemented a standard that can be used to update or amend current ordinances or where new ordinances are needed. For example, a municipality that currently does not have an ordinance in place for a hydrogeologic study may consider reviewing and adopting a similar ordinance from one of the municipalities that has successfully implemented this requirement.

Concerns

Impervious Cover
There are no street or parking standards in place that encourage reduced impervious cover.

Open Space Protection
Only one municipality has a Transfer of Development Rights (TDR) program in place, and only two municipalities have options for condensed housing or cluster development with open space.

Public Water Supply
Only Mount Joy Borough has a wellhead protection ordinance in place.

Stormwater Management
Only two municipalities have stormwater management BMP requirements.

Karst Geology Issues
Only Rapho Township has ordinances related to identification of sinkholes or karst-related development limitations. Most development exists and is proposed within the vulnerable karst geologic area in the southern portion of the watershed.

Natural Resource Protection
Only one municipality requires a natural resource inventory with development.

Sewer and Water
On-lot sewer and water systems are used in more than 85 percent of new development in the watershed.

Sprawl
Agricultural Zoning still permits development to occur.

Opportunities

Parking
Shared parking is encouraged in two of the municipalities.

Resource Conservation
Resource conservation standards for floodplain protection, steep slope protection, wetland protection, riparian buffers and forested areas are in ordinances in most of the municipalities in the study area.

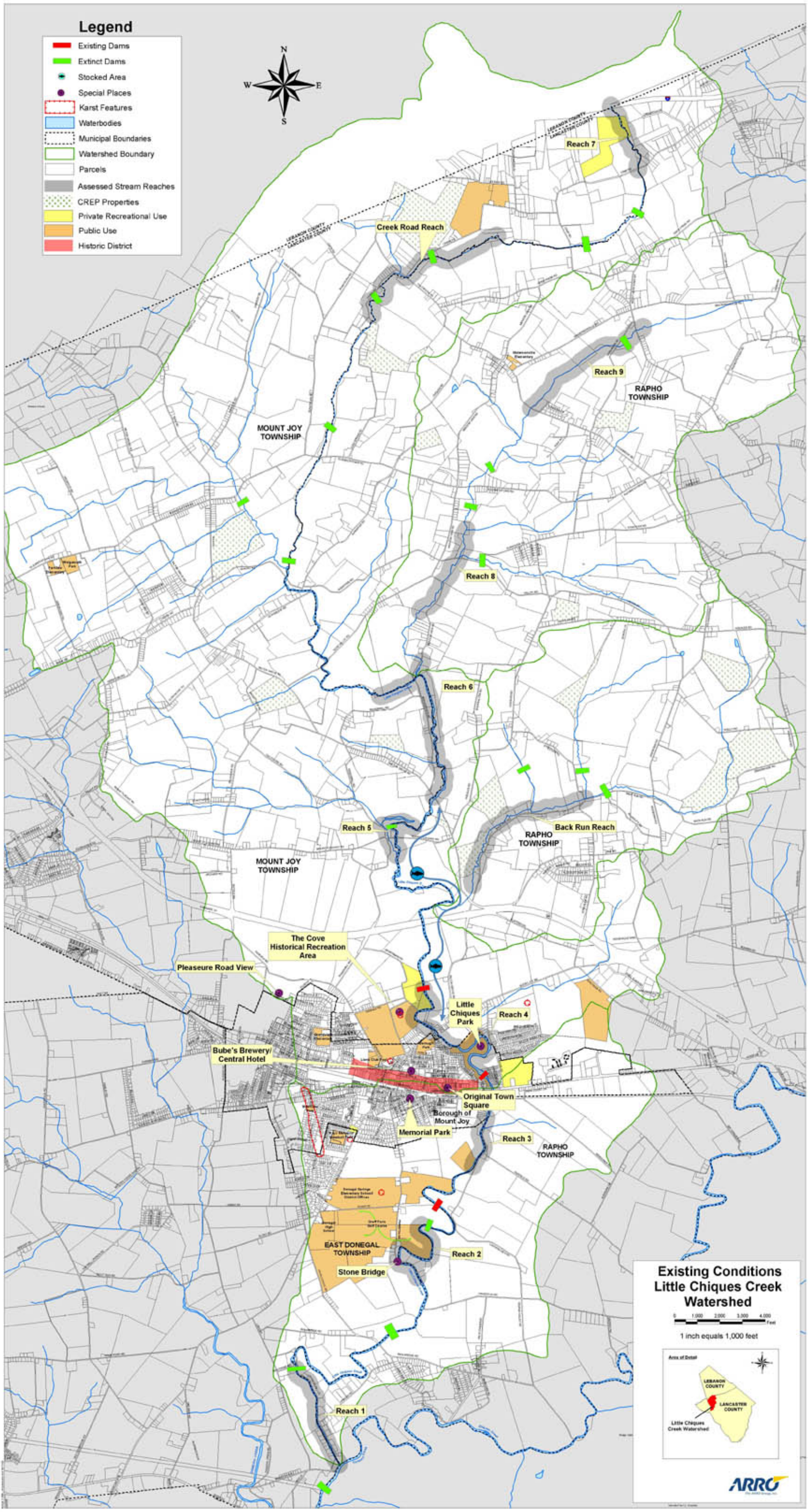
Farmland Preservation
Farmland preservation programs are active and successful in the watershed.

Agricultural Management
Best management practices have been successfully implemented throughout the watershed and many of the farmers are educated in these practices.

Wellhead Protection
One of the few wellhead protection ordinances in the state of Pennsylvania has been successfully implemented in the Borough of Mount Joy.

Land Development Review
Sketch plans are encouraged in every municipality in the watershed. These plans assist planners with understanding the nature of the proposed development before costs and expectations rise in later stages of the review process.

Water Supply Feasibility
Three of the municipalities require a feasibility report or water supply study prior to the approval of a private well.


Legend
Existing Dams
Extinct Dams
Stocked Area
Special Places
Karst Features
Waterbodies
Municipal Boundaries
Watershed Boundary
Parcels
Assessed Stream Reaches
CREP Properties
Private Recreational Use
Public Use
Historic District
N
W
E
S
LEBANON COUNTY
LANCASTER COUNTY
Reach 7
Creek Road Reach
Reach 9
RAPHO TOWNSHIP
MOUNT JOY TOWNSHIP
Reach 8
Reach 6
Reach 5
Back Run Reach
The Cove Historical Recreation Area
Pleasure Road View
Little Chiques Park
Reach 4
Bube's Brewery/ Central Hotel
Original Town Square
Borough of Mount Joy
Memorial Park
Reach 3
EAST DONEGAL TOWNSHIP
Reach 2
Stone Bridge
Reach 1
Existing Conditions
Little Chiques Creek Watershed
0 1,000 2,000 3,000 4,000 Feet
1 inch equals 1,000 feet
Area of Detail
LEBANON COUNTY
LANCASTER COUNTY
Little Chiques Creek Watershed
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3. COMMUNITY INPUT

3. COMMUNITY INPUT

The opinions and viewpoints of people who live and work in the watershed constitute key information municipal planners will need as they make short- and long-term decisions about the use, management, and protection of natural resources that cross municipal boundaries.

Key Person Interviews were conducted with 15 persons, actively involved and well known in their communities, from four sectors: business and industry, education, large-acreage landowner, and municipal. With only two exceptions, Key Person Interviews were conducted in groups, by sector. One landowner and one educator were interviewed individually because of scheduling constraints. All questions as posed to the interviewees are included in the Appendix.

A Landowner Survey Questionnaire was mailed to 383 landowners with property spanning or abutting the main stem or a tributary in the Little Chiques Creek Watershed. Eighty-two completed questionnaires were returned (21 percent return rate).

Responses were compiled and are presented here to provide a snapshot of ideas and opinions on a number of natural resource-related issues as they pertain to this Watershed Conservation Plan. Additional documents related to the Key Person Interviews and the Landowner Survey Questionnaire are included in the Appendix.

A. KEY PERSON INTERVIEWS

The following persons participated in Key Person Interviews.

Business and Industry:

Ms. Jill Hoffines, Floral Designs of Mount Joy, Mount Joy Borough
Mr. Jim Roberts, Jim Roberts Western Auto, Mount Joy Borough
Mr. Randy Wolgemuth, Koser Jewelers, Mount Joy Borough

Education:

Mr. Kenneth DePoe, retired faculty, Donegal School District
Ms. Joanne Murphy , School Board member, Donegal School District
Dr. Carol Saylor, Superintendent, Manheim Central School District

Large-Acreage Landowner:

Mr. and Mrs. Ira and Ruthclaudene Fahnestock, Mr. Linn Fahnestock (son)
1713 Camp Road
Manheim, PA 17545
100+ acres straddles Little Chiques Creek in Rapho and Mount Joy townships.

Mr. Phil Garber
876 Milton Grove Road
Mount Joy, PA 17552
140 acres in Rapho Township, with frontage on Back Run, Little Chiques Creek. (Father, James M. Garber, owns additional 130 acres on the other side of Little Chiques Creek, in Mount Joy Township.)

Municipal

Ms. Nancy Halliwell, Rapho Township Manager
Mr. Bruce Hamer, Mount Joy Township Authority Administrator
Mr. Terry Kauffman, Mount Joy Borough Manager
Mr. David Shireman, chair, Mount Joy Borough Authority Board
Mr. John Weidman, Mount Joy Borough Authority Board

The salient points to be drawn from the SUMMARY: Key Person Interviews*, included below, are highlighted on the following page.*

Information from the first three subject areas was gleaned from questions posed to all persons participating in the Key Person Interviews.

Environmental Priorities

Business and Industry representatives viewed waste disposal and littering as the most important environmental issue in the watershed community. Municipal representatives agreed but added drinking water quality and quantity as equally important. Education representatives focused on streamside recreational use, while landowners were more concerned with soil erosion, stream pollution, and flooding.

Landowner Interests

Municipal representatives named the potential for government intrusion as the primary concern they thought landowners might have with the goals of the Watershed Conservation Plan, while business and industry representatives named a closely related landowner concern – privacy. As one interviewee put it, "a 'What's mine is mine' point of view." Landowners also were concerned about cost and appearance, while educators added land degradation to the list.

Recreational Opportunities

Ball fields topped the list of favorite existing recreational facilities, and municipal representatives named ball fields as the one type of facility that is lacking. All interviewee responses added together name connective hiking/biking trails as the type of recreational facility most lacking. Business and industry representatives (all from Mount Joy Borough) also indicated a need for a community center.

The following information was gleaned from questions posed to specific groups within the total Key Person Interview population.

Municipal/School District Cooperation

Cooperation for creating and sharing outdoor educational and recreational opportunities appears to be satisfactory to good between municipalities, particularly between Rapho Township and Mount Joy Borough. Cooperation also appears to be good between Rapho Township and the Manheim Central School District. However, cooperation between Mount Joy Borough and the Donegal School District is viewed as lacking by municipal representatives.

Potential Sites for Environmental Education

The Donegal School District property bordered by Pinkerton Road and Little Chiques Creek, formerly owned by the late Ezra Engle, was cited as a good site to develop a cooperative environmental education and recreation area for both students and the general public. Little Chiques Park, formerly Sico Park, was cited as being underused, especially for environmental education.

Respect for Landowner Rights

Landowners rated compensation for changing land use as a priority (being paid for land they could no longer use), and also indicated their desire for voluntary involvement.

SUMMARY: Key Person Interviews

Questions 1 through 4 directly address the primary goals of the Conservation Plan and were asked of all four groups. Questions 5 through 10 address peripheral but related issues and were asked of specific groups.

RESPONSE	Business	Education	Landowner	Municipal	TOTAL
1. Top three environmental priorities/water resource issues					
Waste disposal, trash/littering	2		1	3	**6**
Drinking water quality and quantity	1	1	1	3	**6**
Soil erosion and sediment/pollutant runoff into streams		1	3	1	**5**
Improved streamside recreational use / some facilities under-used		3	1		**4**
Flooding		1	2		**3**
Sewerage plant discharge	1	1			**2**
Stormwater runoff	1	1			**2**
Over-development		1	1		**2**
Environmental education - middle school		1			**1**
Thermal pollution in streams		1			**1**
Creek instability			1		**1**
Residential pesticides				1	**1**
2. Landowner interests/concerns re: environmental/recreational conservation plan					
Government intrusion / "What's mine is mine"		1	1	3	**5**
Privacy/lack of user respect	2	1	1		**4**
Cost	1		1	1	**3**
Appearance/maintenance – whose responsibility?			1	1	**2**
Land degradation	1	1			**2**
Restrictive covenants for long-term				1	**1**

RESPONSE	Business	Education	Landowner	Municipal	TOTAL
3. What do you like about local recreational opportunities?					
Ball fields	2	1	1		**4**
Parks	1		1		**2**
Safe hiking/biking trails		1	1		**2**
State Game Lands / hunting, fishing		1	1		**2**
Kayaking in Little Chiques, but dams and obstacles are risks	1				**1**
Pool	1				**1**
Country Roads		1			**1**
Skateboard Park		1			**1**
Variety, with proximity to larger facilities		1			**1**
4. What recreational facilities are lacking?					
Connecting hiking/biking trails between facilities	2	2	1		**5**
Community center	2	1			**3**
Ball fields			1	1	**2**
Downtown stores	1				**1**
Passive recreation for older people		1			**1**
Skateboard park		1			**1**
Water recreation		1			**1**
Convenient parking at ball fields			1		**1**
Facilities within walking distance			1		**1**

RESPONSE	Business	Education	Landowner	Municipal	TOTAL
5. How to motivate people to get involved in environmental projects? (Group-specific question, Business)					
Tell them the end result first	1				**1**
Tell them how they will benefit	1				**1**
Get a small group excited so their enthusiasm can spread	1				**1**
Find a champion/leader to gather support	1				**1**
6. Contribution of Conservation Plan to health of your business? (Group-specific question, Business)					
Improve community's reputation as a desirable place to live	1				**1**
Positive reputation will lead to more visitors/customers	1				**1**
Improved appearance and reputation will lead to increased sales	1				**1**
7. Cooperative planning between municipalities/school districts for recreational and outdoor educational facilities? (Group-specific question, Education and Municipal)					
Good cooperation between Rapho Twp. & Manheim Central S.D.		1		1	**2**
Lack of initiative to get together		1			**1**
When they do get together, cooperation ensues		1			**1**
No cooperation between Mount Joy Boro & Donegal S.D.				1	**1**
Informal cooperation between Mount Joy Boro & East Donegal Twp.				1	**1**
Good cooperation between Mount Joy Boro & Rapho Twp.				1	**1**
Geography precludes cooperation between East Donegal and Rapho				1	**1**

RESPONSE	Business	Education	Landowner	Municipal	TOTAL
8. If there were a change in cooperation, what would be different? (Group-specific question, Education and Municipal)					
More field opportunities for Alternative Education Structure Program		1			**1**
Make better use of resources already available		1			**1**
Cooperation allows us to pursue comprehensive opportunities, helps avoid duplication		1			**1**
Recreation should get more money than "what's left over"		1			**1**
Mount Joy Borough and Donegal S.D. could diminish need for community recreation facilities and buildings				1	**1**
Not really any change				1	**1**
Water quality should be posted where kids play				1	**1**
9. Potential sites for environmental education facilities? Group-specific question, Education)					
Engle property along Pinkerton Road		2			**2**
Little Chiques Park (cited under question 1 as under-used)		1			**1**
Farm Show site and Greentree Development (both outside watershed)		1			**1**
10. During creation of Conservation Plan for environmental/recreational objectives, how can private landowner rights be acknowledged and protected? (Group-specific question, Landowner)					
Provide adequate compensation for changing land use			2		**2**
Keep landowner involvement voluntary			1		**1**

B. LANDOWNER SURVEY QUESTIONNAIRE

Landowners were asked to respond to questions covering three topics:

1. The use of Best Management Practices (BMPs) on lands that lie along the waterways in the Little Chiques Creek watershed;
2. Preserving historical resources that lie along the Little Chiques Creek Watershed stream corridors; and
3. Dedicating land along the Little Chiques Creek and its tributaries for public recreation such as hiking, birding, or picnicking; for greenways; or for wetland, floodplain, and stream restoration projects.

The questionnaire also solicited some basic demographic information as well as respondents' ratings of nine issues directly or indirectly related to the development and use of the Watershed Conservation Plan.

The salient points to be drawn from the Summary: Landowner Survey Questionnaire, presented below, are highlighted here.

Demographics

- Eighty-five percent of the respondents own property either in Rapho Township or Mount Joy Township.

- Forty percent of the households are composed of two persons, with 15 percent composed of four persons, and 12 percent composed of just one person.

- Fifty-eight percent live in households with no one under the age of 18.

- Forty one percent of the respondents are between the ages of 51 and 65, while 30 percent are between the ages of 36 and 50.

- More than half (58 percent) own land that is actively farmed.

Agricultural Best Management Practices

Of those respondents whose land is actively farmed, 85 percent indicated they employ BMPs on their farm. Vegetated stream buffers and manure management are the two BMPs most often employed. The overriding opinion of all respondents concerning their interest in BMPs being used on farmland is either "extremely interested" (49 percent) or "somewhat interested" (38 percent).

Historical Resources

Although 72 percent of respondents said they are not aware of any historical structures or other historical resources along the waterways on or near their land, 71 percent *thought it*

was either "extremely important" or "somewhat important" that municipalities take steps to protect those resources.

Dedication of Land for Recreational or Environmental Projects

The majority of respondents (62 percent) said they are not willing to dedicate their land for Conservation Plan-related projects. The types of activities most favored by the 38 percent (31 persons) who responded in the affirmative are shown below. Each respondent checked as many types of activities as they wanted; the total number of responses for this section totaled 179.

- **12 percent** of all responses
  Stream Restoration
  Native Tree and Shrub Planting

- **11 percent** of all responses
  Birdwatching

- **10 percent** of all responses
  Invasive Plants Control
  Native Wetland Plants Installation

- **8 percent** of all responses
  Walking/Hiking
  Fishing

- Snowmobiling and Bicycling were the least favored activities, with favorable responses from only **2 percent** of respondents.

The names and contact information for all those who indicated a willingness to participate in Conservation Plan-related projects on their land are not included here for reasons of privacy but have been conveyed to the Mount Joy Borough Authority. The complete Summary: Landowners willing to dedicate land for projects document is included at the end of this section.

The Landowner Survey Questionnaire also yielded the following information relevant to planning based on watershed resources:

Respondents overwhelmingly (more than two-thirds) consider as "very important" the improvement of water quality in local streams, protection of farmland and open space from development, increased use of agricultural BMPs, and protection of drinking water quality. More than half also rated as "very important" the preservation of wildlife habitat, long-range planning to guide future growth, the use of zoning to guide the *quality* of development, and increased cooperation in planning between municipalities and school districts and among municipalities. Encouraging streamside recreational and educational opportunities was considered the least important of the nine issues listed.

In addition to formal interviews and survey questionnaires, the same landowners who received the questionnaire also were invited to attend one of two landowner meetings, during which they learned about the activities involved with stream and floodplain restoration and offered additional comments about recreational projects in the watershed. The salient points of consensus that arose from discussion at those meetings are:

- Stream bank erosion is a problem throughout the watershed.
- Public access, especially hiking and biking trails, through active farmland is not a good idea for either the public or the farmers.
- Horses should not be permitted on hiking/biking trails.
- Hiking/biking trails that connect existing recreational areas around the population center of Mount Joy Borough are a good idea.

SUMMARY: Landowner Survey Questionnaire
(Comments, where submitted, follow the relevant question.)

1. In which municipality do you live?

❑ Mount Joy Borough	03
❑ Mount Joy Township	29
❑ Rapho Township	41
❑ East Donegal Township	09
❑ No answer	--

2. How many people live in your household?

1	10
2	33
3	08
4	12
5	08
6	04
7	03
8	02
>8	--
No answer	02

3. How many people in your household are under the age of 18?

0	48
1	07
2	10
3	06
4	04
5	02
6	02
No answer	03

4. In which age range do <u>YOU</u> fall?

- ❑ 18-25 01
- ❑ 26-35 04
- ❑ 36-50 25
- ❑ 51-65 34
- ❑ Over 65 18

5. Is your land actively farmed?

a. Yes 48
b. No 34

If you answered "Yes" to question 5, please answer question 6. If you answered "No" to question 5, please skip to question 7.

6. Do you use agricultural Best Management Practices (BMPs) on your farm?

- ❑ Yes 41
- ❑ No 03
- ❑ No answer 04

If you answered "Yes," which BMPs do you practice?

- ❑ Manure storage 24
- ❑ Streambank Fencing 14
- ❑ Vegetated stream buffers 26
- ❑ Stabilized, limited-access cattle crossings across the stream 10
- ❑ Other:
  - o Contour farming 02
  - o Minimal- or no-till planting 04
  - o Strip cropping 01
  - o Grass waterways 03
  - o Fields buffered by natural growth 01
  - o Crop rotation 01
  - o Appropriate manure application 01
  - o Nutrient management plan 02

Comments:

Need better water runoff management. I have done many projects on this with diversion pond but this does not help when farm next to me does nothing.

Mount Joy Township installed water runoff catch along Echo Valley Road at residence.

7. Whether or not your land is farmed, and whether or not you already use Best Management Practices on your land, please rate your level of interest in using BMPs, such as the planting of vegetated, streamside (riparian) buffers, or reduction in the use of chemical fertilizers on lawns.

❑ Extremely interested	40
❑ Somewhat interested	31
❑ Not very interested	06
❑ Not at all interested	02
❑ No answer	03

Comments:

I support the use of BMPs but I don't see the need for the reduction of chemical fertilizers on lawns.

As long as it is economically feasible.

We already have vegetation buffers at all water runoff areas.

Limited time and money.

Land is stabilized with mowed grass.

I try to keep erosion from occurring in our stream.

It works very well to have streams running into Little Chiques Creek fenced off. Vegetation will grow to strengthen streamside banks, therefore.

I am head of the Manure Mgmt. Task Force for Lancaster Chamber and we are working for solutions to this problem in the county.

By being extremely interested does not mean that I would blindly support any BMPs. In general, I use many BMPs and support them to keep water clean and soil in its place.

Money return for BMP use? We have applied for the CREP Program. Awaiting approval.

Over the past 5+ years I have watched Little Chiques Creek widen and, therefore, cause my property to lose much ground.

Pollution has increased dramatically in my lifetime. If we do all we can to clean up our environment, we and our children can only benefit.

Our waterways are truly unique and FRAGILE habitats. Not only that, we have to think downstream – THE BAY.

I am very much in favor of taking good care of our environment. I do not use lawn fertilizers and only use poisons and pest control as a last resort.

My land (4.5 acres) has middle of Little Chiques Creek as one border of my deed. I've lived and owned this land 60 years. It's been our life of family to have area important part of our life.

Already in place along stream.

We use no chemical fertilizers on our lawn. All of our creek frontage is natural hemlock and plant growth. No cattle either.

The stream on our property runs through the woods.

We have provided an alternate source of water for cows. This might now allow us to consider fencing along the creek.

Farmers are "mandated" to be current on nutrient management and fertilizer and pesticide/herbicide requirements. What about home owners who fertilize/apply pesticides to their lawns and gardens?

We would like to plant young trees along the length of the stream and adjacent land if we would know who to contact.

I take all precautions not to pollute the water. I don't use commercial fertilizer and use spray materials at their minimum.

Already implemented.

We need every farmer to get involved or it won't work.

We have horses that drink out of the streams of Little Chiques Creek.

We recently converted land to CREP.

My land is primarily pasture, and I do not let the cattle in or near the stream. I do not see a need to change anything.

We have unused land along the creek. I've been told by officials not to move or change any of the ground to the creek area. Now, can you get people interested in carrying or removing tree debris? I would like to see my creek property cleaner. I own the farm and creek area.

8. Are you aware of any historic structures or other historic resources along the Little Chiques Creek or one of its tributaries on or near your land?

- ❑ *Yes* *21*
- ❑ *No* *59*
- ❑ *No answer* *02*

Resources noted: NOTE: Specific locations of historical resources on private property will be provided to the Mount Joy Borough Authority but not published for general consumption.

My barn and home are of stone built in 1773.

Old grist mill.

Old stone mill.

Low head dam.

Cedar Crest female seminary, 1800s.

Old Borough Water Plant and dam, Cove, old concrete walking bridge.

Risser Mill.

1864 farmhouse on my property.

Our house and barn were built in 1829.

There are the remains of an old water dam about ½ mile south of Iron Bridge Road.
(NOTE: This is probably the dam associated with Johnson Mill, marked on the Existing Conditions map in Section 2.)

Old cemetery.

Indian relics, wildlife habitat.

Our house was built in the 1810s and the barn dates to the 1820s – both in excellent condition.

Site of covered bridge on Risser Mill Road.
(NOTE: bridge burnt down.)

There were homes along woods behind our acres. 1700 atlas identified owners and residents. Geological checks or subsoil and area were well known by older folks who lived here when we moved here. A rich land.

Dam constructed in 1920 to generate power for surrounding farms. Dam has since been partially removed to allow natural water flow.

My home is an 1814 stone house. I have a study of the property's house done by a grad student in American Studies at Penn State Harrisburg for a class in architecture/history taught by Dr. Irwin Richman. The grad student obtained old photos of house itself, interiors, landscape, horse-and-buggy roads.

9. How important is it to you that your municipality commit time, effort, and possibly money to protecting historical resources along the Little Chiques Creek and its tributaries?

- *Extremely important* *20*
- *Somewhat important* *41*
- *Not very important* *16*
- *Not at all important* *03*
- *No answer* *05*

Comments

Not when land is privately owned.

10. Would you be willing to consider dedicating a small portion of your land along the Little Chiques Creek or one of its tributaries for passive recreation, a greenway, or a restoration project?

a. *Yes* *32*
b. *No* *53*

Comments

Can't (right now) because of legal tie-up I hope to resolve soon.

If you checked "Yes" (Question 10) please indicate the specific activities for which you would be willing to consider dedicating a small portion of your land:

- Recreation (You may check as many of the individual recreational activities listed here as you want.)
  - Walking/Hiking 13
  - Birdwatching 18
  - Fishing 13
  - Picnicking 05
  - Bicycling 01
  - Horseback Riding 03
  - Snowmobiling --
  - Cross-Country Skiing 06
  - Other (please specify)
    - Canoeing above the dam 01
    - Keep development from coming in 01
- Stream Corridor and Floodplain Restoration 25
- Invasive Plants Control 22
- Native Tree and Shrub Planting 26
- Native Wetland Plants Installation 22
- Historic Preservation 11
- Environmental Education – Self-guided Tours 11
- Environmental Education – School-related Activities 11

Comments

No motorized vehicles.

No cross-country skiing! No snowmobiles!

I already have (opened land) for birdwatching and fishing and planting wetland plants.

(Opening for recreation is) not possible since Little Chiques and Brubaker Run flood several times each year.

11. Please circle ONE of the numbers in each box to tell us how important each of the following items is in helping to protect and preserve our community's stream corridor resources AND our quality of life.

1 = Not Very Important 2 = Somewhat Important 3 = Very Important

ITEM	IMPORTANCE low ⟶ high			
Improve the quality of water in streams	**1**	**2**	**3**	**No answer**
	02	21	61	01
Protect farmland/open space from development	**1**	**2**	**3**	**No answer**
	06	18	61	--
Preserve wildlife habitat	**1**	**2**	**3**	**No answer**
	09	21	54	01
Promote increased use of agricultural best management practices	**1**	**2**	**3**	**No answer**
	05	20	60	--
Encourage streamside recreational and educational opportunities	**1**	**2**	**3**	**No answer**
	31	36	18	--
Protect the quality of drinking water	**1**	**2**	**3**	**No answer**
	01	14	78	--
Prepare long-range plans to help guide future community growth	**1**	**2**	**3**	**No answer**
	12	24	49	--

ITEM	IMPORTANCE low → high			
Using zoning to guide the ***quality*** of development	**1**	**2**	**3**	**No answer**
	12	28	44	01
Strengthen cooperation and planning among neighboring municipalities and school districts	**1**	**2**	**3**	**No answer**
	05	33	45	02

Final Comments
(Personal contact information, where given, is not included here but has been provided to the Mount Joy Borough Authority.)

It sounds like an interesting project. After seeing who is involved on the steering committee, I am confident the right motives are behind this. I would be interested in attending the meetings. Let me know if you need some input.

We all like a quiet nature spot to go to meditate after a busy work schedule. It is good for the mind and soul.

Who do I contact (state or township) to get information on how to replace the "temporary" bridge (paced about 25 years ago) on Meadow View Road over Little Chiques Creek? My land is severely losing ground because of how the pipes of the bridge were placed. (My property is located where Rapho Township and Donegal Township meet.) Please respond. Thank you.

Great project if the sole purpose is to clean up watershed and restore nesting areas and propogation areas for wildlife, etc. Bad project if it is intended to further someone's political career or agendas at expense of property owners along watershed.

Thank you for addressing these issues in our community.

Thank you very much for making this effort. Your work is extremely important.

It seems if government/professional people get too involved they mess up the good that has been with their inexperience-of-area knowledge. Nature can be too organized.

My border land floods at almost every rainfall – I don't know what you could possibly do to improve it at all. I doubt that it's of any worth to you.

I think that soil erosion and introduction of large amounts of manure into the creek are the main concerns. Whatever can be done to reduce these two situations will be helpful.

Require developers to provide plans for access to recreational areas such as parks, biking trails, walking trails, etc. in local residential areas. Keep recreational areas out of agriculture areas unless specifically donated as such.

I have a small stream through my yard. Please make farmers keep manure away from streams. I see farmers' barnyard run right into streams.

I encourage to preserve farms and to eliminate development pressure in open farm land. My future plans are to build a 60-cow dairy on our property with streambank fencing.

Declare eminent domain on creekside shacks and vacant structures on Drager Road, Rapho Township, starting at Marietta Ave. to about one-half mile in on Drager (up to the hard bend).

Require developers to provide sidewalks and hiking-bike trails around their new homes developments.

I would like to get involved with some ideas which might be beneficial from the experience I have on my farm making videos of rain runoff of my pond and property of adjoining land.

Way too much pressure is put on farms to follow regulations, while development runs rampant. Rapho has the "triangle" for development, which is to take 20 years. This will be developed in the next five. Then what? Wal Mart? This is very unneeded in our township. More land paved over, increased traffic, destroy small business.

I do not live on the property and the land is under tentative contract for this year. However, I do support this conservation plan and its ideals.

Why are borough and township involved in this when there are already federal-state funded programs promoting BMPs?

Consideration should be given to irrigation needs of cultivated lands along the watershed.

I am for BMPs on my land and would like to see it promoted by townships, etc. However I am not for a lot of laws with officers to police them!

Please! Always respect private property, something most farmers see very little. I hope opening our farms for recreational use is never forced upon us.

I already have problems with people riding horses and four-wheelers on my farms. I am not interested in having more people on my land.

Concerns: liability insurance issues, eminent domain by a local government, fair compensation, funding by whom for conservation plan?
Goals: promote a viable, stable agricultural, rural setting for the future.

I was pleased with the effort to clear the overgrowth along the stream last fall. (The Cove area) I think the waterway itself could use clearing, too. Maybe it could help with the heavy rains and high water.

Thanks to all of you for your obviously hard work and devotion. I'd be glad to be involved in your efforts in ways I could contribute knowledge, experience, writing/talking/presenting skills garnered from 39 years of teaching – plus writing, editing, journalism free-lancing, etc. etc.

I am in favor of protecting the Little Chiques Creek and improving water quality but the adjacent landowner rights must be protected from intrusion by others without permission.

My property holds a pond and springs which are part of the headwaters of Brubaker Run, a small tributary to the Little Chiques. I am open to changes such as enlarging the pond and redirecting the runoff, but in the big picture this probably has no impact on your project.

SUMMARY

Landowners willing to dedicate land for projects

LEGEND

Walk =	Walking/Hiking	Othr =	Other
Bird =	Birdwatching	StrRes =	Stream Corridor and Floodplain Restoration
Fish =	Fishing	Inv =	Invasive Plants Control
Pic =	Picnicking	Nat =	Native Tree and Shrub Planting
Bicy =	Bicycling	Wet =	Native Wetland Plants Installation
Hors =	Horseback Riding	Hist =	Historical Preservation
Snow =	Snowmobiling	EEslf =	Environmental Education – Self-guided Tours
CCSki =	Cross Country Skiing	EEsch =	Environmental Education – School-related Activities

CONTACT	Walk	Bird	Fish	Pic	Bicy	Hors	Snow	CCSki	Othr	StrRes	Inv	Nat	Wet	Hist	EEslf	EEsch
All contact information provided to the Mount Joy Borough Authority but not included for general publication	X	X						X			X	X	X		X	
1*	X	X	X	X	X	X	X	X		X	X	X	X	X		X
	X	X	X	X						X	X	X				
2*										X						
	X	X				X						X			X	X
3*									X							
4*		X	X							X	X	X	X		X	X
5*		X	X							X	X	X	X	X	X	X
								X		X	X		X			
		X	X							X		X	X			
	X	X	X	X	X	X		X		X						
										X		X		X		X
		X								X	X	X	X			
	X	X	X	X		X										
6*	X	X	X	X				X			X	X	X		X	X
7*	X	X						X					X		X	X
8*	X	X	X	X								X	X		X	
9*	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
										X	X	X	X			
	X	X	X					X		X	X	X	X		X	X
										X						

	Walk	Bird	Fish	Pic	Bicy	Hors	Snow	CCSki	Othr	StrRes	Inv	Nat	Wet	Hist	EEslf	EEsch
										X	X	X	X	X		
										X						
										X	X	X	X			
10*											X	X	X			
	X	X	X							X	X	X				
11*										X	X	X				
12*	X	X	X											X		
										X						
	X	X	X							X	X	X	X			
	X	X								X	X	X	X	X		
TOTALS	Walk **15**	Bird **19**	Fish **14**	Pic **7**	Bicy **3**	Hors **5**	Snow **2**	CCSki **8**	Othr **2**	StrRes **22**	Inv **18**	Nat **21**	Wet **18**	Hist **7**	EEslf **9**	Eesch **9**

*** Relevant Comments**

Topic	*Comment*
1. Dedicating Land	"It is a little early to answer this. Discussion points: Liability? Invasion of privacy? Compensation?"
	"I have always allowed people to do these types of activities on my land. I haven't made up my mind whether or not 'public' access should be allowed."
2. Recreational Activities	"This is not possible since Little Chiques and Brubaker Run flood several times each year."
3. Dedicating Land	"Depends." Comment under 'Other' – "To keep development from coming in."
4. Recreational Activities	"I already have (opened land) for bird watching , fishing, and planting wetland plants."
5. Fishing	"With some control."
6. Other activity	"Canoe above the (privately owned and maintained) dam."
7. Recreational Activities	"Very small area. I live on 1.3 acres and my house is only 30 feet or so from a tributary."
	"No motorized vehicles."
8. Dedicating Land	"In question."
9. Dedicating Land	Checked all headings but did not specify individual recreational activities.
10. Dedicating Land	"Not open to public, but very interested in (plant projects)."
11. Dedicating Land	"Maybe."
12. Activities allowed	"With respect."
	"Always have had it a 'shared' area. Only recent residents of area limit usage."
	"My land was never restricted as long as respected."

4. ACTION PLAN – RECOMMENDATIONS

A. TOOLBOX

B. PROJECTS

4. ACTION PLAN - RECOMMENDATIONS

The five goals of the Little Chiques Creek Watershed Rivers Conservation Plan are inter-related and inter-dependent. Each goal involves aspects of water quality, water quantity, and protection of existing natural resources. For land managers to successfully implement the goals and recommendations set forth, it is critical that the evaluation and recommendations provide both direction and flexibility. The final recommendations are presented in two ways. The first is a "toolbox" format that allows flexibility depending on the particular strengths or weaknesses of the responsible local government or organization. The toolbox allows the municipality or watershed association to select and implement various tools as their budget or need allows. The second is a discussion of specific recommended projects, along with potential funding sources and estimated costs, where applicable. This format prioritizes the most easily implemented projects, because in many cases several factors are already in place to facilitate the process.

Little Chiques Creek Watershed
Project Goals

o Identify ways to meet the environmental standards set by state agencies;

o Identify the interests of landowners while protecting their property rights;

o Determine the recreation needs of the public.

o Identify opportunities for environmental education for adults and youth;

o Preserve the cultural and ecological resources in the watershed while improving water quality.

Little Chiques Creek Watershed

Section 4 - Action Plan - Recommendations

A Toolbox

Region / Watershed

Tool	Description	Activities	Source	Exist	Expanded	New	Responsibility	Priority
Water Planning Team	A consortium of groups, individuals and stakeholders to address the broad range of issues with the common goal of a sustainable water supply.	Include representation from wellhead protection, water authorities, sewage treatment, agricultural community, industry, land owners, watershed groups, aquifer groups (ACT 220), county water resources task force, etc. This consortium may provide more efficient guidance, improved communication, and important partnerships needed to protect a common interest....water resources.	State Water Planning Team (ACT 220)			x	Lancaster County Water Resources Task Force PA State Water Planning Team	High
Multi-municipal / Regional Comprehensive Planning	Integrate results of the Little Chiques Creek Watershed Plan (LCCWP) into existing and future multi-municipal and regional planning efforts.	Update comprehensive plans or include strategies in new regional comprehensive planning efforts that address water resource protection. Consider some of the following tools proposed as part of this watershed plan and recommendations noted in the report.	PA Municipalities Planning Code	x			Donegal Region Elizabethtown Region Manheim Central Region	High
Build-out Zoning Strategy	Use current zoning districts and GIS data to develop a build-out scenario for future development in relationship to available water supply and wastewater. Use this map as a guide for updating comprehensive plans and re-zoning.	Consider public water supply and water resources for these plans and / or previous studies or on-lot availability. The goal is to protect high recharge areas and conservation corridors from development, while concentrating development in areas where water and sewage disposal are available.	South Coventry Township Chester County, PA			x	Municipalities	High
Open Space Land Acquisition	Purchase property using public funds or private land trusts for the purpose of preserving important open space and natural areas.	Use this strategy to prioritize land acquisition for potential future water sources, areas of high groundwater recharge potential, potential regional SWM locations, restoration opportunities identified in the LCCWP and other locations with importance to protecting water quality.	Lancaster County Comprehensive Plan Growth Management Element Update		x		Lancaster County Municipalities	Low
Conservation Corridors	Provide a framework for future growth by prioritizing where open space may be protected and where development could occur using the Conservation Corridors identified in the LCCWP as a starting point.	Using the Little Chiques Creek Watershed "Project Map" as a guide, identify locations for conservation corridors in each municipality. GIS data may be mapped based on the source for the conservation corridors, which include wetlands, steep slopes >25%, 100 year floodplain, geologic features (high density karst, sinkholes, caves, etc), and forested lands including wetland buffers, riparian buffers, hedgerows, significant tree stands, etc.				x	Municipality	High
Defined Growth Areas	As applied in Lancaster County, land within defined growth areas is targeted for densities of at least 5.5 units per acre and planned infrastructure (roads, water, sewer) improvements. Current County designations are Urban Growth Areas (UGAs) and Village Growth Areas (VGAs). Outside of these areas, land is planned to remain in predominantly rural and agricultural use.	Growth areas should consider existing and future public water supply. Adjustments to existing growth areas may be necessary in light of the findings of this report. Municipalities without defined growth areas should prioritize establishing them.	Lancaster County Comprehensive Plan Growth Management Element Update		x		Lancaster County Municipalites	High
Source Water (or Wellhead) Protection Overlay Districts	These ordinances are intended to minimize threats to the quality of groundwater and surface water, particularly groundwater supplies, and assist in determining compliance with federal and state environmental regulations that could affect water quality. They protect designated groundwater recharge areas by applying special design standards, such as setbacks, use limitations, signage, and buffers.	Ordinances may be implemented on a municipal level, but because of multi-municipal overlap in zones of influence (a public water source well in one municipality may have a zone of influence in another municipality), a model ordinance for the entire water authority supply area or aquifer should be encouraged.	Mount Joy Borough	x			Water Planning Team Municipalities	Medium
Agricultural Nutrient Management Program	This program is intended to minimize threats to the quality of groundwater and surface water, particularly groundwater supplies, and assists in determining compliance with federal and state environmental regulations that could affect water quality.	Consider a funding source for nutrient management programs and monitoring for farms in particularly vulnerable locations such as groundwater recharge areas, high-density karst areas, and wellhead protection zones 1 and 2, if applicable.	Local Model: Warwick Township Nutrient Management Pilot Project			x	Municipalities	Medium
Community Land Trusts	A non-profit trust that owns the land and permits the resident owner to retain title to the house, representing a more affordable approach to home ownership. Regulations place limits on the amount profit that can be earned by a single homeowner over a period of time. In places where housing prices are rising quickly, this program helps keep housing affordable for future buyers.	Easements owned by land trusts should be prioritized for Conservation Corridors. An Open Space Preservation bill currently under review at the state level would allow municipalities to appropriate money to a land trust for the acquisition of open space, transfer open space property interests to a land trust, and accept nominal payment for the transfer.	Brandywine Conservancy Natural Lands Trust Heritage Conservancy		x		Municipalities	Medium

	Groundwater Study	The new PA state water plan update, ACT 220, will develop plans for addressing the sustainability of water resources. Grant money is available to prepare Groundwater Studies, especially in potentially stressed areas. The SRBC has identified the Manheim/ Lititz / Ephrata valley in northern Lancaster County as stressed. The Little Chiques Creek watershed borders the northern Lancaster County aquifer that was part of the original study.	Use water budget model, as developed by SRBC, to determine potentially stressed areas, where the amount of water withdrawn annually exceeds the average amount of water recharge an average of once in every 10 years, and Critical Aquifer Recharge Areas (CARA's), locations where infiltration contributes to groundwater recharge.	ACT 220 Regional Committee Lower Susquehanna Susquehanna River Basin Commission SRBC			x	Water Planning Team	High
	Critical Aquifer Recharge Area (CARA) Assessment	Once the CARA's have been identified as part of the Groundwater Study, outlined above, a CARA assessment is necessary to determine protection and restoration potential of those areas that contribute significantly to the groundwater supply. CARA's are determined for a particular aquifer area as part of the Water Budget Study, described above.	1. Identify and map CARAs using GIS technology within each municipality. Field assess losing stream reaches to determine infiltration potential. 2. Identify and incorporate protection strategies for recharge areas that go beyond municipal and authority boundaries. 3. Consider Stream Assessment for reaches in this area and prioritize Watershed Assessment for regional SWM priorities.	ACT 220 Regional Committee Lower Susquehanna Susquehanna River Basin Commission SRBC			x	Oversight Committee Municipalities	High
	Stream Assessment	Identify through historical documentation stream reaches affected by current or historical activities such as mill dams, ponds, stream channel relocations, utility crossings, etc. Identify sources of erosion, sedimentation, and nutrient pollution. Classify stream types. Identify and prioritize potential stream and floodplain restoration projects.	A site investigation by a professional water resource engineer experienced in stream / floodplain restoration should assess and locate reaches that include the following characteristics: Channel bed and banks consisting of cohesive sediments that have accumulated between the top of the floodplain and the pre-settlement gravel/bedrock interface. Channels that convey increased flows or precipitation events without accessing the floodplain. Straightened channels that occupy a small portion of the valley or have significant reaches located along the valley wall. Groundwater seeps from hill or valley slopes that discharge directly into the channel. Groundwater seeps that discharge into the channel at higher elevations than the channel bed or normal flow elevations. Stream reaches that do not have the pre-settlement gravels or floodplain visible along the toe of the channel banks in the riffle locations. Sewer discharge, storm drain outfalls or agricultural run-off discharging directly to the channel. Reaches where large areas of the floodplain are available for frequent recharge of the groundwater.	LandStudies, Inc. 315 North Street Lititz, PA 17543 717-627-4440			x	Water Planning Team Watershed Association Municipality	High
	Municipal								
	Tool	**Description**	**Activities**	**Source**	**Exist**	**Expanded**	**New**	**Responsibility**	**Priority**
	Land Recycling (Brownfields Redevelopment)	The Land Recycling Program, administered by DEP, promotes urban revitalization by limiting the environmental liability associated with redeveloping vacant industrial and commercial sites. The program provides incentives for former industrial properties to be returned to productive use. Re-use of existing development keeps new development out of open areas, reducing the increase in impervious surfaces.	ID sites with potential for redevelopment and encourage re-use of these sites by streamlining the review process, especially for sites within designated growth areas.	PA-DEP Brownfield Action Team Application www.dep.state.pa.us, Keyword: "Brownfields,"	x			Municipality	Low
	Combined Sewer Overflow (CSO)	The goal is to reduce the burden on the public sewer system by removing stormwater flows into the sewer system.	Inventory and develop retrofit strategy for older neighborhoods.	"Reducing Combined Sewer Outflows" University of Maryland	x			Municipality	Medium
	Water Recycling	Encourage water recycling in all areas of existing and proposed development (residential, commercial, and industrial). Water re-use and conservation through recycling could significantly improve sustainability of water resources.	Provide guidelines for homeowners to detach their downspouts and store the water for re-use in rain barrels, tanks or cisterns. Provide ordinances that promote water recycling in commercial and industrial operations such as car washes.	SRBC *Local Model:* Ephrata Borough Car Wash Sec 319.76 W	x			Municipality	High
	Hydrogeologic Investigations for Karst Areas	Municipalities may want to consider these investigations for any land development proposed for sites where high-density karst is located. Special site investigations are recommended to identify vulnerabilities related to karst on and surrounding the site, how the development will influence the karst features, and what will be done to mitigate potential failures in the form of sinkholes. This information will allow the municipality to make informed decisions about the proposed land development and method of SWM.	Preliminary Investigation - Review historical aerial photography and published maps of karst features If visible depressions are observed additional investigation, standard penetration testing (SPT) may be necessary to determine if the observed depressions were past sinkholes that had been filled in, or if they were simply topographic depressions. Detailed Investigation - Electromagnetic (EM) and seismic refraction surface geophysical surveys may be necessary to identify subsurface soil and bedrock anomalies; Cone Penetrometer Technology (CPT) logging of subsurface soil hydrogeologic and geotechnical properties; and GeoProbe® direct push soil sampling to characterize the subsurface with regard to carbonate geology issues. These techniques may be employed on site at the same time to gather information on the subsurface for use in addressing the infiltration of stormwater as part of the NPDES Phase II permitting process.	Lancaster County Conservation District Alternative Environmental Solutions 930 Pointview Avenue, Suite B Ephrata, PA 717-738-7272		x		Municipality	High
	Construction in High Density Karst Locations	Site design and construction procedures are important components of sinkhole development. Sinkholes most often form in areas where storm-water runoff is concentrated, where bearing loads are concentrated, and where ground water is pumped in large volumes.	Minimize site disturbance, including cut/fill and drainage alteration. Minimize impervious surface, waterproof pipe-fittings and pipe-to-basin fittings to reduce the potential for leaks. Place foundations on sound bedrock.	Virginia Department of Conservation and Recreation - Hydrologic Modeling and Design in Karst		x		Municipality	Medium

	Response and Remediation of Sinkhole Occurrence During Construction	Sinkholes that occur during construction should be repaired immediately to prevent enlargement and associated adverse impacts.	Report the occurrence to the approving authority within 24 hours. Halt construction activities in the immediate area of the sinkhole. Stabilize and secure the area. Direct surface water away from the sinkhole area to a suitable storm drain system. The hydrogeologist who performed the hydrogeologic investigation for the site should be contacted to assist with determining the best method of remediation.	Virginia Department of Conservation and Recreation - Hydrologic Modeling and Design in Karst		x		Municipality	Medium
	Geologic Hazards Areas	Geologic Hazard Areas differ from other environmentally sensitive or high-density karst areas in that the latter descriptions are too broad to include the site-specific descriptions associated with Geologic Hazard Areas. Additional maps and information regarding site-specific descriptions are necessary to define an area with geologic hazards. These hazards may include caves within the rock strata that are close to the land surface, existing sinkholes, or failures. Once identified, these GHA's can be added to the Conservation Corridors.	Define Geologic Hazards for the watershed, prioritizing urban growth areas. Identify locations of existing GHAs using existing mapping, known sites, aerial infrared data, and depth to bedrock information. These maps may then be used as a guide for future development and for a more site-specific understanding of the high-density karst areas. This work would reduce some of the work associated with the hydrogeologic investigations required for new development.	Ordinance for the Control of Urban Development in Sinkhole Areas in the Blue Grass Karst Region, Lexington, KY Alternative Environmental Solutions 930 Pointview Avenue, Suite B Ephrata, PA 717-738-7272			x	Municipality	Low
	Managing Existing Sinkholes	Existing sinkholes are a direct connection to groundwater sources. For this reason, landowners need to be educated about the importance of protecting existing sinkholes and what to do in the case one should appear on a property.	If the sinkhole is in the vicinity of or could damage existing structures, it is recommended that a Hydrogeologist, or other professional with experience in sinkhole remediation is hired to assess the situation and make expert recommendations on the remediation technique. If the sinkhole is in an area where it will not damage surrounding property, the best approach is to stabilize the area and protect the sinkhole from intrusion with fencing or planting. If water is draining into the area, re-route the flow away from the sinkhole and protect the sinkhole from any fill or hazardous materials.	Alternative Environmental Solutions 930 Pointview Avenue, Suite B Ephrata, PA 717-738-7272			x	Municipality Land Owners	Medium
	Transfer of Development Rights	Zoning tool that directs growth to preferred locations (see Defined Growth Areas) through the sale and purchase of development rights. Development rights are established for a given piece of land and can be separated from the title of that property. These rights can then be transferred to another location within a defined growth area such as a UGA or VGA.	Consider including Conservation Corridors and CARA's in rural resource areas and prioritized as sending areas for Transfers of Development Rights (TDRs).	Lancaster Farmland Trust *Local Model:* Warwick Township Lancaster County		x		Municipalities	Medium
	Rural Resource Areas	Counterpart of Urban Growth Areas - designated areas that are targeted for agricultural and natural resource land preservation, rural economic development policies, and zoning techniques that discourage sprawl development patterns.	Prioritize Conservation Corridor lands as designated Rural Resource Areas.	Lancaster County Comprehensive Plan Growth Management Element Update		x		Lancaster County Municipalites	HIgh
	Farmland Preservation	Focus agricultural preservation through zoning techniques on lands with Conservation Corridors.	Use Conservation Corridors as priority lands for the County's agriculture conservation easements, the State's agricultural security area programs, and local growth management tools (TDRs, UGB/VGBs, etc.).	Lancaster County Agricultural Preservation Board Municipalities	x			Lancaster County Agricultural Preservation Board Municipalities	High
	Stormwater Management								
	Tool	**Description**	**Activities**	**Source**	**Exist**	**Expanded**	**New**	**Responsibility**	**Priority**
	Watershed Assessment to determine Regional Stormwater Management Locations	A Watershed Assessment that integrates information compiled as part of ACT 167 and the results of this study to address stream conditions and determine the best location for priority activities that provide multiple functions such as SWM, flood control, nutrient management, habitat restoration, recreation opportunities, etc.	A site investigation by a professional water resource engineer experienced in stormwater management on a watershed basis should assess and locate areas for SWM based on the following priority areas: Priority 1: Regional stormwater management initiatives for quantity control requirements associated with new development should be performed in identified critical/high-recharge areas of stream corridor floodplains within identified surface water watershed boundaries. Using a floodplain/stream restoration approach to meet quantity control requirements provides the most effective approach for maximizing groundwater recharge and reducing regional peak discharges in stream reaches that have been affected by current or historical activities such as mill dams, ponds, and stream channel relocations/straightening. (See Stream Assessment Tool above.) Priority 2: In developing areas of low recharge potential, traditional stormwater management initiatives should be implemented on site or in upland areas after the receiving waters and floodplains have been restored as identified in Priority 1.	LandStudies, Inc. 315 North Street Lititz, PA 17543 717-627-4440			x	Lancaster County Municipality	High
			Priority 3: In developing areas of high recharge and underlying karst geology, on-site stormwater management initiatives should focus on improving water quality through the use of bioretention, vegetated filter strips, bioswales, lined wet ponds, etc. In these developing areas, retaining detained and/or infiltrating stormwater for volume control should not be permitted.						
	Regional Stormwater Management	One approach to SWM recommended by the ACT 167 watershed-wide Stormwater Management Plan, is Sub-regional (combined site) Storage. The difficulty with implementing regional (combined site) SWM is finding the appropriate site and willing land owners. A Watershed Assessment, see above, will provide the best locations and give the municipality locations to recommend to interested developers.	1. ACT 167 needs to be completed in the watershed where this tool is proposed. 2. A Watershed Assessment needs to be performed with the objective of determining locations for combined storage facilities. 3. Once these sites are located, prioritize according to availability (public lands, willing landowner, etc.) and relationship to future development areas and multi-site runoff. 4. Once the locations are prioritized, incentives for the off-site developers and the land owners of the proposed regional SWM facilities must be considered.	Lancaster County Engineers Office LandStudies, Inc. 315 North Street Lititz, PA 17543 717-627-4440			x	Lancaster County Municipality	High

	Stormwater Management in High Density Karst Locations	A Hydrogeologic Investigation for Karst Areas (see above) is the first step toward stormwater management and erosion and sediment control design in areas designated as high-density karst. The most important considerations during design are to replicate existing drainage patterns as closely as possible and to dissipate overland flows over the largest possible areas. Waterway designs should be shallow, broad and provide maximum bottom width and wetted perimeter to disperse flow over the greatest area.	Consider amendments to stormwater and E&S ordinances to reflect the following points: 1. Minimize modifications to site topography and soil profiles. 2. Where practical, drainage facilities should consist of embankments at or above grade. Temporary and final grading of the site should provide for drainage away from known karst areas. 3. All SWM facilities should be designed to disperse the flows across the broadest channel area possible. 4. Shallow, trapezoidal channel cross-sections are preferred over V or parabolic- shaped channels. 5. Sediment basins and traps should be used as a last resort for sediment control. 6. Basin profiles should be broad and flat to allow maximum dispersion of detained flow. Basin bottoms should be smooth to avoid ponding. 7. Avoid concentrated flows. Inlet / outlet structures should be designed to provide diffuse discharge of water. 8. Use underdrains to encourage gradual discharge of water and to avoid prolonged ponding of water.	Lancaster County Conservation District Virginia Department of Conservation and Recreation - Hydrologic Modeling and Design in Karst Stormwater Management Plan for the Spring Creek Watershed Sweetland Engineering and Assoc. State College, PA 814-237-6518		x		Municipality	High
	Stormwater Management BMP Management Authority	Long-term maintenance and management body that oversees the maintenance of the SWM BMPs in a municipality or for a water resource area.	Responsibility may be municipal or by a watershed group or other conservation group with active and willing membership. These groups are particularly well suited to understand the special maintenance needs of BMPs and associated natural areas. With creative funding sources, these groups could provide technical assistance and implementation. Funding sources include fees from homeowner associations, impact fees from developers, and fees from SWM utilities.	Lancaster County Comprehensive Plan Growth Management Element Update			x	Municipality	Medium
	Transfer of Stormwater Rights	Similar concept to Transfer of Development Rights, but in this case provides preferred locations (regional stormwater receiving areas) through the sale or lease of the development rights for the land. Stormwater rights are established for a given piece of land and can be separated from the title of that property. These rights can then be transferred to another location within the watershed to provide SWM or NPDES requirements for a proposed development in a designated growth area.	Locations for regional stormwater management receiving areas need to be determined as part of a Watershed Assessment. Once areas have been identified within the watersheds of designated growth areas, developers are provided the option to purchase the development rights or rental fee for using the land for SWM for the off-site development.				x	Municipality	Low
	Minimum Disturbance/ Minimum Maintenance	Minimum Disturbance/Minimum Maintenance (MD/MM) - also called site fingerprinting or site footprinting - is an approach to site design in which the clearing of vegetation and the disturbance of soil are carefully limited to a prescribed distance from proposed structures and other improvements. MD/MM is especially appropriate for those sites with existing tree cover, although the vegetation to be conserved may include any type of natural vegetative cover.	Consider providing stormwater credits when MD/MM is used in open space for a proposed development.	Cahill Associates, 104 South High Street West Chester, PA 610-696-4150			x	Municipality	Low
	Stormwater Infiltration for Karst Areas - Alternative to Conventional Methods	Because traditional methods of ponding or impounding water are particularly vulnerable to collapse and failure in karst areas, the following alternative to not providing infiltration in karst areas is a viable model that address both short- and long-term objectives of SWM: a shallow, flat-bottom basin created in a suitable area, a minimum of four feet above existing bedrock or seasonal high water table as determined by soil borings. The bottom of the basin should be subtlety graded completely flat, thereby reducing ponding of water in certain areas. Vegetate the bottom of the basin with native species of trees, shrubs, and grasses. Use vegetation to promote groundwater recharge via conduits created by root system, reduce evapotranspiration, eliminate thermal heating of impounded water, and dramatically reduce ponding times. A well-established root system (mat) of the vegetation will promote surface stability, reducing the threat of sinkholes.	Determine from mapping and/or site investigation suitable areas for the proposed facilities. Conduct soil borings/subsurface data collection located within the limits of the proposed facility by an appropriate qualified professional to determine underlying rock and soil characteristics. Slopes greater than 15% should be avoided to minimize the disturbance to the site. The site should take advantage of the existing topography to the greatest extent possible, minimizing the disturbance to the existing soil profile. Embankments created at existing grade to develop the facility will be far more effective than excavation in karst areas.	Maryland Department of the Environment. 2000 Maryland Stormwater Design Manual Volumes I & II. New Jersey Department of Agriculture. New Jersey Soil Erosion and Sediment Control Design Manual. LandStudies, Inc. 315 North Street Lititz, PA 17543 717-627-4440			x	Municipality Developer	High
		The use of vegetation in the facility will virtually eliminate reduced rates of infiltration found in traditional facilities caused by the accumulation of sediments from run-off and can effectively treat excessive nutrients such as nitrogen and phosphorus and total suspended solids (TSS), including harmful heavy metals, before reaching nearby streams and wells. This facility will also eliminate overheated water found in traditional stormwater detention facilities from reaching nearby receiving waters, reducing the threat to downstream aquatic life. Increased groundwater recharge via use of vegetation in the facility will help maintain the hydrology of nearby streams and headwaters, the health of aquatic systems, and the drinking water supply, particularly during times of drought. Construction cost may be reduced by the use of existing topography. Technique eliminates the need for excessive excavation to install a clay/poly liner under the drain system. Maintenance costs will likely be reduced, because of the elimination of regular maintenance such as mowing and clean-out of accumulated sediment in traditional facil	Subtle grading of the site to create a level bottom to the facility may be necessary to reduce ponding and promote even dispersion of runoff to the total surface area. Quickly establishing vegetation in disturbed areas will reduce overexposure and excessive drying of the soil. Trees and shrubs provide shade; they keep the ground cool and maintain a soil moisture balance.						

	Stormwater Retrofit Strategies	In many urban or fully developed suburban areas, either there is no infrastructure in place to address stormwater runoff or previously installed structures have not been maintained and no longer serve the purpose for which they were intended.	1. Provide guidelines for voluntary maintenance and for retrofitting existing structures to provide infiltration or water quality benefits. The benefit to land owners is improved aesthetic, lower maintenance, and reduced property damage. 2. Inventory locations where stormwater management facilities have failed and are contributing to urban stream degradation or are no longer functioning. This includes erosion at pipe outflows and runoff damage to private and public property. 3. If the condition is affecting public property or water resources, consider outside funding sources to restore and stabilize the facility or infrastructure. 4. Explore Funding options for a retrofitting program	Center for Watershed Protection, Community Stormwater Retrofitting.			x	Local Watershed Group or Association Municipalities	Low
	Land Development								
	Tool	**Description**	**Activities**	**Source**	**Exist**	**Expanded**	**New**	**Responsibility**	**Priority**
	Streets	Residential streets are often unnecessarily wide, and these excessive widths contribute to the largest single component of impervious cover in a subdivision (CWP, 1998). By requiring narrower street widths based on a maximum width, the developer must prove why the additional width is necessary.	Revise street requirements to reduce impervious cover and promote infiltration of runoff. Street width ordinances may use standard, consistent street classification definitions and maximum street widths that are the minimum to accommodate safe travel lanes, maintenance, and emergency management. Allow utilities within ROW and under paving. Allow grass swales instead of curbs and gutters. Require sidewalks on only one side of the street. Reduce total street length by encouraging efficient use and layout.	Recommended Model Development Principles for East Hempfield, West Hempfield and Manor Townships and Lancaster County, PA, Alliance for the Chesapeake Bay and the Center for Watershed Protection, March 2005		x		Municipality	Medium
	Cul-de-sacs	Cul-de-sac turn-arounds provide an opportunity for infiltration of runoff in the middle of the turn-around while reducing the amount of impervious cover and allowing emergency access.	Cul-de-sac turnarounds should incorporate landscaped islands and bioretention in lieu of fully paved turnaround areas.	Recommended Model Development Principles for East Hempfield, West Hempfield and Manor Townships and Lancaster County, PA, Alliance for the Chesapeake Bay and the Center for Watershed Protection, March 2005		x		Municipality	Medium
	Parking Ratios	Parking ratios determine the amount of parking allowed for various land uses or activities. Many times municipal parking ratios are based on national or outdated standards requiring too much parking for a particular use. The result is large expanses of unused or rarely used impervious cover.	The municipality should review and revise parking ratios to reflect actual parking demands. Consider setting parking ratios as a maximum instead of a minimum. Any additional parking could be defined as "overflow parking" for which alternative pervious paving surfaces should be considered, depending on the intensity of use.	Recommended Model Development Principles for East Hempfield, West Hempfield and Manor Townships and Lancaster County, PA, Alliance for the Chesapeake Bay and the Center for Watershed Protection, March 2005		x		Municipality	Medium
	Driveways	Studies show that 20% of the impervious cover in residential subdivisions can consist of driveways (Schueler, 1995). Consider allowing alternatives and limiting the amount of impervious cover on a lot.	Require a maximum amount of a single family home driveway to be impervious and any additional paving to be porous surface. A 3,000 square-foot maximum may be sufficient for most single family homes on a one-acre lot. Encourage shared driveways, especially on flag lots, and reduce minimum driveway widths to 9' for one way and 20' for double lane.	Recommended Model Development Principles for East Hempfield, West Hempfield and Manor Townships and Lancaster County, PA, Alliance for the Chesapeake Bay and the Center for Watershed Protection, March 2005		x		Municipality	Medium
	Parking Lots	Parking lots are the largest component of impervious cover in most commercial and industrial zones, but conventional design practices do little to reduce the paved area in parking lots (CSP, 1998).	Reduce the amount of imperviousness associated with parking lots by providing compact car spaces, minimizing stall dimensions, incorporating efficient parking lanes, and using pervious materials in overflow or spillover parking areas. Wherever possible provide treatment for parking lot runoff using bioretention areas or filter strips integrated into landscaped islands.	Recommended Model Development Principles for East Hempfield, West Hempfield and Manor Townships and Lancaster County, PA, Alliance for the Chesapeake Bay and the Center for Watershed Protection, March 2005		x		Municipality	Medium
	Model Legal Agreement for Shared Parking	Shared parking should be considered wherever possible, especially in urban centers and suburban commercial/industrial zones.	A template agreement for a shared parking easement.	Olympia Municipal Code, Olympia, WA		x		Municipality	Medium
	Porous Asphalt Paving	Porous asphalt paving is being used throughout southeastern Pa. with successful results. These systems provide flexibility in design to accommodate various soil, geologic, and hydrologic conditions while providing infiltration over a broader area. Porous paving surfaces combined with bioretention for overflow provide a reasonable alternative to conventional impervious paving.	Allow alternative porous paving wherever the use permits, especially in low-intensity, infrequent uses or overflow parking areas. Consider porous paving swales in less intensive areas of parking lots that overflow into bioretention facilities.	Cahill Associates, 104 South High Street West Chester, PA 610-696-4150 Harbor Engineering 41 South Main Street Manheim, PA 717-665-9000		x		Municipality	High
	Building Envelope Limitations	On lots larger than one acre, extensive open space outside of the building envelope is converted to lawn or other ornamental landscaping, which reduces the infiltration potential of each lot.	Consider ordinance language that encourages native meadow or reforestation outside of the building envelope, especially the rear yard if it abuts existing farmland or other natural environment (forest, wetland, pond, stream, etc.) This reduces maintenance, provides buffers, and encourages infiltration.	The Homes at Wyncote Design Guidelines Lower Oxford Township, Chester County, PA Haines Township Subdivision and Land Development Ordinance, Centre County, PA		x		Municipality	Medium

	Forest Conservation	A process for urban greenspace protection during the development process. Individual sites proposed for development are assessed and thresholds for clearing, afforestation, and reforestation are established based on the net tract area, land use category, existing forest cover, and proposed clearing area. Long-term protective instruments are required to ensure that the retained area will remain forested.	Forest Stand Delineation and preparation of Forest Conservation Plans as a means of identifying existing forest stands on a site and mitigating the impact of removal and development either on the site or within the watershed.	Maryland State Forest Conservation Act		x		Municipality	Medium
	Open Space Development / Conservation Zoning	Allows subdivision of smaller lot sizes than typically allowed in rural areas with a minimum open space requirement (usually 50%).	Each township should consider an Open Space or Conservation Development Ordinance as a by-right form of development within designated zoning districts. A detailed list of design standards pertaining to the quality, quantity, and configuration of open space is important. Consider a minimum lot size and a net density with a minimum amount of open space.	"Growing Greener Conservation by Design" Natural Lands Trust Hildacy Farm 1031 Palmers Mill Road Media, PA 19063 610-353-5587		x		Municipality	High
	Dedicated Easements	Voluntary dedication of open space or agricultural easements to a public entity or qualified private land conservation organization. The landowner still owns the property; however, the land must remain in farming or open space in perpetuity.	To cover their cost in maintaining the land they own or in monitoring the land on which they hold easements, land trusts typically require some endowment funding. When conservation zoning offers a density bonus, developers can donate the proceeds from the additional "endowment lots" to such trusts for maintenance or monitoring. In some situations, a local government might desire to own part of the conservation lands within a new subdivision, such as when that land has been identified in a municipal open space plan as a good location for a park or open space link. Developers can be encouraged to sell or donate certain acreage to municipalities through additional density incentives, although the final decision would remain the developer's.	Brandywine Conservancy PO Box 141 Chadds Ford, PA Natural Lands Trust Hildacy Farm 1031 Palmers Mill Road Media, PA 19063 610-353-5587		x		Municipality	Medium
	Green Building Technology	Environmentally sustainable building design that includes use of energy-efficient materials, recycled materials, solar energy, and structural and mechanical components that save utility costs over the life of the structure and have minimal impact on the environment.	Encourage the U.S. Green Building Council's Leadership in Energy Efficient Design (LEED) program certification based on a rating system for buildings and land development on a municipal level. Review the requirements of LEED and target elements that protect groundwater recharge and promote water recycling and other methods for protecting water resources.	United States Green Building Council (USGBC) Leadership in Energy and Environmental Design (LEED) www.usgbc.org		x		Municipality	Medium
	Riparian Buffer Regulations	Some municipalities incorporate riparian buffers as an Overlay Zoning District, while others provide only guidelines for voluntary establishment. The important consideration is to provide a required setback from a water course, stream, or drainage swale and to discourage locating structures or other man-made features in these areas. These areas should also be set aside for potential future restoration work that may be necessary to stabilize the stream system. Revegetation is only temporary if the stream reach is actively moving and is characterized by deep cutting.	Using the Stream Assessment as a basis, determine the sections of streams where legacy sediments and clay layers limit infiltration, and prioritize these stream reaches for riparian buffer easements for potential future restoration work. Also determine the most stable stream reaches where short-term revegetation would be least vulnerable.	Rapho Township Zoning Ordinance Section 326 East Cocalico Township Zoning Ordinance Section 233 Pennsylvania Organization for Watersheds & Rivers 610 North Third St. Harrisburg PA 17101 (717) 234-7910		x		Municipality	Medium
	Buffer Ordinance	Create a general buffer ordinance, applicable to various uses, that incorporates native plant material and accommodates multiple objectives, including visual breaks, stormwater management, infiltration, greenways, and trails. Buffers may have various uses (residential and agricultural, for example) adjacent to streams, steep slopes, wetlands, etc. and may also serve as links to other buffers or natural areas.	Determine types of uses and buffers along with minimum widths for each type of buffer. For example, the minimum width for a riparian buffer may vary depending on the size or order of the stream. A list of native plants to be used in each buffer type, along with the required spacing, should be included. Spacing of the material should directly relate to the size of the plants installed. A base groundcover should be established for each buffer type. Maintenance guidelines describing types of invasive plants and their removal are a vital component of this ordinance.	Recommended Model Development Principles for East Hempfield, West Hempfield and Manor Townships and Lancaster County, PA, Alliance for the Chesapeake Bay and the Center for Watershed Protection, March 2005		x		Municipality	Low

	Floodplain Protection Ordinance	Floodplains and streams are many times the only available open space left in developed urban areas. Typically these systems are stressed by the dramatically altered hydrologic systems. These areas must be protected, but at the same time provide excellent opportunities to restore the floodplain and reclaim storage volumes and stream stability. Many municipalities are currently revising their floodplain ordinances to meet new FEMA requirements. When making revisions, consider allowing uses within the floodplain that relate to restoration work while protecting the floodplain from encroachments.	1. Adopt a floodplain ordinance that protects the floodplain from obstructions, while allowing the opportunity for restoration activities that may reduce flooding and improve infiltration and groundwater recharge while creating recreational opportunities and habitat diversity. 2. Consider Floodplain / Riparian Buffer Ordinance Amendment Considerations in the appendix.	LandStudies, Inc. 315 North Street Lititz, PA 17543 717-627-4440		x		Municipality	High
	Steep Slope Conservation District	An overlay of any zoning district with slopes of 20 - 30% and greater. Steep slopes are often adjacent to streams and in wooded areas. Restrictions such as a minimum building envelope or lot size to prevent erosion and removal of vegetation may be warranted if the entire lot is in the Steep Slope District. Provide a list of acceptable slope stabilization plantings that are native and not invasive while providing quick cover.	Designate protection for slopes > 30%. Provide plant list and specifications for planting methods in a guideline format for stabilizing slopes >30% for new construction and any time disturbance eliminates cover. Consider building-envelope or lot-size restrictions if lots are located entirely or partially within the Steep Slope Overlay District.	Natural Resource Protection Standards Section 115-43 Steep Slope Conservation District East Bradford Township, PA		x		Municipality	Low
	Low Impact Development (LID) Standards	LID is an ecologically friendly approach to site development and stormwater management that aims to mitigate development impacts to land, water, and air. The approach emphasizes the integration of site design and planning techniques that conserve the natural systems and hydrologic functions of a site.	Incorporate elements of LID into local zoning ordinances.	Governor's Green Government Council www.gggc.state.pa.us www.lowimpactdevelopment.org		x		Municipality	High
	Management of Existing Vegetation	Native plant communities provide a vital role in infiltration capabilities of surface runoff. For this reason, it is important to consider standards for preserving existing woodland and established native plant communities and encouraging the establishment of natural meadows and woodlands in residential areas.	Conserve woodlands, hedgerows, and other naturally occurring established plant systems. Protect vegetation from mechanical injury, excavation, and fill. Establish maintenance standards in residential areas. Selectively control noxious vegetation and manage natural areas that include woodlands, meadows, and sensitive areas such as wetlands and floodplains. Also establish standards for maintenance of vegetation in residential areas that allow for natural meadows while considering proper maintenance to control invasive material.	Natural Resource Protection Standards Section 115-45 Management of Existing Vegetation East Bradford Township, PA		x		Municipality	Medium
	Water Supply and Disposal								
	Tool	**Description**	**Activities**	**Source**	**Exist**	**Expanded**	**New**	**Responsibility**	**Priority**
	Interconnection of Nonpublic Water and Sewage Systems	Regulations for central water system and/or sewage system to serve five or more dwelling units. This system is NOT part of a municipally-owned water and/or sewage system at the time of initial occupancy.	Management party must be identified along with inspection schedule and responsibility.	Mount Joy Borough Code		x		Municipality	Low
	Aquifer Test Requirements	Prior to the installation of any new water system or subdivision of land into lots that would be served by individual wells in the area or in proximity to areas of known groundwater contamination or inadequate yields of potable supplies, aquifer and water quality tests shall be performed. This test should be required in stressed areas (where the demand exceeds the supply).	Include Aquifer Test Requirements for new water systems or the subdivision of land into lots served by individual wells.	Lancaster County Subdivision and Land Development Ordinance Section 609.03		x		Municipality	High
	Water Needs Analysis / Water Feasibility Analysis	The applicant shall submit an analysis of raw water needs (groundwater or surface water) from either private or public sources along with a water feasibility analysis to enable the municipality to evaluate the impact of the proposed development on the groundwater supply and on existing wells	Prioritize this analysis for sites with Conservation Corridors	West Cocalico Township Zoning Ordinance Sec 55.q page 153 Mount Joy Borough Code Section 119-16		x		Municipality	High
	Water Supply	Whenever an existing or approved water system is accessible to a proposed project, a distribution system shall be provided to furnish an adequate supply of water to each unit.	Require a Water Needs Analysis or Feasibility Study as part of this Ordinance.	B11, B12, B13, G23, G24, G25	x			Municipality	Medium
	Well Construction Standards	Pa. is one of only four states that does not have construction standards for private wells. Unlike community water systems, which are permitted and strictly regulated by the state, private water systems are constructed, tested, and treated by the homeowner.	Provide regulations that require new wells to be constructed with a sanitary cap, as well as shock chlorination following construction of the well, and grout seal on new well construction to reduce *E. coli* contamination.	Center for Rural Pennsylvania 717-787-9555 info@ruralpa.org		x		Municipality	Medium
	Well Capping / Abandonment	Unsealed or improperly sealed wells may threaten public health and safety and the quality of the groundwater resources. The proper abandonment (decommissioning) of a well is a critical first step in its service life.	1. Eliminate the physical hazard of the well. 2. Eliminate a pathway for migration of contamination. 3. Prevent hydrologic changes in the aquifer system, such as the changes in hydraulic head and the mixing of water between aquifers. The method of decommissioning a well will depend on both the reason for abandonment and the conditions and construction details of the boring or well. Enlist the services of a professional well driller, licensed in Pa., to perform these services.	ACT 610, the Water Well Drillers License Act "Water-well Abandonment Guidelines" Ground Water Monitoring Guidance Manual, PA DEP. Mount Joy Township's Capped Sewer Ordinance	x			Municipality	Medium

	Site Plan Review Checklist for Groundwater Protection	The standards include a basic list of groundwater protection site plan review standards. The model is based on those prepared by the consulting team for the Michigan Society of Planning Officials groundwater protection project. These standards need to be revised with respect to individual municipal ordinances and Pa. state laws and are not intended to exceed state laws in stringency.	Determine if the proposed land development includes any of the following: loading/unloading/handling/storage/parking areas for hazardous substances, floor drain use and routing, secondary containment, underground storage tanks, solid waste disposal, emergency response contingency plan, or any other hazard that could impact the groundwater supply.	Michigan Society of Planning Officials "Site Plan Review Checklist for Groundwater Protection"			x	Municipality	Low
	Education								
	Tool	**Description**	**Activities**	**Source**	**Exist**	**Expanded**	**New**	**Responsibility**	**Priority**
	Environmental Education	Discuss how school districts in the watershed may want to integrate watershed improvements, projects, concerns, and opportunities into their environmental education curricula.	Consider involvement with implementing and maintaining projects described in the LCCW report. Consider a "watershed awareness" outdoor activities day for elementary students. Consider an ongoing, long-term research or monitoring program for high-school students. Involve students in creating studies based at outdoor environmental education sites suggested in the LCCW report.	PA Environmental Education requirements. LandStudies, Inc.			x	School Districts	High
	Managing Small Vernal Ponds	Maintaining a healthy pond is challenging because it contains a complex aquatic ecosystem that can be unbalanced by livestock, waterfowl, or runoff from surrounding lands. Many of the ponds in the study area are maintained for water storage and are perched systems with limited aquifer recharge potential. Although in some cases these ponds, if vernal in nature, may provide recharge, it is important to consider the management and health of these eco-systems.	Preliminary Assessment and Monitoring to understand the land uses and drainage area that contribute to the pond. Maintain dams and standpipes to maintain water levels and prevent erosion. Establish a riparian buffer to protect the shoreline, prevent erosion and discourage Canada geese. Create a Pond Management Plan - ID services and resources provided by the pond and its uses and determine a management approach with technical assistance.	"Ecologically Based Small Pond Management" report by West Chester University (Fairchild and Velinsky, 2004)			x	Land Owners	Low
	Natural Landscaping	Bayscapes are environmentally-sound landscapes benefiting people, wildlife, and the Chesapeake Bay. Bayscaping advocates a holistic approach to landscaping through principles inspired by relationships in the natural environment.	Plant conventional landscapes with low-input landscaping (reduced mowing, fertilizing, and pesticide use) that uses native plant material.	Alliance for the Chesapeake Bay "Bayscapes - PA" Rebecca Wertime (717) 737-8622		x		Land Owners	Low
	Managing Land Adjacent to Streams and Waterways	Educational information from the USDA Forest Service about the importance and methods for taking care of property adjacent to streams. Of the 83,161 miles of rivers and streams in Pa., approximately 85% are small, headwater streams. Protecting small streams is crucial because they often influence drinking water sources.	Protect the stream and floodplain from fill, obstructions, and structures. Establish a streamside buffer (riparian buffer) consisting of native trees, shrubs, or other plants as a transition area between the stream and upland areas. Don't try to fix the stream without the assistance of a professional water resource engineer with experience in stream system maintenance and geomorphology.	PA DEP USDA Forest Service 814-723-5150		x		Land Owners	Low
	Conservation Reserve Enhancement Program (CREP)	CREP is a federal/state partnership with a goal of enrolling 100,000 acres of cropland and pasture in conservation plantings to improve water quality and provide wildlife and fisheries habitat. This program provides plant material and installation and rents the non-productive land at a yearly per-acre rate. Planting trees may reduce evapotranspiration and provide root zone conduits for infiltration through impenetrable layers.	Educated landowners adjacent to streams, watercourses and about the benefits of this program.	NRCS Lancaster Office 717-299-1563	x			Land Owners	Low
	Tox-Away Day	This program is a one- or two-day event that allows residents within the watershed to bring hazardous household waste to a local site for proper disposal. Materials may include dangerous substances that pose a risk to water resources such as paint, oils, cleaning fluids, old computers, herbicides, pesticides, etc.	Planning for a tox-away day must begin very early - as long as 6 to 18 months before the collection date. Following are the major subjects that need to be addressed. Define Roles and Responsibilities of those involved Create the Planning Committee and begin planning approx. 8 months to 1 year prior to the planned event Identify the Program Sponsor Hire the hazardous Waste Contractor (begin by talking with local solid waste authorities to see if they off the service and to determine fees) Use the opportunity to educate the community about the protection of water resources and proper disposal of hazardous waste.	PA DEP Household Hazardous Waste Disposal Events DEP website Lancaster County Solid Waste Management Authority 1299 Harrisburg Pike PO Box 4425 Lancaster, PA 17604 Phone: 717-397-9968					Low

B. PROJECTS

Land-use analysis and landowner input contributed to the placement of recreation-oriented projects and linkages in and around the watershed's population center (Mount Joy Borough and vicinity), while targeting conservation corridor considerations to the upper, more uniformly agricultural sector of the watershed.

Watershed Implementation Plan

Because the Little Chiques Creek watershed is a sub-watershed of the Chiques Creek watershed, for which a Total Maximum Discharge Load (TMDL) has been assigned (see Little Chiques Stream Assessment, Section 2), it is eligible to receive funding under the U.S. Environmental Protection Agency's Section 319(h) grants program, designed to reduce nonpoint source pollution. According to information on an EPA website (www.cwn.org/docs/issues/pollutedrunoff/319kit.htm), "Section 319(h) grants are used to protect or restore waters polluted or threatened by nonpoint source pollution. Grants can be used to implement pollution reduction practices (known as best management practices or BMPs), to survey nonpoint source pollution problems, and to conduct education campaigns designed to reduce pollution, among other activities." (In Pennsylvania, application for 319 grant funding is made through the state's Growing Greener program.)

We recommend that application be made for a grant to fund a Watershed Implementation Plan, which would include:

- a detailed assessment of stream channels throughout the Little Chiques Watershed, along with recommendations for restoration;
- an investigation of agricultural practices that contribute pollutants; and
- an identification of areas that employ streambank fencing and other BMPs.

See also "Stream Assessment" in the Toolbox, included in this section.

Stream and Floodplain Restoration

As noted in the Stream Assessment, Section 2, stream and floodplain restoration efforts should be given priority in the headwaters of the main stem and tributaries to alleviate the substantial bed load material being transported through the system. At least three landowners on adjacent parcels in the headwaters of the main stem already have expressed in participating in stream and floodplain restoration projects. For that reason, an approximately two-mile length of headwater channel has been noted on the *Project Map* as a priority restoration area. A Watershed Implementation Plan should be completed before stream and floodplain restoration projects can be considered.

Fish Stocking

The Pennsylvania Fish and Boat Commission currently stocks Little Chiques Creek main stem between Milton Grove Road and Route 772 (see Existing Conditions map, Section 2). Information concerning any areas of the main stem or any of the tributaries in the watershed under consideration for future stocking was not available.

Specific Project Sites

All projects described here are shown on the *Project Map*, included in this section.

Priority

Confluence – Brubaker Run and Little Chiques Creek

The area of the confluence, which is in close proximity to the Meadowview Road bridge crossing over Little Chiques Creek, is showing signs of considerable erosion, bed load deposition, and overall instability as a result of the numerous historical and more recent impacts to the stream channels in this vicinity. Culverts under the crossing are improperly aligned with stream flow; Brubaker Run enters Little Chiques Creek at an upstream angle, creating an area of turbulent flow; and sediment transport through both channels – Little Chiques and Brubaker Run – is heavy because of historical activities that have created unstable systems with high bed loads through both channels.

A detailed stream assessment will provide more information on the problems in this area and would contain specific recommendations to correct them. For the immediate future, this site has been called out as a priority area of concern so that municipal officials are aware of the problems, including a continuing loss of private land to erosion.

The Cove

The Cove, located just north of Mount Joy Borough in Mount Joy Township, has historically served the local community as a picnic and outdoor recreation area and, for a time, as the Mount Joy Bird Sanctuary. The site had suffered from several decades of neglect until the past year or two, when the fledgling Little Chiques Watershed Association began to clean it up and remove much of the non-native, invasive bamboo along the stream channel. The property has already been targeted for a restored outdoor recreational area through a partnership between Mount Joy Township and the Mount Joy Sportsmen's Association, and a preliminary plan has been created.

As noted in the Stream Assessment, Section 2, "this portion of the Little Chiques main stem, in particular, is actively evolving, and the process will accelerate as the concrete pedestrian crossing [which fell into the stream channel as the channel widened] continues to crumble. At the upstream limit of this reach, the dam is deteriorating and already has been breached. … The deterioration of this structure, along with the downstream deterioration of the concrete crossing structure, will lead to an increased sediment supply, and increased channel slope, and an increased rate of change (evolution) in the channel throughout this section of Little Chiques Creek."

The recommendation for this site is to continue to restore this favorite community recreation area with the knowledge that the high degree of stream system instability in the area can lead to changing conditions in the landforms along the creek. Infrastructure should be kept to a minimum to avoid unnecessary loss over the coming decades. Picnic pavilions and other low-impact amenities are suitable for this area.

The Cove lies in the downstream end of the area of Little Chiques Creek that is stocked with fish by the Pennsylvania Fish and Boat Commission. It is important to note that the failure or removal of the grade controls (pedestrian crossing and dam) allows Little Chiques Creek to evolve to the elevation of its historical gravels. Restoration or natural evolution to this elevation is necessary to provide long-term stability and high-quality aquatic habitat.

Little Chiques Park

Little Chiques Park, formerly Sico Park, is sited within the confines of a historical oxbow meander in the Little Chiques Creek channel, along the eastern edge of Mount Joy Borough. The initial recommendation is to create a master plan for the improvement of the park both as an outdoor environmental education site and as a recreational area focused on its water resources, with information concerning the condition of the stream being taken into account as the plan is developed.

Donegal School District Property
(former Ezra Engle farm, Pinkerton Road)

A portion of this parcel presents an excellent opportunity for the Donegal School District to collaborate with East Donegal Township, and perhaps nearby Mount Joy Borough, to develop a master plan for an environmental education site for both school students of all ages as well as the general public. From the parcel's lower boundary at Little Chiques Creek up through the existing woodlot, a portion of this property contains a wide diversity of ecosystem types in a contained area. Stream, floodplain, wetland, and upland woods are all available in a concise continuum. Environmental education opportunities for the general public could be provided in the form of a self-guided walk with appropriate signage.

Stone Bridge *(Pinkerton Road)*

Stone Bridge, the historical Pinkerton Road crossing over Little Chiques Creek, has long been a favorite place for locals to enjoy the stream and especially to fish. We recommend that a master plan be developed to enhance the area traditionally used for parking and streamside fishing, located on the Rapho Township side of Little Chiques Creek. The plan could include such amenities as a discrete area to park several cars, minimal seating (benches and perhaps a table), a trash can, installation of native plants suitable for the site, and any other features that would help keep the area stable and clean for both the landowner and users. The project area is small enough to be maintained easily and regularly by Watershed Association volunteers, or by a local school, church, Scouting, or civic group. The landowner has indicated his interest in allowing this project to be designed and implemented with his ongoing approval.

Pedestrian Trail

Mount Joy Borough already is in the early stages of developing a pedestrian "loop" to link public recreation areas in and around the Borough. The pedestrian trail noted on the *Project Map* ties into that loop and extends down to Little Chiques Creek via Jacob Street and the edge of the Sewage Treatment Facility property. The trail could potentially extend along Little Chiques Creek at least to the Donegal School District-owned parcel noted above and perhaps as far as Stone Bridge on Pinkerton Road. Permission from several landowners would need to be obtained for the full extent of the trail.

Potential

Wenger Feeds Parking Lot - Porous Paving Monitoring

Wenger Feeds retrofit and upgraded an existing parking lot within their distribution facility site in the Borough of Mount Joy. As part of this upgrade, a porous paving "swale" was installed along with the access to the drainage pipe at the bottom of the subsurface swale. This access provides a rare opportunity to monitor, over time, the porosity and performance of this porous asphalt swale. A protocol and a technique were prepared for seasonal monitoring. A flow meter will need to be purchased to perform this task.

Vulnerable Dams *(Cove & Main Street areas)*

Of all the dams once imposed upon Little Chiques Creek, three remain. Two of those dams, one near the Cove in Mount Joy Township (top photo) and one between Main Street and Little Chiques Park in Mount Joy Borough, are discussed in Little Chiques Creek Stream Assessment, Section 2. The third, northwest of Longenecker Road, between the Groff Farm Golf Course and the Donegal School District Property noted above, is privately owned and maintained.

As noted in the Stream Assessment, the upstream dam, near the Cove, has been breached and is deteriorating. The downstream dam, also known as Sico Dam, appears to be in better condition. We make no recommendation about the maintenance or removal of either of these dams, except as follows:

Officials at some time in the future will need to make an educated decision about the two dams. If they are both left in, they will need to be maintained. If the option to remove is selected, we recommend the removal of only one dam because of the substantial gradient difference that would need to be addressed by the removal of both dams.

When a dam is maintained:
Sediment deposits continue to accumulate behind the dam and in the stream valley upstream of the dam. The upstream channel and floodplain continue to aggrade, while the downstream channel degrades because of lack of sediment. When aggradation behind the dam reaches the height of the dam, sediments begin to be carried over the dam – silts and other fine particles first, followed by larger and larger sediments, depending on the nature and the quantity of the sediment carried through the stream system.

When a dam is removed or breached through deterioration:
The upstream channel, which has aggraded during the functioning period of the dam, will begin to degrade, and it will widen and change pattern and profile as cutting down begins to occur. The downstream channel will receive a flush of sediment at a rate dependent on the amount of breaching that is occurring.

Proper removal of a dam would entail a stream corridor and floodplain restoration both upstream and downstream of the dam site to create a proper pattern and profile to accommodate the system's sediment load. Prior to removal, much of the sediment that is built up immediately behind the dam should be dredged and taken off site. Both the amount of dredging and the restoration design would require a thorough assessment and survey to create a stable stream system.

Rapho Township Park

The master plan for this site is being or has already been developed. The recommendation for the site is merely to maintain an awareness of the park's proximity to a tributary to Little Chiques Creek and to the overall stream system. Future amenities and installations should be designed to allow optimal permeability for groundwater recharge and to avoid any negative affect on nearby surface water resources.

Former Grandview Elementary School

This site, now the property of Mount Joy Borough, contains surface water that has been ditched as well as possible wetland areas. As plans for developing this open space continue to be refined, those water resources should be taken into account through enhancement as natural features within the site or, minimally, through their protection from any negative effects of site development.

Little Chiques Creek Watershed Projects

Costs and Funding Sources

Priority	Project	Potential Funding Sources	Type of Work	Estimated Cost
High	**Watershed Implementation Plan**	- EPA (Environmental Protection Agency) Section 319 Program PA - PA Growing Greener program - Public / private sector funding	Geomorphological Assessment and Report, including BMPs	$60,000
High	**Stream and Floodplain Restoration**	- PA Growing Greener program - Public / private sector funding	Design, Permitting, and Construction	$100 - $300 per linear foot
High	**Confluence of Brubaker Run and Little Chiques Creek**	- PA Growing Greener program	Design, Permitting, and Construction	$100 - $300 per linear foot
High	**The Cove**	- DCNR C2P2 Program - WREN program (Water Resource Education Network) - Local / national foundations - Public / private sector funds	Recommendations to Existing Plan	$1,000
Medium	**Little Chiques Park**	- DCNR C2P2 Program - WREN program (Water Resource Education Network) - Local / national foundations - Public / private sector funds	Masterplan	$3,000
Medium	**Porous Asphalt Monitoring - Wenger Feeds Parking Lot**	- WREN program - Public / private sector funds	Monitoring and Assessment of Performance	$2,000

Medium	**Donegal School District Property**	- DCNR C2P2 Program - PA Growing Greener program - WREN program - NFWF Program - PA Environmental Education Grants Program - Local / national foundations - Public / private sector funds	Masterplan	$5,000
Medium	**Stone Bridge at Pinkerton Road**	- DCNR C2P2 Program - NFWF Program - Local municipalities - Public / private sector funds	Masterplan	$3,000
Medium	**Corridor Pedestrian Trail**	- ISTEA - DCNR C2P2 Program - PA Growing Greener Program	Masterplan and Public Involvement	$10,000
Low	**Vulnerable Dams**	- PA Fish & Boat Commission - EPA's Section 319 Program - PA Growing Greener Program - NFWF Program - CBF (Chesapeake Bay Foundation) Grants - Public / private sector	Structural Assessment, including under-water inspection	$4,000 per dam
Low	**Rapho Township Park**	- CBF Grants - Lancaster County Conservancy - local homeowners association - Local / national foundations - Public / private sector funds	Recommendations to existing plan	$1,000
Low	**Former Grandview Elementary School**	- DCNR C2P2 Program - WREN program - Local / national foundations - Public / private sector funds	Recommendations to existing plan	$1,000

Legend

- Priority Watershed Activities
- Potential Watershed Activities
- Priority Restoration Location
- Potential Trail Corridor
- Main Stem Little Chiques Creek
- Conservation Corridors
- Municipal Boundaries
- Watershed Boundary
- Parcels
- Private Recreational Use
- Public Use
- Urban Growth Boundary
- CREP Properties

N W E S

LEBANON COUNTY
LANCASTER COUNTY

MOUNT JOY TOWNSHIP

RAPHO TOWNSHIP

Confluence - Brubaker Run and Little Chiques Creek

Significant erosion and private property loss due to placement of road crossing, angle of confluence, and historical land use.

The Cove

Passive recreation, Restoration of Bird Sanctuary Status

Little Chiques Park

Enhanced Stream Buffer, Improved Streamside Trail, Environmental Education Stations.

Vulnerable Dam

Former Grandview Elementary School

Ralpho Township Park

Vulnerable Dam

Borough of Mount Joy

EAST DONEGAL TOWNSHIP

Donegal School District Property (Former Ezra Engle Farm, Pinkerton Road)

Recreational Trail and Environmental Education Stations.

Stone Bridge (Pinkerton Road)

With landowner's permission, stabilized parking and fishing area with amenities.

Project Map
Little Chiques Creek Watershed

0 1,000 2,000 3,000 4,000 Feet

1 inch equals 1,000 feet

ARRO

REFERENCES

REFERENCES

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APPENDIX

- **Information Sheet: TMDL for Chickies Creek Watershed**
- **Ordinance Overview for Water Quality Issues**
- **Water Resource-Related Ordinance Audit – East Donegal Township**
- **Water Resource-Related Ordinance Audit – Mount Joy Borough**
- **Water Resource-Related Ordinance Audit – Mount Joy Township**
- **Water Resource-Related Ordinance Audit – Rapho Township**
- **Key Person Interview Questions**
- **Landowner Survey Questionnaire**
- **Considerations for Amendments to Floodplain Regulations**

Information Sheet
TMDL for Chickies Creek Watershed

What is being proposed?
A Total Maximum Daily Load or TMDL plan has been developed to improve the water quality in the Chickies Creek Watershed.

Who is proposing the plan? To whom? Why?
The Pennsylvania Department of Environmental Protection (DEP) is proposing to submit the plan to the US Environmental Protection Agency (EPA) for review and approval as required by the federal regulation.

In 1995, EPA was sued for not developing TMDLs when Pennsylvania did not do so. DEP has entered into an agreement with EPA to develop TMDLs for certain waters over the next several years. DEP developed this TMDL in compliance with the state/EPA agreement.

What is a TMDL?
A Total Maximum Daily Load (TMDL) sets a ceiling on the pollutant loads that can enter a waterbody so that the waterbody will meet water quality standards. The Clean Water Act requires states to list all waters that do not meet their water quality standards even after pollution controls required by law are in place. For these waters, the state must calculate how much of a substance can be put in the water without violating the standard, and then distribute that quantity to all the sources of the pollutant on that waterbody. A TMDL plan includes waste load allocations for point sources, load allocations for nonpoint sources and a margin of safety.

The Clean Water Act requires states to submit TMDLs to EPA for approval. Also, if a state does not develop the TMDL, the Clean Water Act states that EPA must do so.

What is a water quality standard?
The Clean Water Act sets a national minimum goal that all waters are "fishable" and "swimmable." To support this goal, states must adopt water quality standards.

Water quality standards are state regulations that have two components. The first component is a use, such as warm water fishes or recreation. States determine the uses supported by each of their waters. The second component relates to the instream conditions necessary to protect the uses. These conditions or criteria are physical, chemical or biological characteristics, such as temperature, the minimum concentration of dissolved oxygen, and the maximum concentrations of toxic pollutants.

It is the combination of "uses" and "criteria" that make up water quality standards. If criteria are being exceeded, the uses are not being met, and the water is said to be violating water quality standards.

What is the purpose of the plan?
The Chickies Creek Watershed was determined to be impaired from excess nutrient and sediment contributions. This determination was made based on the health of the biological community residing in the water. The plan includes a calculation of the loading for both the nutrient and sediment that will meet the water quality objectives.

Why was the Chickies Creek Watershed ***selected for a TMDL?***
In 1996, DEP listed a Stream Segment in the Chickies Creek Watershed under Section 303(d) of the federal Clean Water Act as impaired due to excess nutrient loading.

Also, in 1998, DEP listed Stream Segments ID # 1247, 970729-1415-SAW and 970812-1045-SAW of Chickies Creek Watershed under Section 303(d) of the federal Clean Water Act as impaired due to excess nutrient and sediment loading.

The 1996 Section 303(d) List for Chickies Creek Watershed is as follows:

Segment ID	Stream Code	Stream	Source Code	Cause (s)	Miles Degraded
1247	07919	Chickies Creek	Agriculture	Nutrients	10.0

The 1998 Section 303(d) List for Chickies Creek Watershed is as follows:

Segment ID	Stream	Source Code	Cause (s)	Miles Degraded
1247	Chickies Creek	Agriculture	Nutrients	22.8
970729-1415-SAW	Chickies Creek	Agriculture	Siltation	9.4
970812-1045-SAW	Chickies Creek	- Urban Runoff/ Storm Sewers - Agriculture	- Unknown - Nutrients/Siltation	7.7

What pollutants does this TMDL address?
The proposed plan provides calculations of the stream's total capacity to accept nitrogen, phosphorus and sediments.

Where do the pollutants come from?
All of the pollution in the Chickies Creek Watershed comes from non-point sources (NPS) of pollution. The pollutants come primarily from overland runoff.

How was the TMDL developed?
DEP used a reference watershed approach to estimate the necessary loading reduction of nutrients and sediment that would be needed to restore a healthy aquatic community and allow the streams in the watershed to achieve their designated uses. The reference watershed approach is based on selecting a non-impaired watershed that has similar land use characteristics and determining the current loading rates for the pollutants of interest. This is done by modeling the loads that enter the stream, using precipitation and land use characteristic data. For this analysis we used the AVGWLF model (the Environmental Resources Research Institute of the Pennsylvania State University's ArcView based version of the Generalized Watershed Loading Function model developed by Cornell University). This modeling process uses loading rates in the non-impaired watershed as a target for loading reductions in the impaired watershed. The

impaired watershed is modeled to determine the current loading rates and determine what reductions are necessary to meet the loading rates of the non-impaired watershed.

The reference stream approach was used to set allowable loading rates in the affected watersheds because neither Pennsylvania nor EPA has water quality criteria for nitrogen, phosphorus or sediment.

How much pollution is too much?
The allowable amount of pollution in a waterbody varies depending on several conditions. TMDLs are set to meet water quality standards at the critical flow condition. For a free flowing stream impacted by non-point source pollution loading from nutrients and sediment, the TMDL is expressed as a yearly loading. This accounts for pollution contributions over all stream flow conditions.

DEP has established the water quality objectives for phosphorus and sediment by using the reference watershed approach. This approach assumes that when the impaired watershed achieves loadings similar to the unimpaired, reference watershed, the impairment is eliminated. Reducing the current loading rates for nitrogen, phosphorus and sediment in the impaired watershed to the current loading rates in the reference watershed will result in meeting the water quality objectives.

How will the loading limits be met?
BMP's (Best Management Practices) will be installed throughout the watershed to achieve the necessary loading reductions.

How can I get more information on the TMDL?
The TMDL can be accessed through the DEP Website (http://www.dep.state.pa.us) by typing "TMDL" in the direct link field, and clicking GO. Please note that at the current time, attachments and appendices must be requested through paper mail. Persons with a disability may use the AT&T Relay Service by calling 1-800-654-5984 (TDD users) or 1-800-654-5988 (voice users) and request that the call be relayed.

To request a copy of the full report, contact Bill Brown at 717-783-2951 during the business hours of 8:00 a.m. to 4:30 p.m., Monday through Friday. One may also contact Mr. Brown by mail at the Bureau of Watershed Conservation, PA DEP, 400 Market St., Harrisburg, PA 17105 or by email at brown.bill@dep.state.ps.us.

How can I comment on the proposal?
You may provide e-mail or written comments to the above address. All comments must be received no later than February 13, 2001.

Little Chiques Watershed

Ordinance Overview for Water Quality Issues

Prepared by LandStudies, Inc 315 North Street Lititz, PA 17543

	MUNICIPALITIES				
	East Donegal Township	**Mount Joy Borough**	**Township of Mount Joy**	**Rapho Township**	**Lebanon County** West Cornwall / South Londonderry
Impervious Cover					
Streets					
Street width min.	34’	34’	30’ with curb	28’	
Required in UGB / VGB only		X			
Joint use driveways encouraged and standard agreement provided		X			
Parking Ratios					
Minimum parking for professional office (per 1,000 s.f.)	2.5	3.3	3.3	3.3	
Minimum parking for shopping centers (per 1,000 s.f.)	2.5	5 for rooms accessible to customers	5 for rooms accessible to customers & employees	5	
Minimum parking for single family (per unit)	2 Excludes garage	2 Includes garage	2 < 3 bedrooms	2	
Shared parking is encouraged		X		X	

	MUNICIPALITIES				
	East Donegal Township	**Mount Joy Borough**	**Township of Mount Joy**	**Rapho Township**	**Lebanon County** West Cornwall / South Londonderry
Parking Lots					
Minimum parking stall < 10' x 20'		X		X	
Landscape islands and landscaping required within parking lot	X	X		X	
Open Space Protection					
Resource Conservation					
Floodplain protection or district	X	X	X	X	
Steep slope protection			X		
Wetland protection	X	X		X	
Existing tree protection measures			X		
Forested land protection		X		X	
Conservation development standards			X		
Ecologically sensitive or resource conservation district	X	X			
Riparian buffers		X	X	X	X
Wildlife habitat and natural area standards	X				

	MUNICIPALITIES				
	East Donegal Township	**Mount Joy Borough**	**Township of Mount Joy**	**Rapho Township**	**Lebanon County** West Cornwall / South Londonderry
Growth Limits/ Agricultural Preservation					
Active farm preservation program	X		X	X	
TDR program			X		
UGB/VGB boundary in place	X	X	X	X	
Clean and green enrollment	X		X	X	
Agricultural security district				X	
Prime agricultural soils protection				X	
Agricultural Preservation District			X		
Adaptive re-use / infill development encouraged				X	
Sliding scale zoning				X	
Condensed housing or cluster use permitted with open space requirements			X	X	
By right				X	
Conditional or special use			X		
Public Water Supply Protection					
Wellhead or aquifer recharge area protection		X			

	MUNICIPALITIES				
	East Donegal Township	**Mount Joy Borough**	**Township of Mount Joy**	**Rapho Township**	**Lebanon County** West Cornwall / South Londonderry
Open Space Management					
Protect natural resources, historical resources, and integrate with recreational links		X			
Storm Water Management					
SWM/ BMPs encouraged		X		X	
Land Use/ Development					
Karst Geology Issues					
Hydrogeologic study				X	
Sinkhole and depression ID				X	
Sinkhole protection measures				X	
Limitations (blasting, land use, SWM basins, underground storage, tanks, manure storage, etc.)		X		X	

	MUNICIPALITIES				
	East Donegal Township	**Mount Joy Borough**	**Township of Mount Joy**	**Rapho Township**	**Lebanon County** West Cornwall / South Londonderry
Specific Water-Related Uses					
Car wash facilities required to use public sewer and water system				X	
Car wash facility required to recycle water	X	X		X	
Swimming pool disposal and filling			X		
Ornamental ponds, wading pools, lakes, dams, or impoundments standards	X	X		X	
Quarry or extractive related use standards	X	X		X	
Mushroom operations/compost		X		X	
Septage and /or solid waste disposal and processing facilities				X	
Cemeteries not permitted in floodplain, flood fringe or areas of high water	X	X		X	
Hospital and medical facilities waste disposal		X		X	
Stockyard, slaughtering and feedlots		X		X	
Intensive farming operations		X			

	MUNICIPALITIES				
	East Donegal Township	**Mount Joy Borough**	**Township of Mount Joy**	**Rapho Township**	**Lebanon County** West Cornwall / South Londonderry
Land Development Review					
Sketch Plan optional	X	X	X	X	
Natural, cultural resources inventory				X	
Private Water Use					
Private Wells					
Yield and quantity aquifer testing (quantity of water available for proposed use)				X	
Feasibility report or water supply study		X	X	X	
Sewage Disposal					
Sewage Enforcement Officer	X	X	X	X	
Lot size increased to ensure acceptable level of nitrate-nitrogen in adjacent groundwater				X	
Alternative on-lot systems permitted		X		X	
Ag Land Use					

	MUNICIPALITIES				
	East Donegal Township	**Mount Joy Borough**	**Township of Mount Joy**	**Rapho Township**	**Lebanon County** West Cornwall / South Londonderry
Agricultural Management					
PA Nutrient Management Plan recommended	X			X	
Ag Best Management Practices	X		X		

Little Chiques Creek Watershed

Water Resource-Related Ordinance Audit

Municipality: **East Donegal Township**

Contact: *Barbara Stoner*

Address: 190 Rock Point Road
Marietta, PA 17547

Phone: 717-426-3167

Ordinances Reviewed:

East Donegal Zoning Ordinance - amended through October 10, 2002

East Donegal Subdivision and Land Development Ordinance - amended through April 10, 1997

I Land Use Regulations

A <u>Zoning Ordinance</u>
Does their Zoning Ordinance have standards related to the following:

___ Condensed Housing (Cluster) with Open Space Standards
___ Special Exception

___ Agricultural Preservation Zoning District

_X__ Resource Conservation Zoning District
Sec. 501 Conservation District to establish linear park along Susquehanna River.

___ Ecologically Sensitive Zoning District

___ Conservation Development Standards

_X__ Growth Limits
(Village Growth Boundary - VGB or Urban Growth Boundary - UGB)

__ Transfer Development Rights (TDRs)

___ Riparian Buffers

_X__ Floodplain Protection
Sec 512 Floodplain District.

___ Wetland Protection

___ Tree Protection Requirements (for individual min. size trees)

___ Preservation of existing natural vegetation and wooded areas

___ Forest Stand or Woodland Protection

___ Steep Slope Protection

___ Wellhead or Aquifer Recharge Area Protection

___ Karst Geology *(check those that apply)*

- ___ Hydrogeologic Study
- ___ Sinkhole and Depression Identification
- ___ Sinkhole Protection Measures
- ___ Limitations (blasting, land use, SWM basins, underground storage tanks, manure storage, etc.)

_X__ Quarry and Extractive Related Use Standards
Sec. 937 Mineral Extraction.

___ Septage and/or Solid Waste Disposal and Processing Facilities Standards

_X__ Carwash Facilities Standards
Sec. 911 Carwash – requires recycled water and no discharge into storm sewer or water course.

___ Swimming Pool standards related to water use

_X__ Ornamental ponds, wading pools, lakes, dams or impoundments standards
Sec 946 Stream Improvements, Fish Hatcheries and Ponds – locate facility to protect natural features – floodplains, wetlands, wildlife, steep slopes >15%, etc.

___ Other:
Sec 912 Cemeteries – not allowed in floodplain.

II Land Development Regulations

Does the Subdivision and Land Development Ordinance have standards related to the following:

__X_ Sketch Plan optional _x__

___ Natural, cultural resources inventory

_X__ Environmental Impact Statements
Within Sec 510.5 Environmental Analysis and Mitigation Measures
Sec 510 Environmentally Sensitive Areas – wetland delineation, nay use in floodplain subject to DCNR approval, wildlife habitat, natural areas as ID by Township of LCPC or nature Conservancy, preserve geologic features.

___ Encourages joint parking facilities

_X__ Requires landscape islands within parking lots over a certain size
Sec 607.6 Parking Lot Interior Landscaping – 1 tree / 20 parking spaces.

___ Parking standards to minimize impervious (< 10' x 20' spaces)

__ Cartway width standards to minimize impervious (< 24' cartway)

___ Permits pervious surfacing and/or provides standards

___ Site meeting with Lancaster County Conservation District Representative

___ Guidelines for alternative native plant community establishment (reforestation, warm season grass meadows, etc. as alternative to lawns)

___ Other:

<u>Stormwater Management</u>

Does your Stormwater Management Ordinance include the following (check those that apply):

___ Encourages reduction of impervious area

___ Stormwater Management Best Management Practices (BMPs)

___ Encourages groundwater recharge

___ Recommends replicating existing drainage patterns

___ Reduction of non-point source pollution

___ Limitations for Karst Geology

___ Other

II Private Wells

___ Yield and Quantity Aquifer Testing (*suitability of the water supply for the proposed use)*

___ Water Supply Study

___ Well capping requirements or standards

___ Permitting requirements

III Sewage Disposal

_x_ Sewage Enforcement Officer

___ Lot size increased to ensure acceptable level of nitrate-nitrogen in adjacent groundwaters

__ Alternative on-lot systems permitted

Little Chiques Creek Watershed

Water Resource Related - Ordinance Audit

Municipality: **Mount Joy Borough**

Contact: Terry Kauffman

Address: 21 East Main Street Mount Joy, PA 17552

Phone: 717-643-2300

Ordinances Reviewed:

Mount Joy Zoning Ordinance - July 12, 1999

Mount Joy Borough Subdivision and Land Development Ordinance - Amended through September 14, 1992

Donegal Region Comprehensive Plan - Spring 1995

I Agricultural Lands

Check all that are considerations (either implemented or planned):

___ Clean and Green enrollment

___ Farm Preservation

___ Agricultural Security

___ PA Nutrient Management - recommend nutrient management plans

___ TDR sending areas

___ Agricultural Best Management Practice's (stream fencing, cattle crossings, etc.)

___ Protection of prime agricultural lands or soils

___ Other:

II Land Use Regulations

A Zoning Ordinance

Does their Zoning Ordinance have standards related to the following:

___ Condensed Housing (Cluster) with Open Space Standards
___ Conditional Use or ___ By-right

___ Agricultural Preservation Zoning District

_X__ Resource Conservation Zoning District

___ Ecologically Sensitive Zoning District

___ Conservation Development Standards

_x__ Growth Limits
(Village Growth Boundary - VGB or Urban Growth Boundary - UGB)

___ Transfer Development Rights (TDRs)

_x__ Riparian Buffers
Sec 326 Streamside (Riparian) Buffers - Zone 1 combination of the following 15' from streambank, 100 year floodplain, adjoining wetland, adjoining area of steep slopes > 25%. Zone 2 50' outside Zone 1, Zone 3 - 10' outside Zone 2 unless a pasture is proposed then no Zone 3.

_x__ Floodplain Protection
Sec 230 Floodplain Zone.

_x__ Wetland Protection

Sec 408 Wetland Study - requirements are listed
Sec 326 Streamside (Riparian) Buffers - wording regarding wetlands protection.

___ Tree Protection Requirements (for individual min. size trees)

___ Preservation of existing natural vegetation and wooded areas

_x__ Forest Stand or Woodland Protection
Sec 609.4 Existing Wooded Areas - 50%must be maintained that exist at the time of plan submission, replacement to meet 50%.

___ Steep Slope Protection

___ Wellhead or Aquifer Recharge Area Protection

___ Karst Geology *(check those that apply)*

___ Hyrdogeologic Study
___ Sinkhole and Depression Identification
___ Sinkhole Protection Measures
___ Limitations (blasting, land use, SWM basins, underground storage tanks, manure storage, etc.)

_x__ Quarry and Extractive Related Use Standards
Sec 447 Quarries and Other Extractive - Related Uses.

_x__ Septage and/or Solid Waste Disposal and Processing Facilities Standards
Sec 454 Septage and Solid Waster Disposal and Processing Facilities
454.18 submit real water needs (ground and surface water) from either private or public sources, indicating quantity, water feasibility study provided to evaluate the impact of the development on the groundwater supply and on existing wells.

___ Carwash Facilities Standards

___ Swimming Pool standards related to water use

_x__ Ornamental ponds, wading pools, lakes, dams or impoundments standards
Sec 302.5 Man-Made Lakes, Dams, and Impoundments - permit req. from PADEP if closer then 50' to stream, volume of > 50 acre feet, 75' setback from lot lines, subsurface sewage disposal system or well, all groundcover must be maintained.

_x__ Other:
Sec 305 Common Open Space Requirements - where required must conform with the following - protect natural resources (streams, ponds, wetlands, woodlands, aquifer recharge areas, etc.), important historical or archaeological sites, play and recreation areas, integration of greenbelts throughout the development that links with off site parks, schools, etc.

Sec 401 Adaptive Reuse of Existing Agricultural Buildings.

Sec 405 Automobile Filling Stations.

Sec 406 Automobile Service, Reconditioning and Repair Facilities.

Sec 407 Automobile Storage Compounds.

Sec 452 Mushroom Compost, and Operation of Facilities - compliance with state and fed standards and regulations, 452.9 Disposal of leachate - must comply with state and fed laws, no disposal in to storm sewer, to the ground or in any other manner inconsistent with PADEP regulations.

Sec 413 Car Washes - public sewer and water and recycling water systems are required.

Sec 414 Churches and Related Uses - permitted in A, R, R-1 and R-2 zones as special exception.

Sec 414.5 Cemeteries - assurances must be provided that water supplies of surrounding properties will not be contaminated by burial activity within the proposed cemetery, no plots within floodplain or flood fringe areas.

Sec 418 Commercial Poultry Operations - A zone permitted by special exception, 100 acres min, 10% coverage, manure management plan req., LCCD conservation plan, disposal of dead animals. 418.13 100,000 gallons of water per day max…..otherwise written evidence from the SRBC. 418.15 req. install and maintenance of streamside buffer along any watercourse that is located upon the subject property.

Sec 435.8 Hospitals - adequate provision shall be made for the collection, disposal and recycling of garbage, trash and medical and hazardous waste.

Sec 457 Stockyards.

B Subdivision and Land Development Ordinance (SLDO)

Does the Subdivision and Land Development Ordinance have standards related to the following:

_x__ Sketch Plan required _x__ optional _x__

Sec 304 Pre-Application Review (Sketch) - strongly urged to discuss with Township staff.

Sec 402 Sketch Plans - should include features of the Township's future land use plan, thoroughfares plan, community facilities plan, etc, specific site analysis, man-made and natural features, soil types, stability, wetlands, scenic vistas, water courses, drainage patterns, slope, and transportation patterns, features of site and nearby areas affected or impacted by the proposed development and land use.

Sec 213.3 Commercial Recreation Zone (CR) - Special Review Process - Concept Master Plan and Site Development Plan - physical characteristics of the site must be show including (slopes> 15%, 100 yr floodplain, alluvial soils, wetlands, sinkholes, caves, vistas or other significant geologic feature, endangered or threatened species, archaeological resources, historic sites, significant stands of mature trees) Max coverage 70%.

_x__ Natural, cultural resources inventory
Sec 206.7.1 Natural and Cultural Features Inventory - Village Overlay Zone District (over R-2 District).

___ Environmental Impact Statements

_X__ Encourages joint parking facilities
Sec 306.9 Joint Use Driveways - min. 16' wide, if serves > 1 DU, cross access easement.

_x__ Requires landscape islands within parking lots over a certain size
Sec 314.15 Landscaping and Screening Requirements.

_x__ Parking standards to minimize impervious (< 10' x 20' spaces)
Sec 314.7 Parking Space Sizes 19'x9'.

__ Cartway width standards to minimize impervious (< 24' cartway)
Sec 602.7 Cartway Width - 28' min width.

Sec 602.14 Cul-de-sacs 80' diameter paving area.

___ Permits pervious surfacing and/or provides standards

___ Site meeting with Lancaster County Conservation District Representative

___ Guidelines for alternative native plant community establishment (reforestation, warm season grass meadows, etc. as alternative to lawns)

___ Other:
Sec 301 Access Drives - # intersecting with a street may not exceed two per lot.

Sec 403.3 Existing Features - lists significant environmental or topographic features on the site.

Sec 602.12 Sidewalks - req. in UGB or VGB only.

C Stormwater Management

Does your Stormwater Management Ordinance include the following (check those that apply):

___ Encourages reduction of impervious area

_x__ Stormwater Management Best Management Practices (BMPs)
Sec 610.2.H Innovative methods for detention and control of SW run-off may be used when approved by the Township.

___ Encourages groundwater recharge

___ Recommends replicating existing drainage patterns

___ Reduction of non-point source pollution

_x__ Limitations for Karst Geology
Sec 610.2 Design Standards - SWM facilities can not occur over or adjacent to karst features, etc., SWM shall not be discharged into sinkholes.

___ Other:
Sec 610.2 Design Standards - SWM run-off shall flow directly into a natural watercourse or existing sewer system.

III Private Wells

___ Yield and Quantity Aquifer Testing (*suitability of the water supply for the proposed use)*

___ Water Supply Study
Sec 408.1 Water Service Feasibility Report - residential then groundwater recharge on the tract after development will exceed the anticipated water usage figures based on DEP standards, actual projected water usage for commercial, industrial, agricultural uses, etc.

___ Well capping requirements or standards

___ Permitting requirements

IV Sewage Disposal

_x_ Sewage Enforcement Officer

___ Lot size increased to ensure acceptable level of nitrate-nitrogen in adjacent groundwaters

_x_ Alternative on-lot systems permitted
Sec 408.2.4 Alternate or experimental on-site sewage systems must be certified by DEP, why a conventional system will not work.

Little Chiques Creek Watershed

Water Resource Related - Ordinance Audit

Municipality: **Mount Joy Township**

Contact:

Address: 159 Merts Drive
Elizabethtown, PA 17022

Phone: 717-367-8917

Ordinances Reviewed:

Township of Mount Joy Zoning Ordinance - February 2005

Township of Mount Joy Subdivision and Land Development Ordinance - 1996

I Land Use Regulations

A Zoning Ordinance
Does their Zoning Ordinance have standards related to the following:

_x__ Condensed Housing (Cluster) with Open Space Standards
_x__ Special Exception

_x__ Agricultural Preservation Zoning District

___ Resource Conservation Zoning District

___ Ecologically Sensitive Zoning District

_x__ Conservation Development Standards

___ Growth Limits
(Village Growth Boundary - VGB or Urban Growth Boundary - UGB)

_x__ Transfer Development Rights (TDRs)
section 135 – 251.

_x__ Riparian Buffers
Sec 135-194 - greater width of major drainage swales, 75' setback, 50' if conservation easement is established.

_x__ Floodplain Protection
Floodplain Conservation District.

___ Wetland Protection

_x__ Tree Protection Requirements (for individual min. size trees)
Section 119.37.

___ Preservation of existing natural vegetation and wooded areas

___ Forest Stand or Woodland Protection

_x__ Steep Slope Protection
Section 135-193 Slope Control Regulations > 20% slope if > 50% of lot is 20% slope then lot must be a min. of 40,000 s.f.

___ Wellhead or Aquifer Recharge Area Protection

___ Karst Geology *(check those that apply)*

- ___ Hyrdogeologic Study
- ___ Sinkhole and Depression Identification
- ___ Sinkhole Protection Measures
- ___ Limitations (blasting, land use, SWM basins, underground storage tanks, manure storage, etc.)

___ Quarry and Extractive Related Use Standards

___ Septage and/or Solid Waste Disposal and Processing Facilities Standards

___ Carwash Facilities Standards

_x__ Swimming Pool standards related to water use
Section 135-216

___ Ornamental ponds, wading pools, lakes, dams or impoundments standards

_x__ Other:

II Land Development Regulations

Does the Subdivision and Land Development Ordinance have standards related to the following:

_x__ Sketch Plan optional _x__

___ Natural, cultural resources inventory

___ Environmental Impact Statements

___ Encourages joint parking facilities

_x__ Requires landscape islands within parking lots over a certain size **Sec 135-171 E.**

___ Parking standards to minimize impervious (< 10' x 20' spaces)

__ Cartway width standards to minimize impervious (< 24' cartway)

___ Permits pervious surfacing and/or provides standards

___ Site meeting with Lancaster County Conservation District Representative

___ Guidelines for alternative native plant community establishment (reforestation, warm season grass meadows, etc. as alternative to lawns)

___ Other:

Stormwater Management

Does your Stormwater Management Ordinance include the following (check those that apply):

___ Encourages reduction of impervious area

___ Stormwater Management Best Management Practices (BMPs)

___ Encourages groundwater recharge

___ Recommends replicating existing drainage patterns

___ Reduction of non-point source pollution

___ Limitations for Karst Geology

___ Other:

II Private Wells

___ Yield and Quantity Aquifer Testing (*suitability of the water supply for the proposed use)*

___ Water Supply Study

___ Well capping requirements or standards

___ Permitting requirements

III Sewage Disposal

_x_ Sewage Enforcement Officer

___ Lot size increased to ensure acceptable level of nitrate-nitrogen in adjacent groundwaters

__ Alternative on-lot systems permitted

Section 119-16 Feasibility Report on Sewer and Water Facilities.

Sanitary and Sewage Disposal and Water Supply.

Little Chiques Creek Watershed

Water Resource Related - Ordinance Audit

Municipality: **Rapho Township**

Contact: Nancy Halliwell

Address: 971 Colebrook Road
Manheim, PA 17545

Phone: 717-665-3827

Ordinances Reviewed:

Rapho Township Subdivision and Land Development Ordinance - April 20, 2000

Rapho Township Zoning Ordinance - Amended October 21, 2004

Manheim Central Regional Comprehensive Plan - 2000, a Strategic Update to the Comprehensive Plan

I Agricultural Lands

Check all that are considerations (either implemented or planned):

___ Clean and Green enrollment

___ Farm Preservation

___ Agricultural Security

___ PA Nutrient Management - recommend nutrient management plans

___ TDR sending areas

___ Agricultural Best Management Practice's (stream fencing, cattle crossings, etc.)

___ Protection of prime agricultural lands or soils

___ Other:

II Land Use Regulations

A Zoning Ordinance

Does their Zoning Ordinance have standards related to the following:

___ Condensed Housing (Cluster) with Open Space Standards
___ Conditional Use or ___ By-right

_x__ Agricultural Preservation Zoning District

Sec. 201 Agricultural Zone (A) Permitted Uses - private schools, 2,000 s.f. max., >21 acres permitted to subdivide one-acre min and max 2-acre parcel, parent track can not go below 20 acres, manure storage facilities (comply with guidelines in the publication Manure Management for Environmental Protection, reviewed by LCCD). Special Exception Uses - adaptive re-use of agricultural buildings, churches, clubhouses, commercial livestock or poultry operations, golf courses, etc. Sec. 201.6 - sliding scale for max # of permitted DU.

Sec 201.10 Required Conservation Plan - requires approved conservation plan by Lancaster County Conservation District.

___ Resource Conservation Zoning District

___ Ecologically Sensitive Zoning District

___ Conservation Development Standards

___ Growth Limits
(Village Growth Boundary - VGB or Urban Growth Boundary - UGB)

___ Transfer Development Rights (TDRs)

_x__ Riparian Buffers

Sec 326 Streamside (Riparian) Buffers - Zone 1 combination of the following 15' from streambank, 100 year floodplain, adjoining wetland, adjoining area of steep slopes > 25%. Zone 2 50' outside Zone 1, Zone 3 - 10' outside Zone 2 unless a pasture is proposed then no Zone 3.

_x__ Floodplain Protection
Sec 230 Floodplain Zone.

_x__ Wetland Protection

Sec 408 Wetland Study - requirements are listed
Sec 326 Streamside (Riparian) Buffers - wording regarding wetlands protection.

___ Tree Protection Requirements (for individual min. size trees)

___ Preservation of existing natural vegetation and wooded areas

_x__ Forest Stand or Woodland Protection
Sec 609.4 Existing Wooded Areas - 50%must be maintained that exist at the time of plan submission, replacement to meet 50%.

___ Steep Slope Protection

___ Wellhead or Aquifer Recharge Area Protection

___ Karst Geology *(check those that apply)*

- ___ Hyrdogeologic Study
- ___ Sinkhole and Depression Identification
- ___ Sinkhole Protection Measures
- ___ Limitations (blasting, land use, SWM basins, underground storage tanks, manure storage, etc.)

_x__ Quarry and Extractive Related Use Standards
Sec 447 Quarries and Other Extractive - Related Uses.

_x__ Septage and/or Solid Waste Disposal and Processing Facilities Standards
Sec 454 Septage and Solid Waster Disposal and Processing Facilities
454.18 submit real water needs (ground and surface water) from either private or public sources, indicating quantity, water feasibility study provided to evaluate the impact of the development on the groundwater supply and on existing wells.

___ Carwash Facilities Standards

___ Swimming Pool standards related to water use

_x__ Ornamental ponds, wading pools, lakes, dams or impoundments standards
Sec 302.5 Man-Made Lakes, Dams, and Impoundments - permit req. from PADEP if closer then 50' to stream, volume of > 50 acre feet, 75' setback from lot lines, subsurface sewage disposal system or well, all groundcover must be maintained.

_x__ Other:
Sec 305 Common Open Space Requirements - where required must conform with the following - protect natural resources (streams, ponds, wetlands, woodlands, aquifer recharge areas, etc.), important historical or archaeological sites, play and rec areas, integration of greenbelts throughout the development that links with off site parks, schools, etc.

Sec 401 Adaptive Reuse of Existing Agricultural Buildings.

Sec 405 Automobile Filling Stations.

Sec 406 Automobile Service, Reconditioning and Repair Facilities.

Sec 407 Automobile Storage Compounds.

Sec 452 Mushroom Compost, and Operation of Facilities - compliance with state and fed standards and regulations, 452.9 Disposal of leachate - must comply with state and fed laws, no disposal in to storm sewer, to the ground or in any other manner inconsistent with PADEP regulations.

Sec 413 Car Washes - public sewer and water and recycling water systems are required.

Sec 414 Churches and Related Uses - permitted in A, R, R-1 and R-2 zones as special exception.

Sec 414.5 Cemeteries - assurances must be provided that water supplies of surrounding properties will not be contaminated by burial activity within the proposed cemetery, no plots within floodplain or flood fringe areas.

Sec 418 Commercial Poultry Operations - A zone permitted by special exception, 100 acres min, 10% coverage, manure management plan req., LCCD conservation plan, disposal of dead animals, 418.13 100,000 gallons of water per day max…..otherwise written evidence from the SRBC. 418.15 req. install and maintenance of streamside buffer along any watercourse that is located upon the subject property.

Sec 435.8 Hospitals - adequate provision shall be made for the collection, disposal and recycling of garbage, trash and medical and hazardous waste.

Sec 457 Stockyards.

B Subdivision and Land Development Ordinance (SLDO)

Does the Subdivision and Land Development Ordinance have standards related to the following:

_x__ Sketch Plan required _x__ optional _x__

Sec 304 Pre-Application Review (Sketch) - strongly urged to discuss with Township staff.

Sec 402 Sketch Plans - should include features of the Township's future land use plan, thoroughfares plan, community facilities plan, etc, specific site analysis, man-made and natural features, soil types, stability, wetlands, scenic vistas, water courses, drainage patterns, slope, and transportation patterns, features of site and nearby areas affected or impacted by the proposed development and land use.

Sec 213.3 Commercial Recreation Zone (CR) - Special Review Process - Concept Master Plan and Site Development Plan - physical characteristics of the site must be show including (slopes> 15%, 100 yr floodplain, alluvial soils, wetlands, sinkholes, caves, vistas or other significant geologic feature, endangered or threatened species, archaeological resources, historic sites, significant stands of mature trees) Max coverage 70%.

_x__ Natural, cultural resources inventory
Sec 206.7.1 Natural and Cultural Features Inventory - Village Overlay Zone District (over R-2 District).

___ Environmental Impact Statements

_X__ Encourages joint parking facilities
Sec 306.9 Joint Use Driveways - min 16' wide, if serves > 1 DU, cross access easement.

_x__ Requires landscape islands within parking lots over a certain size
Sec 314.15 Landscaping and Screening Requirements.

_x__ Parking standards to minimize impervious (< 10' x 20' spaces)
Sec 314.7 Parking Space Sizes 19'x9'.

__ Cartway width standards to minimize impervious (< 24' cartway)
Sec 602.7 Cartway Width - 28' min width.

Sec 602.14 Cul-de-sacs 80' dia paving area.

___ Permits pervious surfacing and/or provides standards

___ Site meeting with Lancaster County Conservation District Representative

___ Guidelines for alternative native plant community establishment (reforestation, warm season grass meadows, etc. as alternative to lawns)

___ Other:
Sec 301 Access Drives - # intersecting with a street may not exceed two per lot.

Sec 403.3 Existing Features - lists significant environmental or topographic features on the site.

Sec 602.12 Sidewalks - req. in UGB or VGB only.

C <u>Stormwater Management</u>
Does your Stormwater Management Ordinance include the following (check those that apply):

___ Encourages reduction of impervious area

_x__ Stormwater Management Best Management Practices (BMPs)
Sec 610.2.H Innovative methods for detention and control of stormwater run-off may be used when approved by the Township.

___ Encourages groundwater recharge

___ Recommends replicating existing drainage patterns

___ Reduction of non-point source pollution

_x__ Limitations for Karst Geology
Sec 610.2 Design Standards - Stormwater management facilities can not occur over or adjacent to karst features, etc., SWM shall not be discharged into sinkholes.

___ Other:
Sec 610.2 Design Standards - SWM run-off shall flow directly into a natural watercourse or existing sewer system.

III Private Wells

___ Yield and Quantity Aquifer Testing (*suitability of the water supply for the proposed use)*

___ Water Supply Study
Sec 408.1 Water Service Feasibility Report - residential then groundwater recharge on the tract after development will exceed the anticipated water usage figures based on DEP standards, actual projected water usage for commercial, industrial, agricultural uses, etc.

___ Well capping requirements or standards

___ Permitting requirements

IV Sewage Disposal

_x_ Sewage Enforcement Officer

___ Lot size increased to ensure acceptable level of nitrate-nitrogen in adjacent groundwaters

_x_ Alternative on-lot systems permitted
Sec 408.2.4 Alternate or experimental on-site sewage systems must be certified by DEP, why a conventional system will not work.

KEY PERSON INTERVIEW QUESTIONS

GROUPS:
Municipal (5)
Agricultural/Large Landowner (4)
Business/Industry (3)
Education (3)

Little Chiques Creek Watershed Conservation Plan
A tool for long-term planning

Goals
1. Meet environmental standards set by the Commonwealth
2. Protect the interests of landowners
3. Meet the recreation needs of the general public

We're also, within those contexts, looking at ecological and historical protection, and education.

1. ENVIRONMENTAL (two questions)

What are the top three environmental priorities in your municipality?

Narrowing it down to water resources – what issues are most important in your municipality?

You might want to think about…

Quantity:
Flooding (where, how often, how damaging)
Drinking Water Supplies

Quality:
Water-based Recreation (boating, fishing, swimming)
Drinking Water Supplies

Accessibility:
Public Access
Recreational Opportunities

2. LANDOWNER INTERESTS (1 question)

What do you think the specific interests of landowners are when it comes to developing a watershed-based conservation plan that looks at environmental and recreational issues and opportunities?

In other words…
What will they care about?
What will they be most concerned about?

2. RECREATIONAL (two questions)

What do you like about the recreational opportunities in your municipality?

What is lacking?

GROUP SPECIFIC QUESTION
Municipal
Education

To what extent are the municipalities and the school district working together on planning for recreational and outdoor educational facilities?

- **There should be more cooperation.**
- **There is enough cooperation.**
- **Municipalities should work more independently.**

If there were more cooperation / more independence in planning for and creating opportunities for public recreation, what would be different?

GROUP SPECIFIC QUESTION
Education

Can you name one or two sites that would provide good opportunities to create environmental education facilities? How could the work and money needed to create those sites be raised?

GROUP SPECIFIC QUESTION
Municipal
Agriculture/Large Landowner

During the process of creating a long-term watershed-based conservation plan that addresses both environmental and recreational issues, how can private property owners' interests best be acknowledged and protected?

GROUP SPECIFIC QUESTION
Business/Industry

Let's imagine that your municipality wants the citizenry to contribute to improving or correcting environmental problems by, for example, changing behaviors, approving a bond issue to buy public green space, helping clean up dumping sites, helping plant trees and other plants, contributing money to a tree/shrub/plant fund. What would be the best way to motivate people to become involved?

GROUP SPECIFIC QUESTION
Business/Industry

How would a watershed-based conservation plan in your municipality contribute to the health and welfare of your business?

We invite you to participate in this LANDOWNER SURVEY for the Little Chiques Creek Watershed Conservation Plan

The Steering Committee of the Little Chiques Creek Watershed Conservation Plan has sent you this brief questionnaire because you own land adjacent to either the main stem or a tributary of the Little Chiques Creek. We hope you will take a few minutes to fill out the questionnaire and return it to us in the envelope we've provided. Before you begin, here is some background on the Conservation Plan and why your participation is so important.

To help with long-term planning AND protect natural resources in the community, the Mount Borough Water Authority, Mount Joy Borough, Rapho Township, and East Donegal Township are working together to create a Conservation Plan to improve long-term water quality, provide community access for recreation, respect landowner rights, and preserve the scenic qualities of the Little Chiques Creek and its tributaries. Because your land is adjacent to one of the streams in the Little Chiques Creek Watershed, your opinion about the future use and protection of these streams is extremely important.

We ask you to answer the questions in the enclosed questionnaire and return it in the envelope provided before **Tuesday, August 31st**. Your answers will help us plan for the future of our area's water resources and how we use them.

We will discuss the results of this Landowner Survey at a Public Meeting on Thursday evening, November 18, when the information that will be used to create a Conservation Plan will be presented. Current information about opportunities for public participation in the Little Chiques Creek Watershed Conservation Plan is available on-line at www.littlechiqueswatershed.com, or you can call Dale Floyd, 653-8124, or Sandy Christian, 653-2622.

- ***IMPORTANT NOTE!*** You may submit your completed landowner survey questionnaire anonymously. However, if you include your name, address, and phone number at the end of the questionnaire, you will be entered into a drawing to win one of four $20 gift certificates from these local merchants: Bube's, Café Coffee, Gus's Keystone Family Restaurant, and Moseby's.

THANK YOU FOR PARTICIPATING!

LANDOWNER SURVEY QUESTIONNAIRE

Little Chiques Creek Watershed Conservation Plan

August 2004

The Steering Committee wants your opinion about three different matters:

1. The use of Best Management Practices (BMPs) on lands that lie along the waterways in the Little Chiques Creek watershed;
2. Preserving historic resources that lie along the Little Chiques Creek Watershed stream corridors; and
3. Dedicating land along the Little Chiques Creek and its tributaries for public recreation such as hiking, birding, or picnicking; for greenways; or for wetland, floodplain, and stream restoration projects.

Instructions for Completing the Survey Questionnaire

Answer each question below by checking the box that most nearly reflects your answer or opinion. Feel free to add additional comments in the spaces provided.

3. In which municipality do you live?

- ❑ Mount Joy Borough
- ❑ Mount Joy Township
- ❑ Rapho Township
- ❑ East Donegal Township

4. How many people live in your household? _____

5. How many people in your household are under the age of 18? _____

6. In which age range do YOU fall?

- 18-25
- 26-35
- 36-50
- 51-65
- Over 65

7. Is your land actively farmed?

- Yes
- No

If you answered "Yes" to question 5, please answer question 6. If you answered "No" to question 5, please skip to question 7.

6. Do you use agricultural Best Management Practices (BMPs) on your farm?

- Yes
- No

If you answered "Yes," which BMPs do you practice?

- Manure storage
- Streambank Fencing
- Vegetated stream buffers
- Stabilized, limited-access cattle crossings across the stream
- Other (please explain)

7. **Whether or not your land is farmed, and whether or not you already use Best Management Practices on your land, please rate your level of interest in using BMPs, such as the planting of vegetated, streamside (riparian) buffers, or reduction in the use of chemical fertilizers on lawns.**

   - ❑ Extremely interested
   - ❑ Somewhat interested
   - ❑ Not very interested
   - ❑ Not at all interested

   Use this space if you want to add a few words of explanation for your answer to this question:

   _____

   _____

   _____

   _____

   _____

   _____

8. **Are you aware of any historic structures or other historic resources along the Little Chiques Creek or one of its tributaries on or near your land?**

   - ❑ Yes
   - ❑ No

   If you checked "Yes," please tell us what those resources are:

   _____

   _____

   _____

   _____

9. **How important is it to you that your municipality commit time, effort, and possibly money to protecting historical resources along the Little Chiques Creek and its tributaries?**

- ❑ Extremely important
- ❑ Somewhat important
- ❑ Not very important
- ❑ Not at all important

10. **Would you be willing to consider dedicating a small portion of your land along the Little Chiques Creek or one of its tributaries for passive recreation, a greenway, or a restoration project?**

- ❑ Yes
- ❑ No

If you checked "Yes," please indicate the specific activities for which you would be willing to consider dedicating a small portion of your land:

- ❑ Recreation (You may check as many of the individual recreational activities listed here as you want.)
  - o Walking/Hiking
  - o Birdwatching
  - o Fishing
  - o Picnicking
  - o Bicycling
  - o Horseback Riding
  - o Snowmobiling
  - o Cross-Country Skiing
  - o Other (please specify) _____
- ❑ Stream Corridor and Floodplain Restoration
- ❑ Invasive Plants Control
- ❑ Native Tree and Shrub Planting
- ❑ Native Wetland Plants Installation
- ❑ Historic Preservation
- ❑ Environmental Education – Self-guided Tours
- ❑ Environmental Education – School-related Activities
- ❑ Other (please specify): _____

11. Please circle ONE of the numbers in each box to tell us how important each of the following items is in helping to protect and preserve our community's stream corridor resources AND our quality of life.

1 = Not Very Important 2 = Somewhat Important 3 = Very Important

ITEM	IMPORTANCE low → high		
Improve the quality of water in streams	1	2	3
Protect farmland/open space from development	1	2	3
Preserve wildlife habitat	1	2	3
Promote increased use of agricultural best management practices	1	2	3
Encourage streamside recreational and educational opportunities	1	2	3
Protect the quality of drinking water	1	2	3
Prepare long-range plans to help guide future community growth	1	2	3
Using zoning to guide the ***quality*** of development	1	2	3
Strengthen cooperation and planning among neighboring municipalities and school districts	1	2	3

12. Do you have any other comments or suggestions you'd like to add?

_____

_____

_____

_____

_____

_____

PLEASE PRINT:

Name: _____

Address: _____

City, State, ZIP: _____

Phone: _____

Thank you for completing this questionnaire. Your opinions are important to us, and your answers and comments will be given serious consideration as we begin to create a long-range Conservation Plan that will benefit the communities within the Little Chiques Creek Watershed.

Remember to check our website – www.littlechiqueswatershed.com.
Information about the Conservation Plan
and the dates, times, and places of all meetings will be listed there.

Sincerely,

The Little Chiques Creek Watershed Conservation Plan Steering Committee

Bill Achor	Nancy Halliwell	Maggie Methlie
Sandy Christian	Terry Kauffman	Barbara Stoner
Allan Esbenshade	Ron Kennedy	Jere Swarr
Kenneth Gainer	Matt Kofroth	Jim Zuch
Roger Garber		

Considerations for Amendments to Floodplain Regulations

The following amendments to allow stream and floodplain restoration activities as permitted uses in floodplains are important because of the multiple benefits derived from stream and floodplain restoration activities, including: flood conveyance and reduction, wetland creation, groundwater recharge, sediment and nutrient reduction in waterways, stormwater management, stabilized riparian buffer establishment and invasive species removal, riparian and in-stream wildlife habitat improvement, topsoil generation, and aesthetic enhancement.

Permitted Uses

Stream restoration work, including, but not limited to: efforts to control erosion and sedimentation; floodplain management techniques; efforts to promote groundwater recharge; efforts to lower flood stages; efforts to reduce nutrient loads; and the placement of in-stream habitat structures to improve fisheries habitat

The following uses are permitted when incorporated into design plans. These plans and associated uses shall be subject to approval by the Commission. The plan shall demonstrate that the proposed uses: do not increase the height or frequency of floodplain water; are installed so as to withstand the maximum volume, velocity, and force of floodplain water; are flood- and floatation-proof; do not create unhealthy or unsanitary conditions; and do not degrade the quality of surface water, or the quality of groundwater.

1 Groundwater recharge and/or nutrient reduction facilities
2 Ponds and created wetlands
3 Flood-proofing and flood hazard reduction measures / structures to protect existing buildings or other existing infrastructure
4 Public and private utility facilities, except buildings
5 Water oriented uses (excluding buildings), e.g. docks, piers, boat launching ramps, hatcheries
6 Water monitoring devices
7 Culverts, bridges, and their approaches for floodplain crossings by streets, access drives and driveways

Prohibited uses

Sanitary landfills, dumps, junk and salvage yards, and outdoor storage of vehicles and/or materials, except those materials necessary for the completion of stream restoration work provided for in this Section.

LandStudies

Design and Performance Standards

Prior to any proposed stream restoration work, a Water Obstruction & Encroachment Permit, if required, shall be obtained from the Pennsylvania Department of Environmental Protection, Water Management Program, and authorization, if required, shall be gained from the U.S. Army Corp of Engineers.

Application Procedures

Within the Floodplain Zone, a zoning permit shall be required for any proposed development, construction, reconstruction, placement, replacement, renovation, extension, repair or other improvements of uses or structures, including placement of mobile homes, and activities such as mining, dredging, filling, grading, paving or drilling operations, but excepting any proposed stream restoration work permitted, if required, by a Water Obstruction & Encroachment Permit issued by the Pennsylvania Department of Environmental Protection, Water Management Program, and authorized, if required, by the U.S. Army Corps of Engineers. Application for a zoning permit shall be filed with the Zoning Officer who shall make an initial determination on the application.