

EXECUTIVE SUMMARY
**Little Chiques Creek Watershed
Rivers Conservation Plan**



Prepared for
The Mount Joy Borough Authority

by



and



October 2005



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.

EXECUTIVE SUMMARY

Little Chiques Creek Watershed 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

Little Chiques Creek Watershed Rivers Conservation Plan

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.

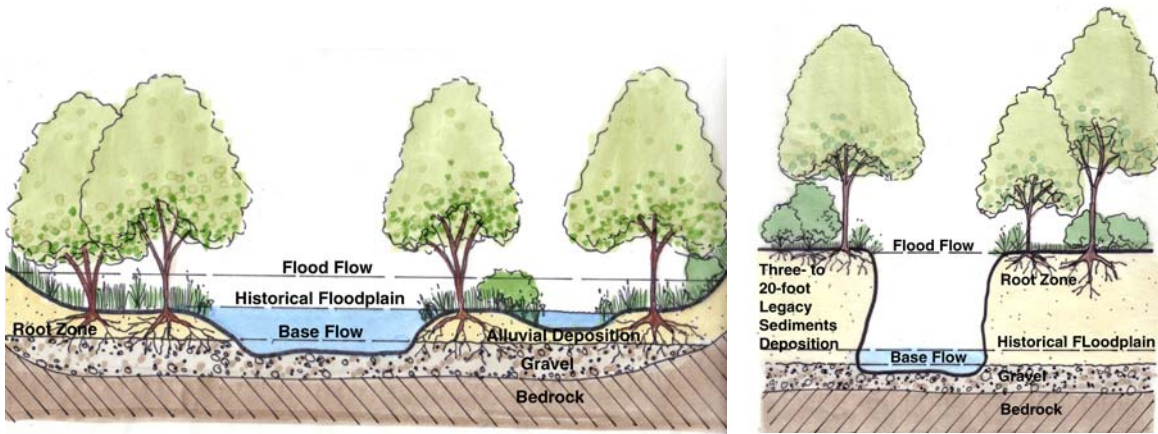
Shallow, meandering stream channels, connected floodplains, porous floodplain materials, and wetland plants and root systems – all functioned interactively with groundwater, and the entire system stored, filtered, and infiltrated high flows from the channel and surface flows from higher elevations. This 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.

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.

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.

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

Malfunctioning Septic Systems
Sinkhole Potential
Groundwater Contamination
Increase in Sinkhole Activity
Loss of Prime Agricultural Soils

Opportunities

Natural Features Discourage Development
Projected Growth Areas
Existing Corridors
Water Supply

► 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

Stream Instability
Encroachments
Water Quality
Increased Impervious Cover
Reduced Area for Flooding
Thermal Pollution
Increased Water Demand
Hazardous Waste
Combined Sewer Overflows
Loss of Critical Aquifer Recharge Areas

Opportunities

Stream and Floodplain Restoration
Stormwater Management BMPs
Public Education
Protected Corridor in Urban Setting

► 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
Invasive Plants
Intensive Farming Practices
Lack of Trails

Opportunities

Riparian Corridors Exist
Parks and Recreation Uses Relate to
Natural Areas
Public and Private Opportunities

► 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

Impervious Cover
Open Space Protection
Public Water Supply
Stormwater Management
Karst Geology Issues
Natural Resource Protection
Sewer and Water
Sprawl

Opportunities

Parking
Resource Conservation
Farmland Preservation
Agricultural Management
Wellhead Protection
Land Development Review
Water Supply Feasibility

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

**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.

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.

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).