

## IMPAIRED STREAM SEGMENTS

It is necessary to understand the meaning of “impaired” in order to appreciate the remainder of this report writing. Impaired, in the context of discussing water quality and stream health, refers to a less than desirable state of water chemistry and aquatic habitat condition in a particular section or length of stream, or possibly an entire stream. By proclaiming a section of stream impaired, one is stating that the water chemistry and/or habitat conditions are not ideal for promoting the health and well-being of the aquatic life, terrestrial animals and/or humans that in some way, shape or form interact and depend on the water resource.

In the case of aquatic life, species diversity will change and adjust with the present stream condition. In its pristine condition (before impact by man or otherwise), a stream will support a certain aquatic community consisting of both pollution tolerant and intolerant macroinvertebrate and fish species populations. In a pristine condition, there is the right mix and balance of these aquatic organisms; every fish and bug performing its natural function and the stream’s habitat in turn successfully supporting and sustaining its aquatic life.

But this natural balancing act can be “knocked off balance” by outside impacts not commonly known to the stream and beyond the stream’s ability to absorb. At some point, this outside influence becomes too much, too fast and too long a persisting condition that the stream is altered to the point the change brings about a chemical or physical condition beyond the tolerance range of certain aquatic life. The stream’s habitat is no longer suitable for a particular species and so it vanishes. What was once present, no longer exists. An impact has occurred, thus the stream is now impaired (at least to a certain degree).

However, this matter of stating that a stream is impaired can be rather subjective because of the value placed upon various stream aspects or elements differ from person to person. In reality, man has somehow impacted every stream in Pennsylvania. Air pollution and the resulting acid rain, along with dam construction, land development, agriculture, timber harvesting, mining and other modern day landuses have occurred in every corner of the Keystone State. The environmental community would readily admit every stream has been or is impacted by man to a certain degree, but it would not automatically state that every stream is impaired.

Therefore considering all the above, it becomes necessary to establish threshold limits or some basis on which to judge stream health. The federal Clean Water Act (CWA) forms the basis for most of the water pollution control programs in the United States. The CWA requires that every state monitor surface water quality (which includes streams). Pennsylvania’s program for monitoring surface waters is known as Pennsylvania’s “Surface Waters Assessment Program” (SWAP).

The SWAP assessment process first involves having a qualified biologist perform reconnaissance of the subject stream and watershed, looking particularly at land cover,

landuses, abandoned mine drainages and known point discharges such as sewer treatment plants. This reconnaissance allows the biologist the opportunity to see the watershed and stream first hand and helps them understand the watershed complexities. The biologist then takes a closer look at the stream's biological and physical condition at strategically selected locations determined during the reconnaissance process.

Pennsylvania's in-stream biological assessments are mirrored after the US Environmental Protection Agency's "rapid bioassessment protocols" (the same protocols RETTEW biologists used during this very study). The biologist collects and identifies aquatic macroinvertebrates (aquatic insects, worms, snails and such) to the taxonomic "family" level. The sampling protocols include the usage of assigned pollution tolerance values for the various collected organisms. Conclusions as to the stream's health can then be derived when taking into account the various collected organisms, their relative abundances and their tolerance ratings. A stream with an over abundance of pollution tolerant species and a lack of pollution intolerant species is considered impaired. Streams of the same stream type and of known unimpaired quality are used as a reference for comparison purposes. The reference stream is in fact the yardstick used in measuring the subject stream.

At the same time, the biologist completes a habitat evaluation that considers the physical condition of the stream and riparian corridor. Such things as substrate composition, streambank erosion, water depth, sediment deposition, available in-stream cover for fish, vegetative cover and riparian buffer zones are considered.

Ultimately a decision is made as to whether the subject stream is impaired or not and for what reasons – biological and/or physical habitat shortcomings. Pennsylvania is then required, through the CWA, to list such impaired streams or stream segments. This listing is commonly referred to as the "303(d) List of Impaired Waters"; named so because of section 303(d) of the CWA that requires such a listing be prepared and maintained.



Currently, the Little Conestoga Creek Watershed contains forty different stream segments totaling over 53 miles listed as being impaired. The impairments exist in all six sub-watersheds.

**LITTLE CONESTOGA CREEK WATERSHED – 303(d) LISTED IMPAIRMENTS**

SUB-WATERSHED	DRAINAGE AREA (Square Miles)	MILES IMPAIRED	SOURCE/CAUSE OF IMPAIRMENT
Brubaker Run	2.879	2.92	Nutrients and siltation from agricultural related grazing – urban runoff and stormwater impacts
Indian Run	3.206	2.36	Nutrients and siltation from agricultural related crops
Millers Run	1.236	1.94	Nutrients and siltation from agricultural related grazing and crops – urban runoff and stormwater impacts
Swarr Run (and unnamed tributaries)	8.88	7.90	Nutrients and siltation from agricultural related grazing and crops – urban runoff and stormwater impacts
West Branch	12.310	2.45 main stem and 1.97 for one unnamed tributary	Nutrients and siltation from agricultural related grazing and crops
Main Stem (and unnamed tributaries)	65.5	18.11 main stem and 16.01 for 12 unnamed tributaries	Nutrients and siltation from agricultural related grazing – urban runoff and stormwater impacts

Findings from RETTEW field investigations concur and support the Pennsylvania Department of Environmental Protection’s 303(d) listing shown above. In addition, RETTEW biologists believe the two following stream segments should also be considered impaired.

**Bachman Run –(A tributary to the Main Stem)**

The entire tributary should be considered impaired beginning at its confluence with the Main Stem located northeast of East Petersburg Borough just south of Graystone Road (Rte. 722) and continuing upstream to Waters Edge Road and West Woods Drive southwest of Lititz Borough. The lower reaches of Bachman Run are residentially developed, while the upper reaches are mostly in agricultural production. Rohrer’s Quarry (a limestone quarry) is also located in the headwaters of Bachman Run. Nutrients and siltation from agricultural related crop production and flashy stormwater/flooding events resulting from land development leading to accelerated streambank erosion and mass wasting of soils are obvious detrimental impacts. Rohrer’s Quarry is also a concern. The

quarry is in the midst of restructuring the way in which they deal with water seepage into the quarry pit. They currently pump accumulated water from the pit, through a sediment basin, and into the Bachman Run headwaters. This “on again – off again” water supply is of sufficient volume to dramatically alter the baseflow within the stream. Planned upgrades including enlarging the sediment basin, which in turn should allow for a more consistent flow of water to the stream over a 24-hour period.

### **West Branch**

Currently the Pennsylvania Department of Environmental Protection considers the West Branch impaired beginning just downstream of Blue Rock Road (Rte. 999) upstream to Rohrer Road just south of Mountville. RETTEW would contend that the impaired status should continue upstream and downstream, thus including the entire West Branch Sub-watershed.

In addition to maintaining the 303(d) List of Impaired Waters, the Pennsylvania Department of Environmental Protection is also responsible for establishing and maintaining water uses for each stream within the Commonwealth. These water uses are listed in the Pennsylvania Code, Title 25 Environmental Protection, Chapter 93 Water Quality Standards. The Department is to consider each stream and assign various “protected water uses”, the purpose of which is to make sure a stream receives adequate protection so that its offered water use is preserved and maintained. For example, a stream may serve as a migratory route for anadromous fish like American shad. In this case, the water use “MF” standing for “Migratory Fishes” would be assigned thus assuring this attribute of the stream is protected when various encroachment activities (such as a bridge, dam, dike, levee) are proposed for construction.

The following protected water uses are applicable and assigned to various stream segments and tributaries within the Little Conestoga Creek Watershed. The listing is ordered beginning at the headwaters of the Little Conestoga Creek and continuing downstream to the confluence with the Conestoga River.

### **Little Conestoga Creek (Main Stem)**

Beginning in the headwaters downstream to the confluence with Swarr Run  
**TSF** – Trout Stocking – Maintenance of stocked trout from February 15 to July 31 and maintenance and propagation of fish species and additional flora and fauna which are indigenous to a warm water habitat.

### **Swarr Run**

**TSF** – Trout Stocking – Maintenance of stocked trout from February 15 to July 31 and maintenance and propagation of fish species and additional flora and fauna which are indigenous to a warm water habitat.

### **All Unnamed Tributaries to Swarr Run**



**CWF** – Cold Water Fishes – Maintenance and/or propagation of fish species including the family Salmonidae (trout and salmon) and additional flora and fauna which are indigenous to a cold water habitat.

**Millers Run**

**CWF** – Cold Water Fishes – Maintenance and/or propagation of fish species including the family Salmonidae (trout and salmon) and additional flora and fauna which are indigenous to a cold water habitat.

**Little Conestoga Creek (Main Stem)**

Between the Swarr Run confluence and the West Branch confluence.

**WWF** – Warm Water Fishes – Maintenance and propagation of fish species and additional flora and fauna which are indigenous to a warm water habitat.

**West Branch**

**TSF** – Trout Stocking – Maintenance of stocked trout from February 15 to July 31 and maintenance and propagation of fish species and additional flora and fauna which are indigenous to a warm water habitat.

**Little Conestoga Creek (Main Stem)**

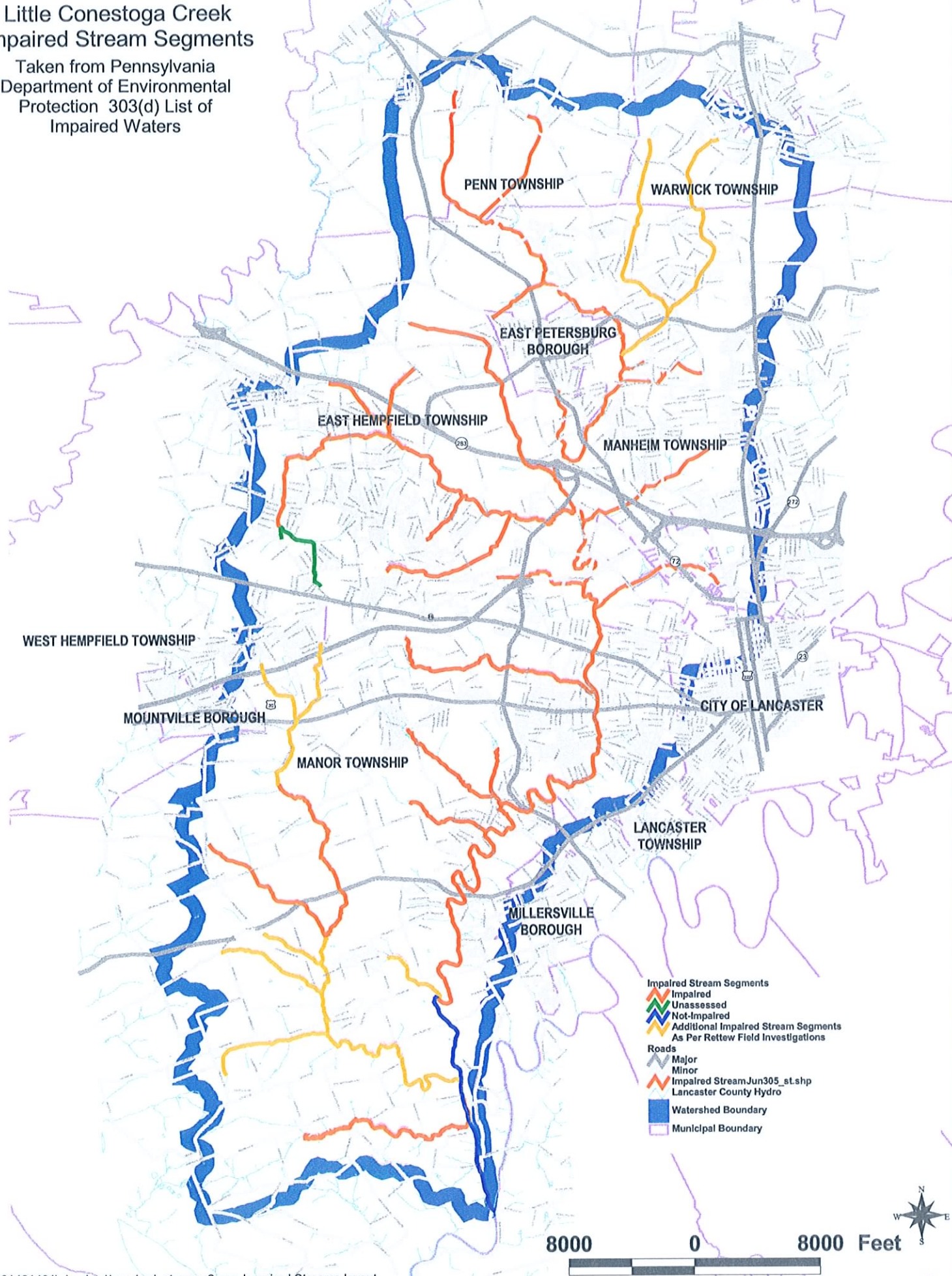
Between the West Branch confluence and the Conestoga River confluence.

**WWF** – Warm Water Fishes – Maintenance and propagation of fish species and additional flora and fauna which are indigenous to a warm water habitat.

Findings from RETTEW field investigations revealed some of the stream segment protected water uses listed above are not being adequately maintained and protected. Specifically, all unnamed tributaries to Swarr Run and Millers Run are listed as being CWF Cold Water Fishes. However habitat conditions are far from being that of supporting the maintenance and/or propagation of fish species including the family Salmonidae (trout and salmon) and additional cold water flora and fauna. The Millers Run sub-watershed consists mainly of residential landuse/land cover. The stream suffers from urban runoff and flashy uncontrolled stormwater flooding events – likewise with the unnamed tributaries to Swarr Run. The 303(d) Listing of Impaired Waters lists these same waters as being impaired; thus there is a conflict between what the streams actually are and what they are supposedly protected as being.

# Little Conestoga Creek Impaired Stream Segments

Taken from Pennsylvania Department of Environmental Protection 303(d) List of Impaired Waters





# SOURCES AND CAUSES OF IMPAIRMENT

The preceding chapter defined what is meant by the term “impairment” in regards to this writing. This chapter focuses on the sources and causes of impairment within the Little Conestoga Creek Watershed.

In the environmental and biological fields of study, sources and causes of pollution (leading to impairment) are typically categorized into two broadly defined categories:

- Point Source Pollution
- Non-point Source Pollution

The terms “point source pollution and non-point source pollution” refer not to a specific polluting substance or practice, but rather describe the means by which it is introduced. By using the term “point source pollution”, one is simply referring to any number of pollutants that can be traced back to one location of introduction, such as a pipe or a ditch. Raw sewage piped to a stream could be broadly referred to as point source pollution.

“Non-point source pollution” refers to any number of pollutants that are washed from the land surface – there being no one specific point of discharge. Non-point source pollution includes air pollution and harmful runoff containing any number of substances generated by any number of landuses.

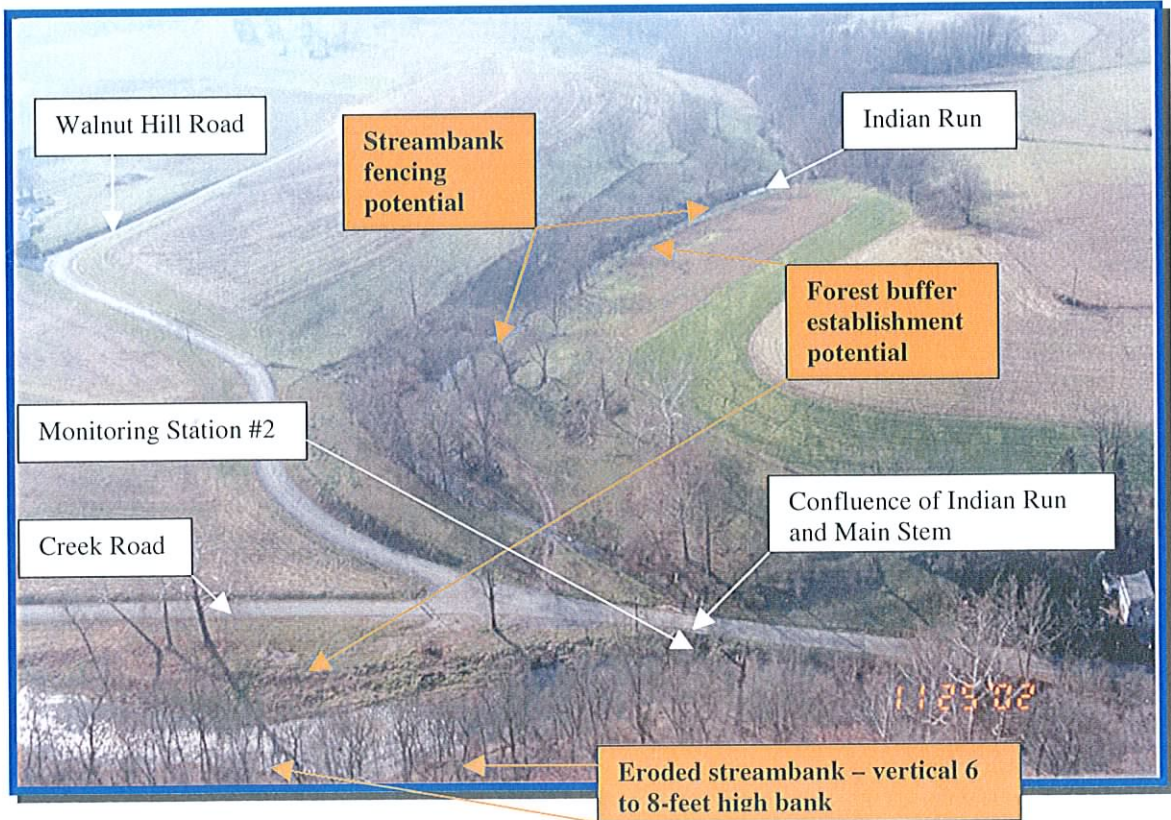
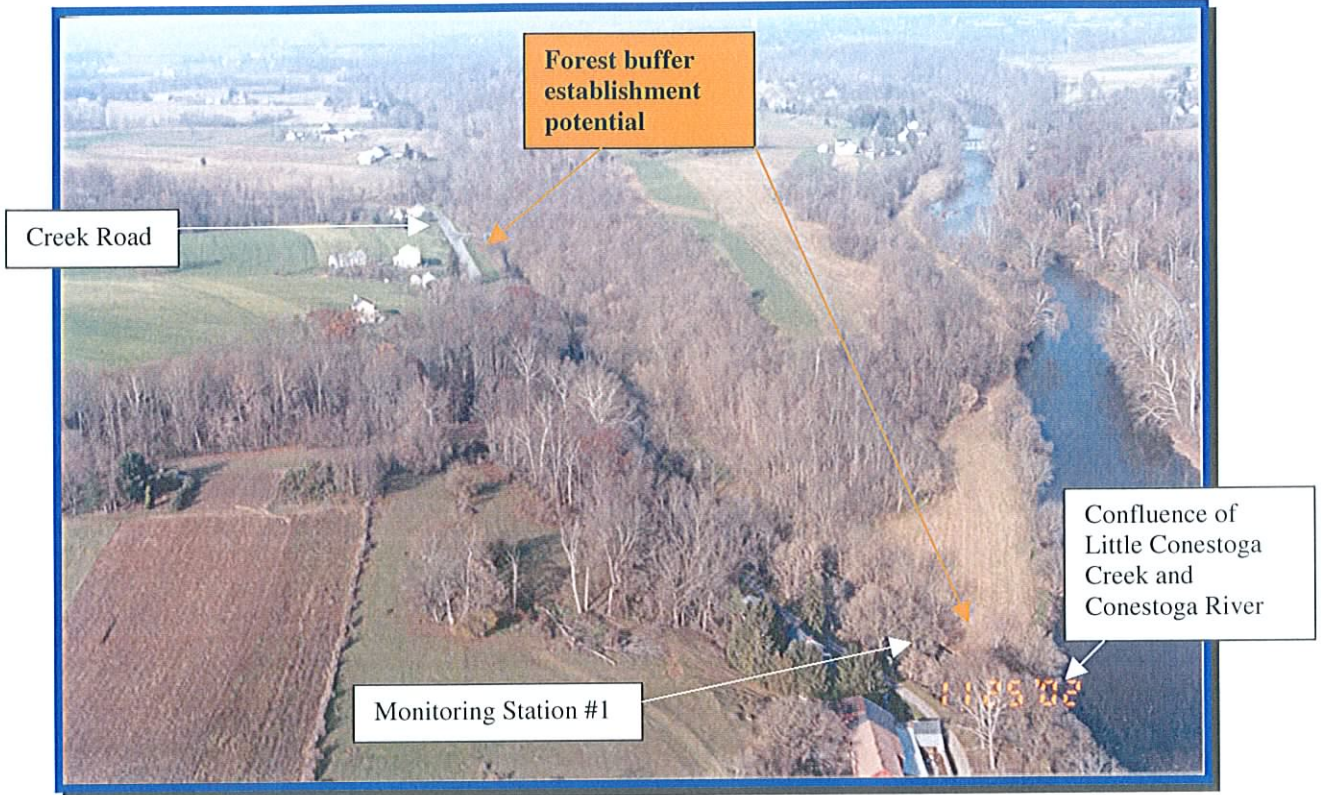
The removal of vital habitat components is also a cause of impairment. The destruction of forested riparian corridors for example can lead to impairment.

The remainder of this chapter includes aerial photographs taken by RETTEW via helicopter at an altitude ranging from 300 to 500-feet. The photographs are captioned and arranged in sub-watershed order for easy understanding and comparison with the other chapters of this writing.

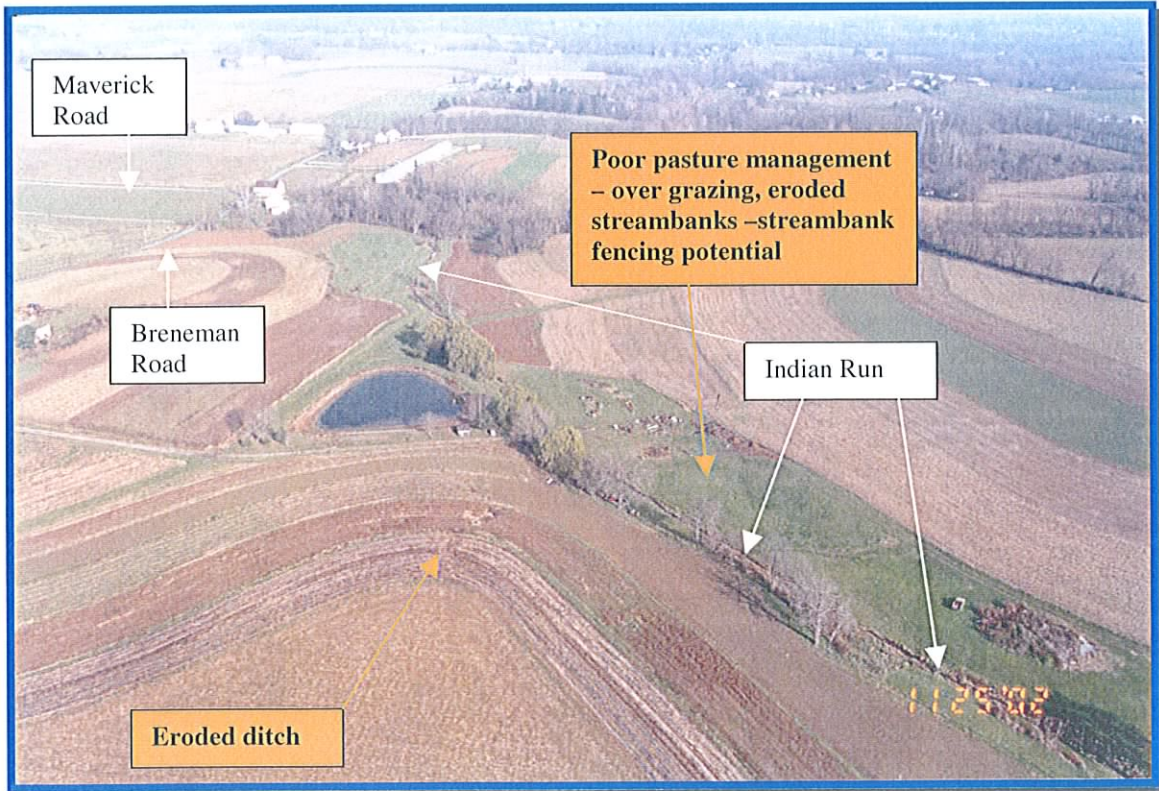
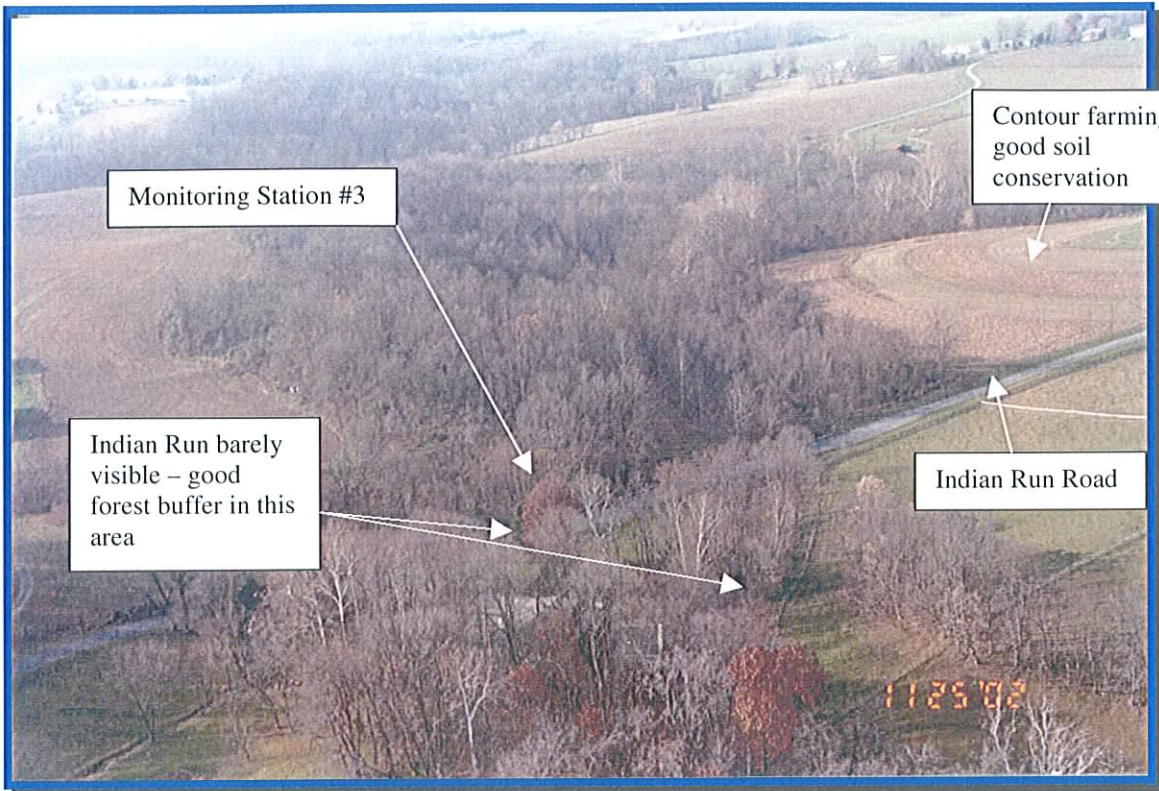
Additionally, RETTEW has provided a CD containing all collected aerial video footage. “Quicktime” 6.0 or higher is required for viewing. The CD too is organized more or less in sub-watershed fashion. A particular stream segment can be viewed by double-clicking the chosen segment on the menu listing.

By viewing the aerial video footage and looking at the enclosed pictures, one can begin to develop a good understanding of the various landuses within the watershed and the various point and non-point pollution sources leading to impairment. Such information when coupled with actual field reconnaissance is invaluable in the development of a restoration plan and restoration strategy.

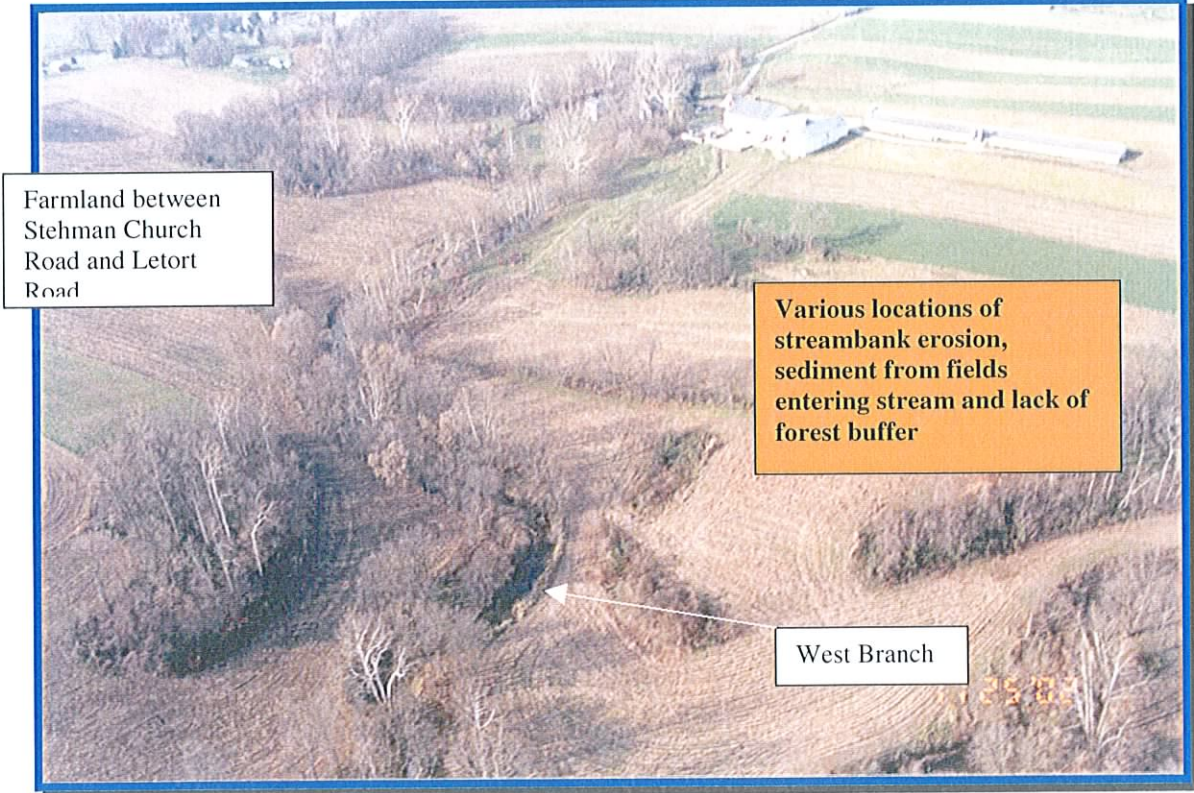
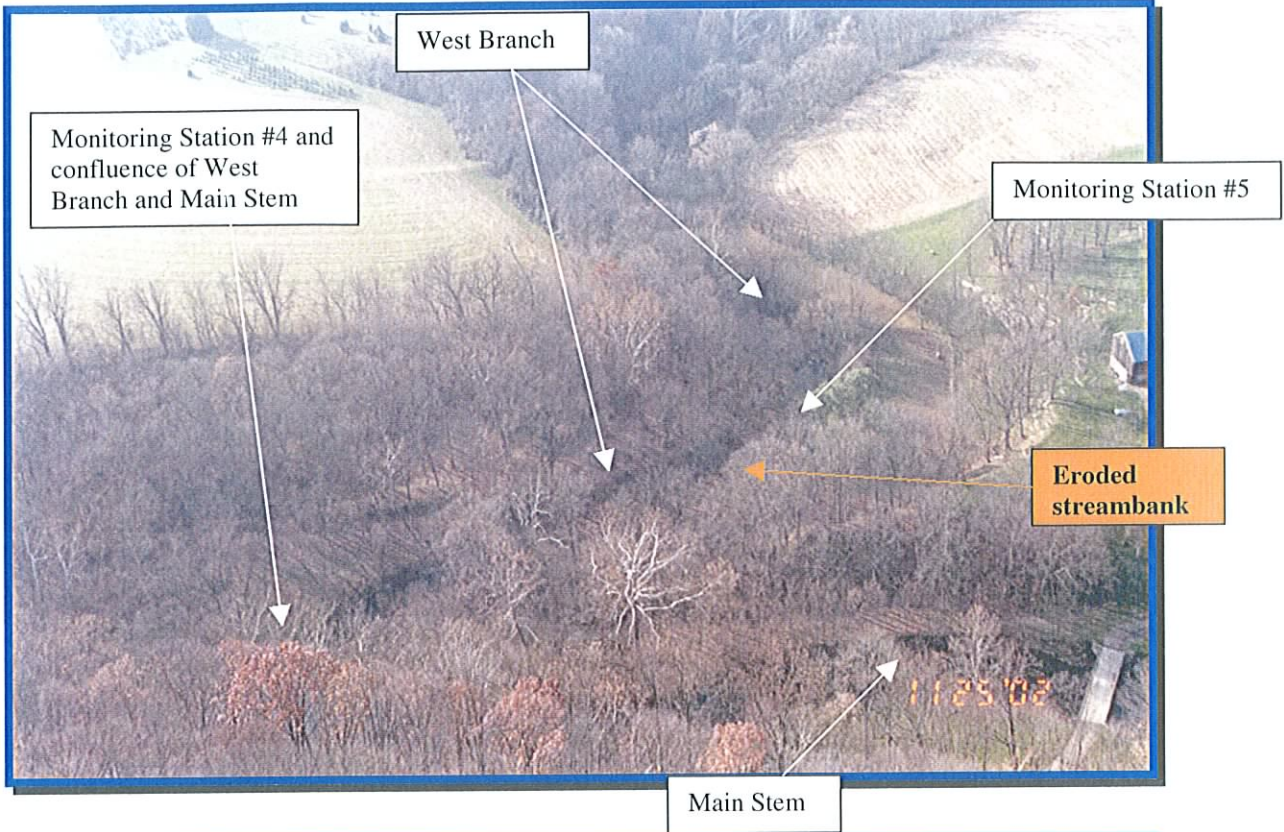




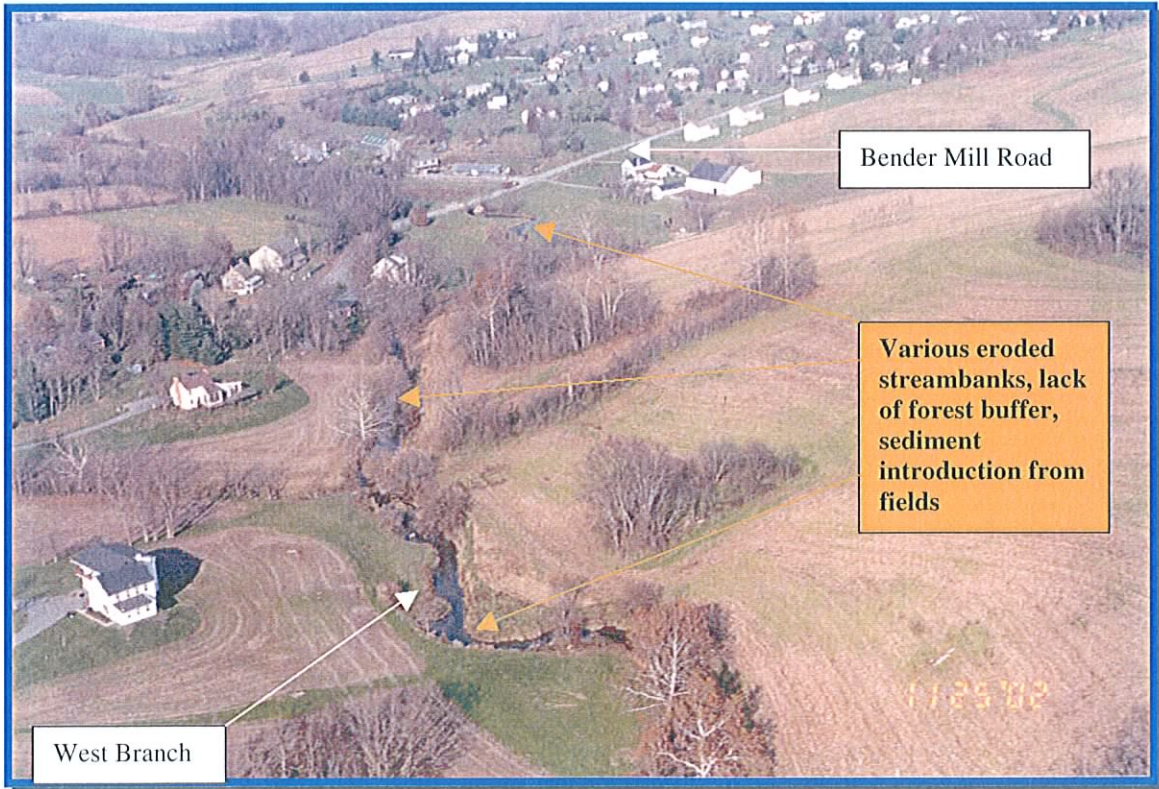
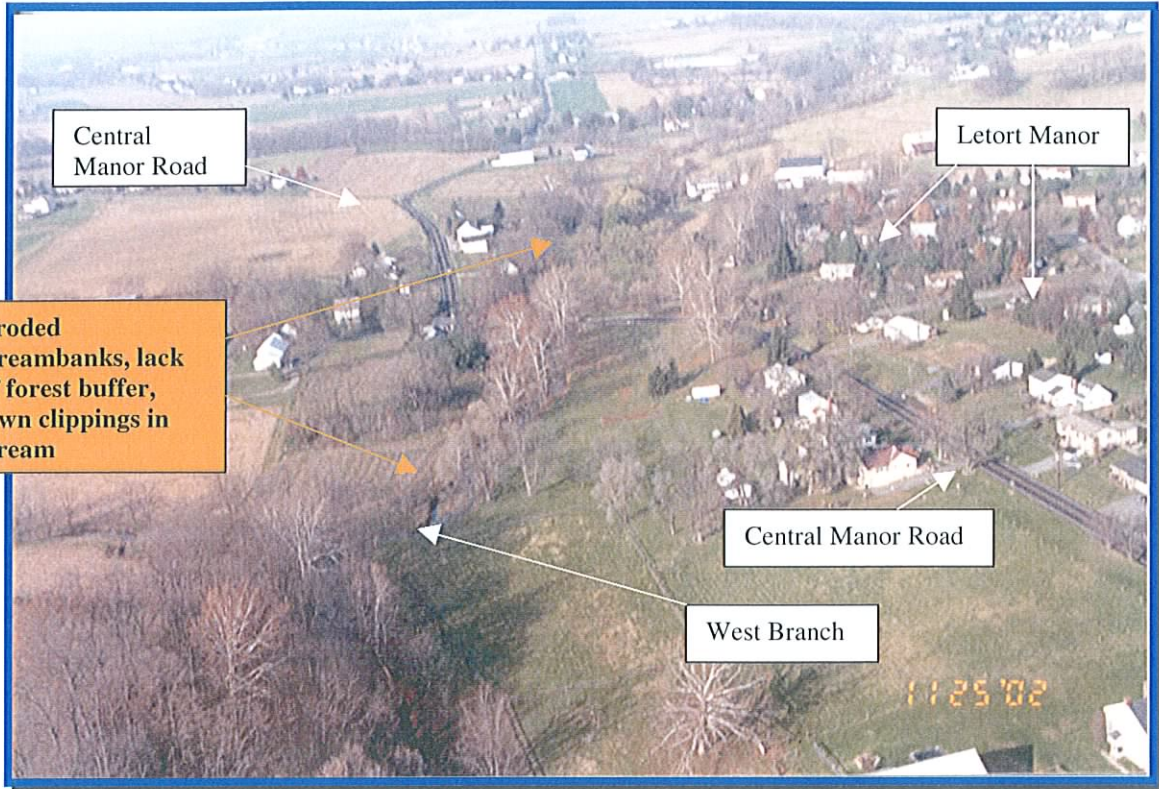




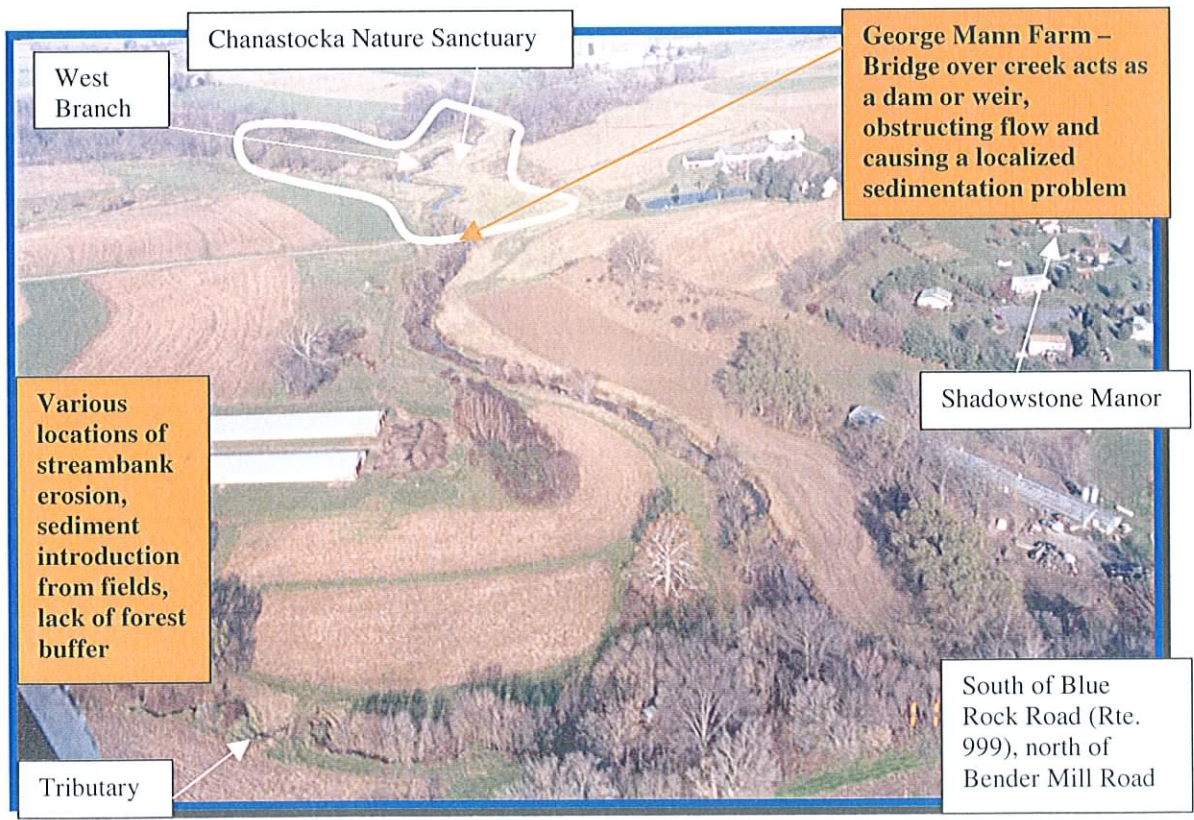




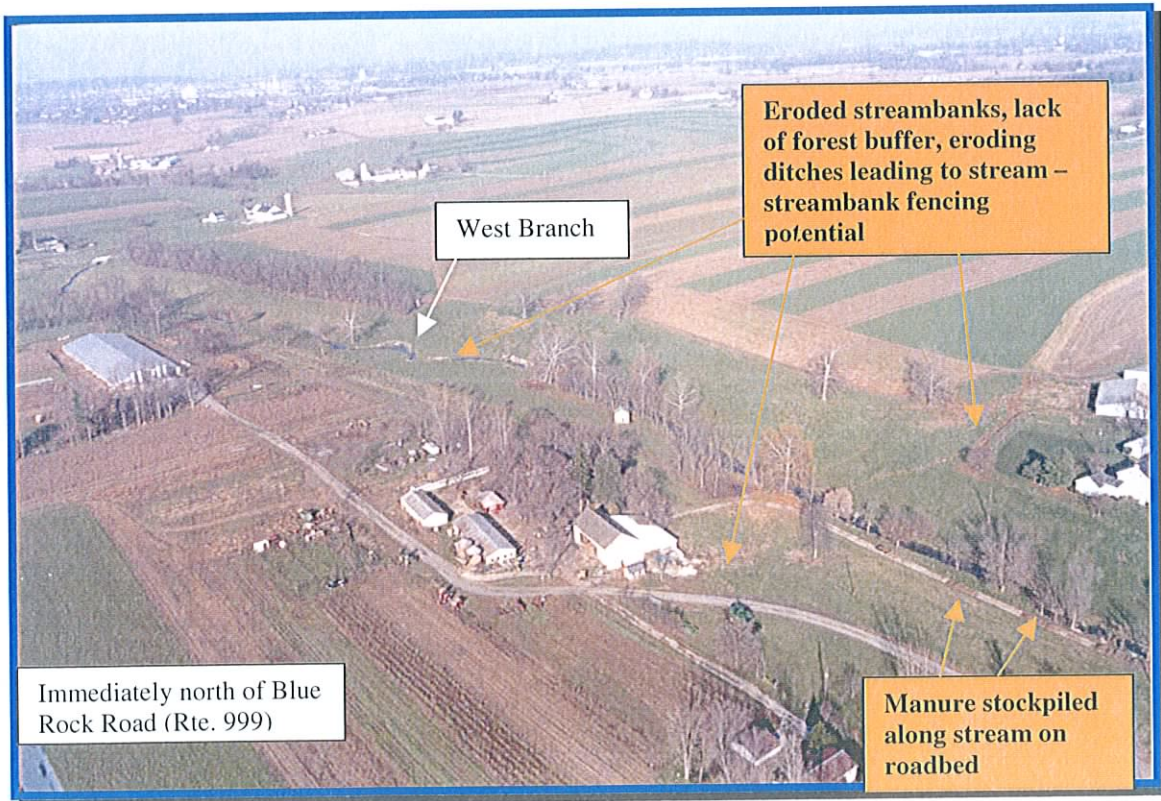
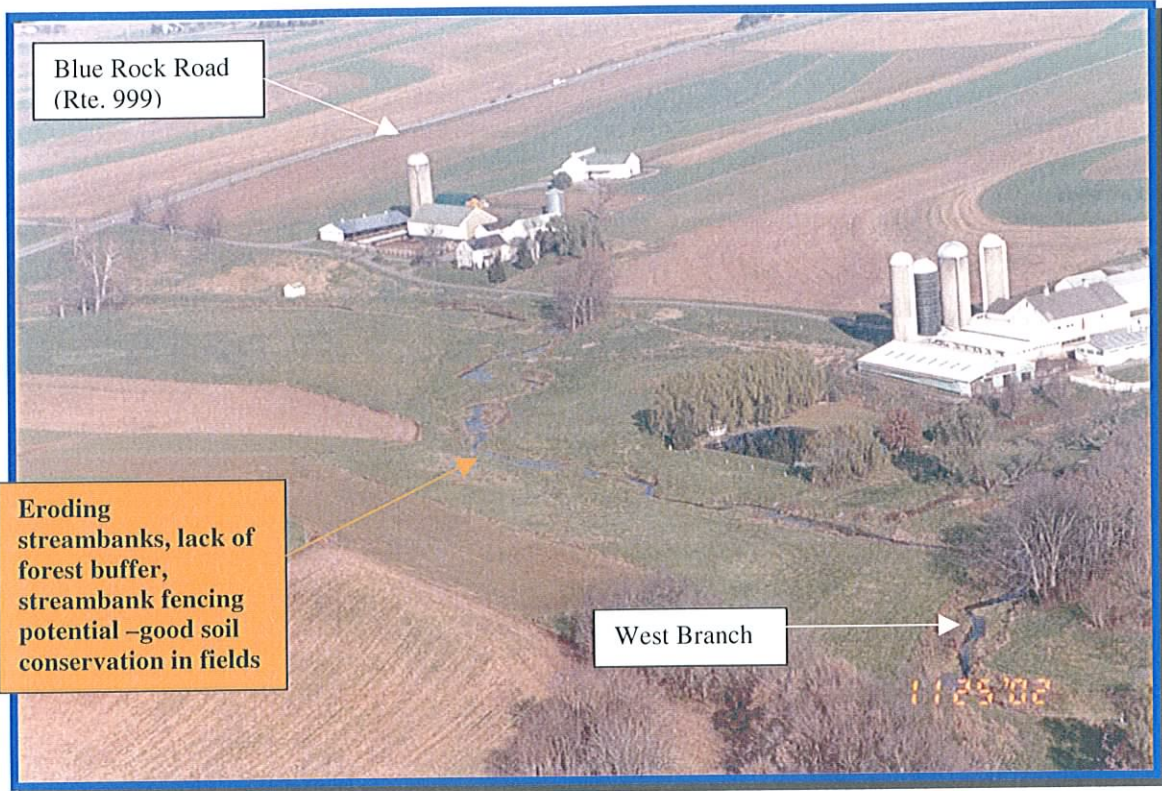




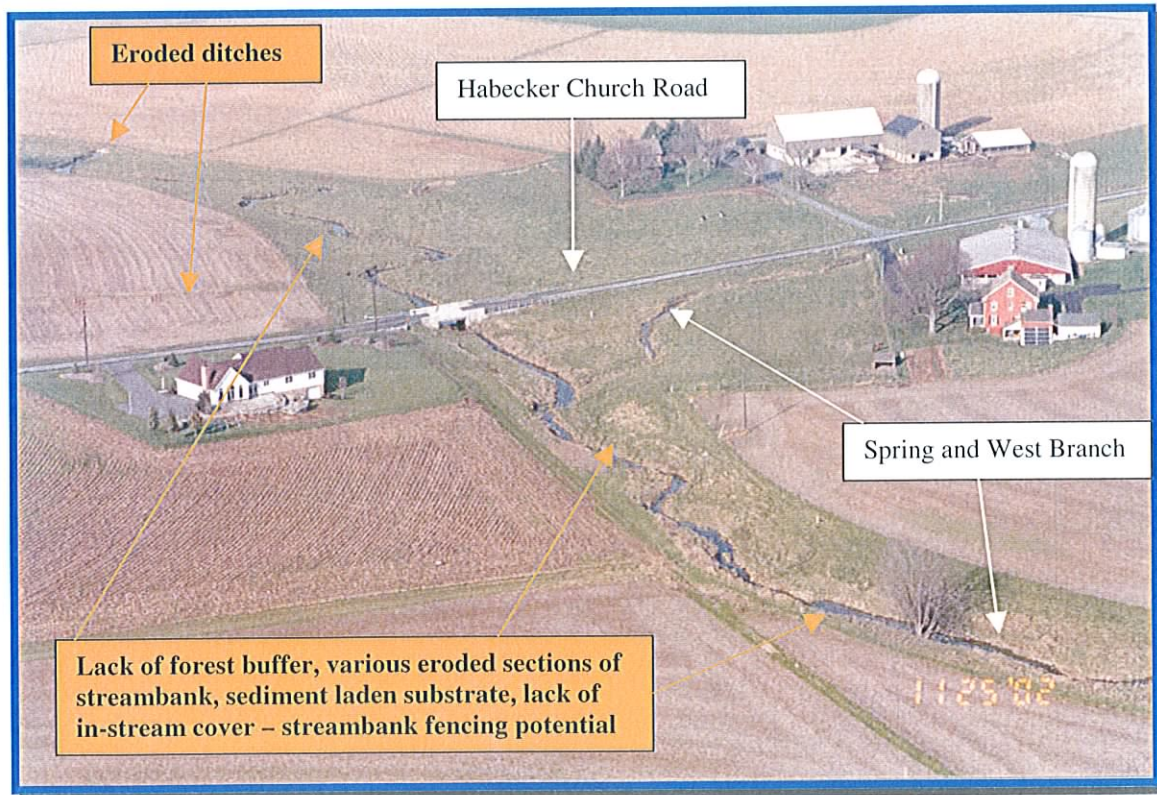
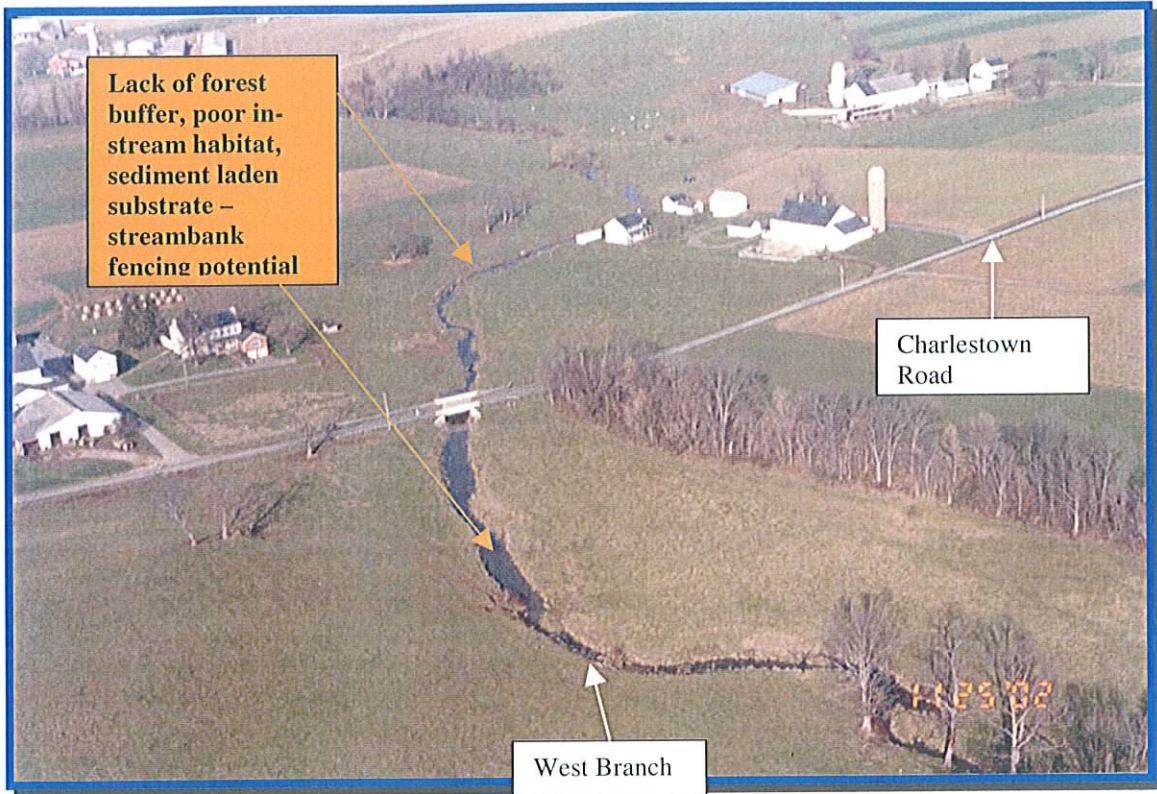




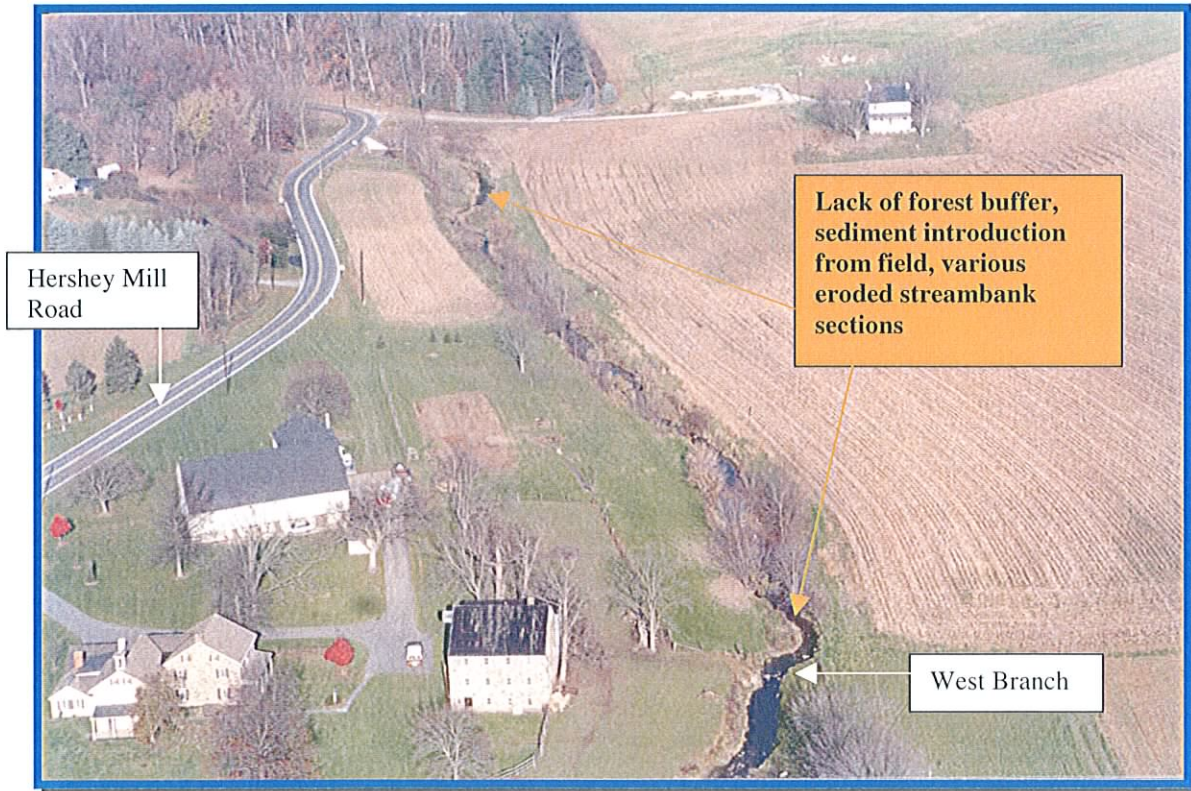
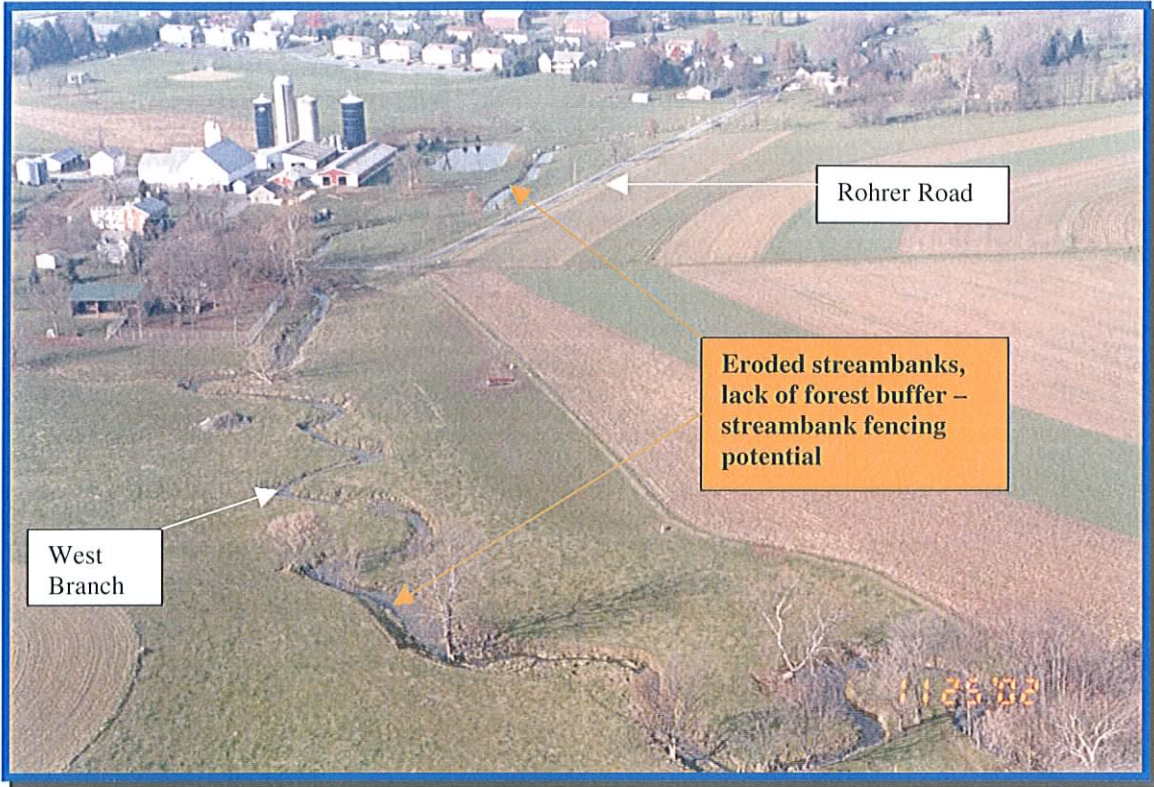




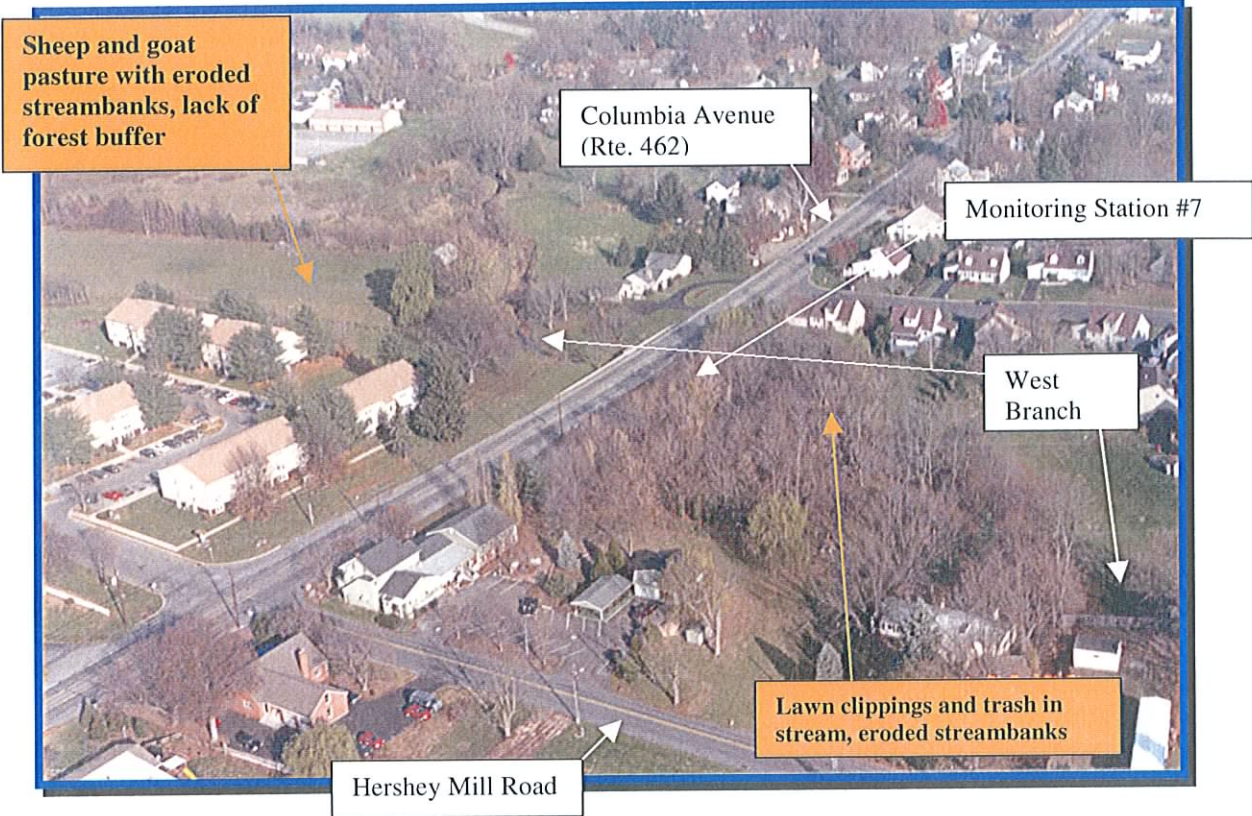




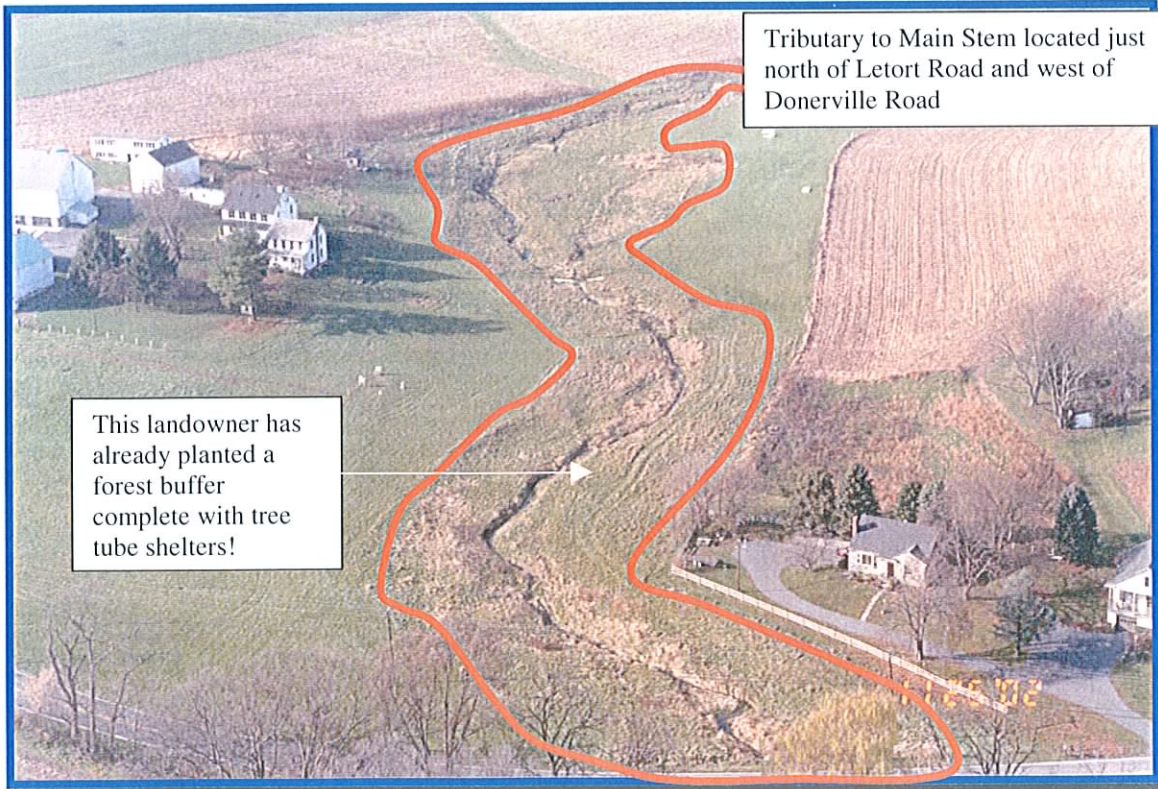
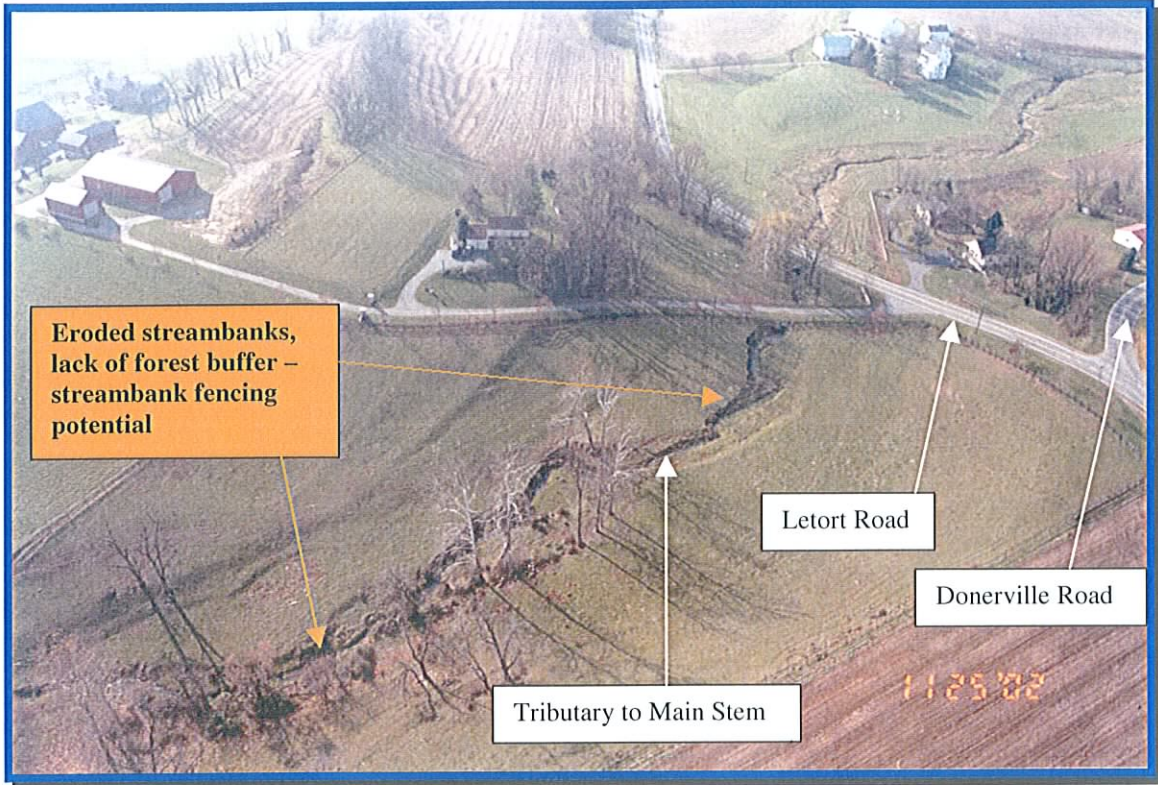




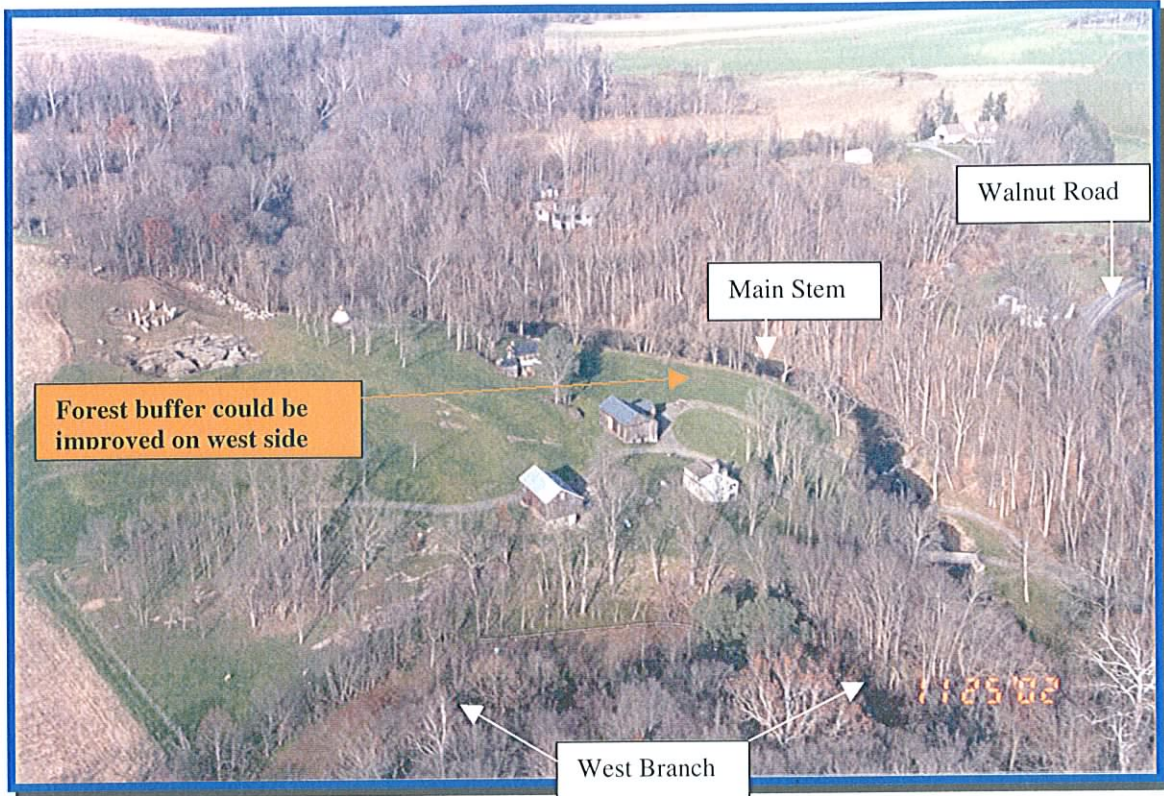




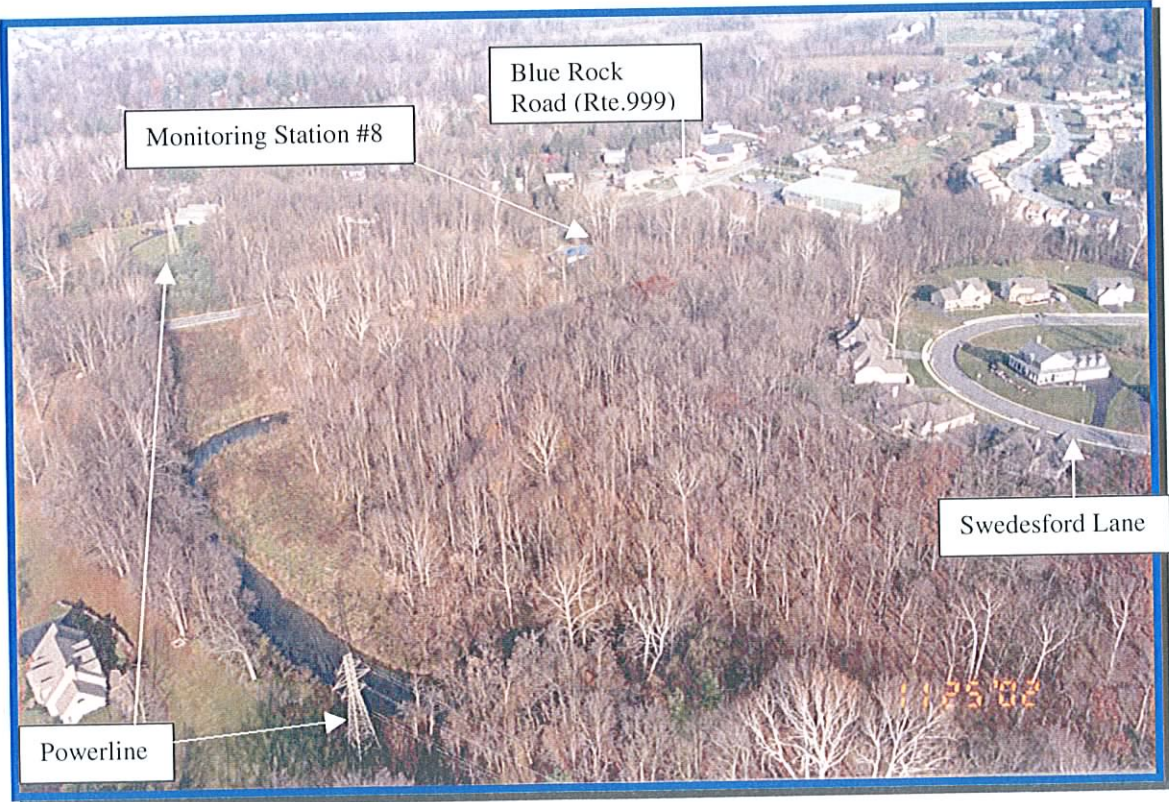
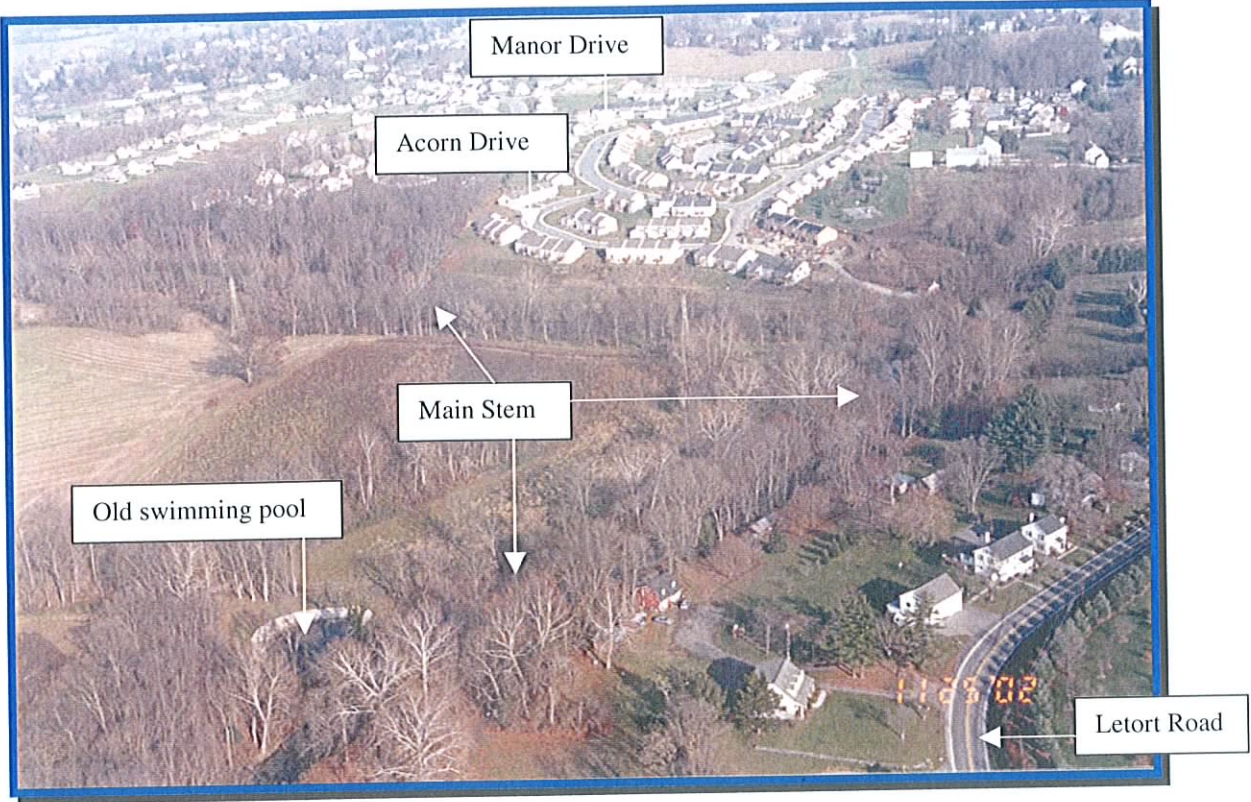








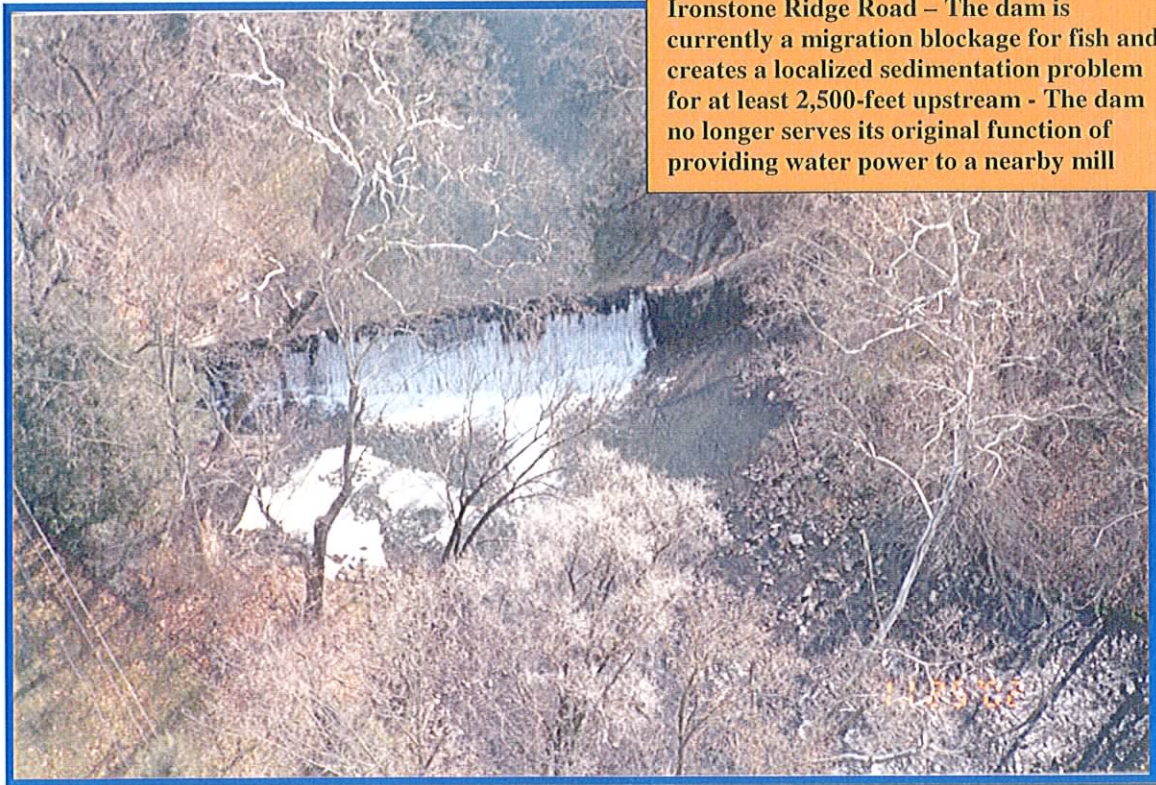




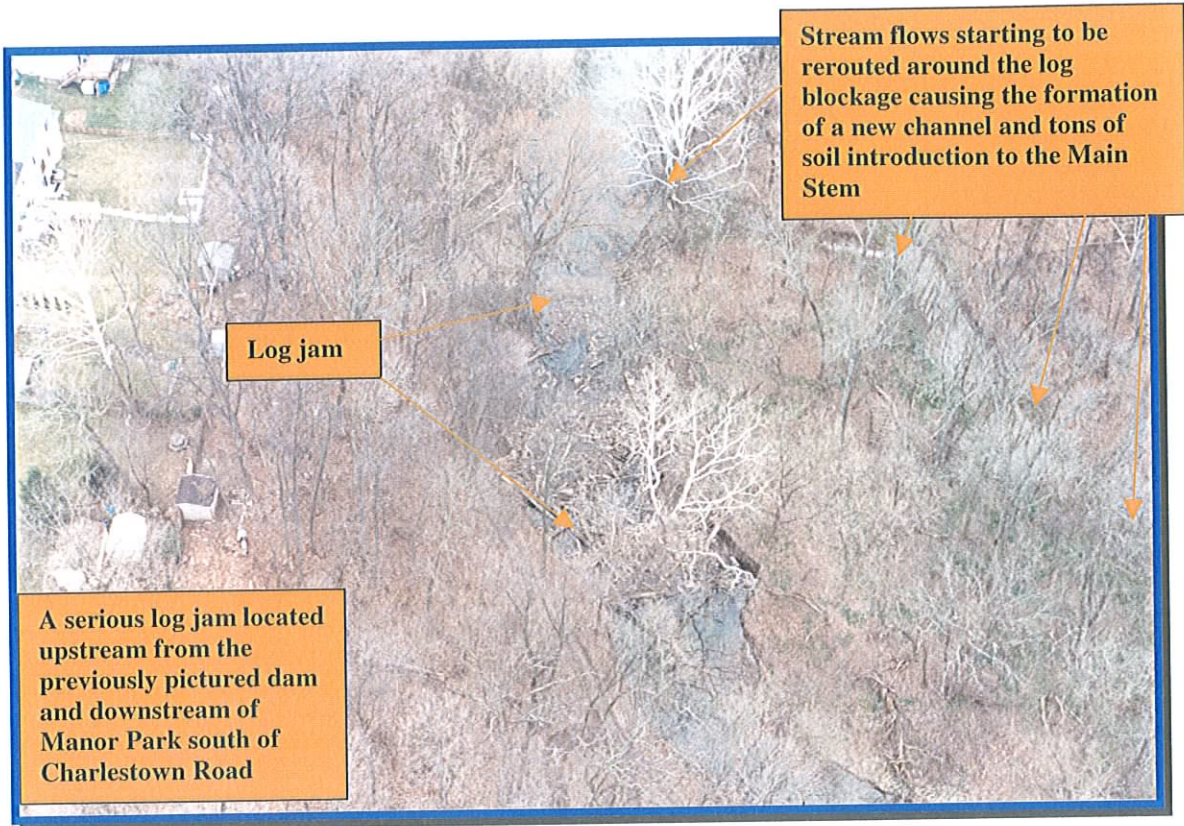




Frantz Mill Dam located north and upstream of Blue Rock Road (Rte. 999) and immediately south of the intersection of Ironstone Ridge Road and Holly Drive – The dam is most easily viewed from Ironstone Ridge Road – The dam is currently a migration blockage for fish and creates a localized sedimentation problem for at least 2,500-feet upstream - The dam no longer serves its original function of providing water power to a nearby mill





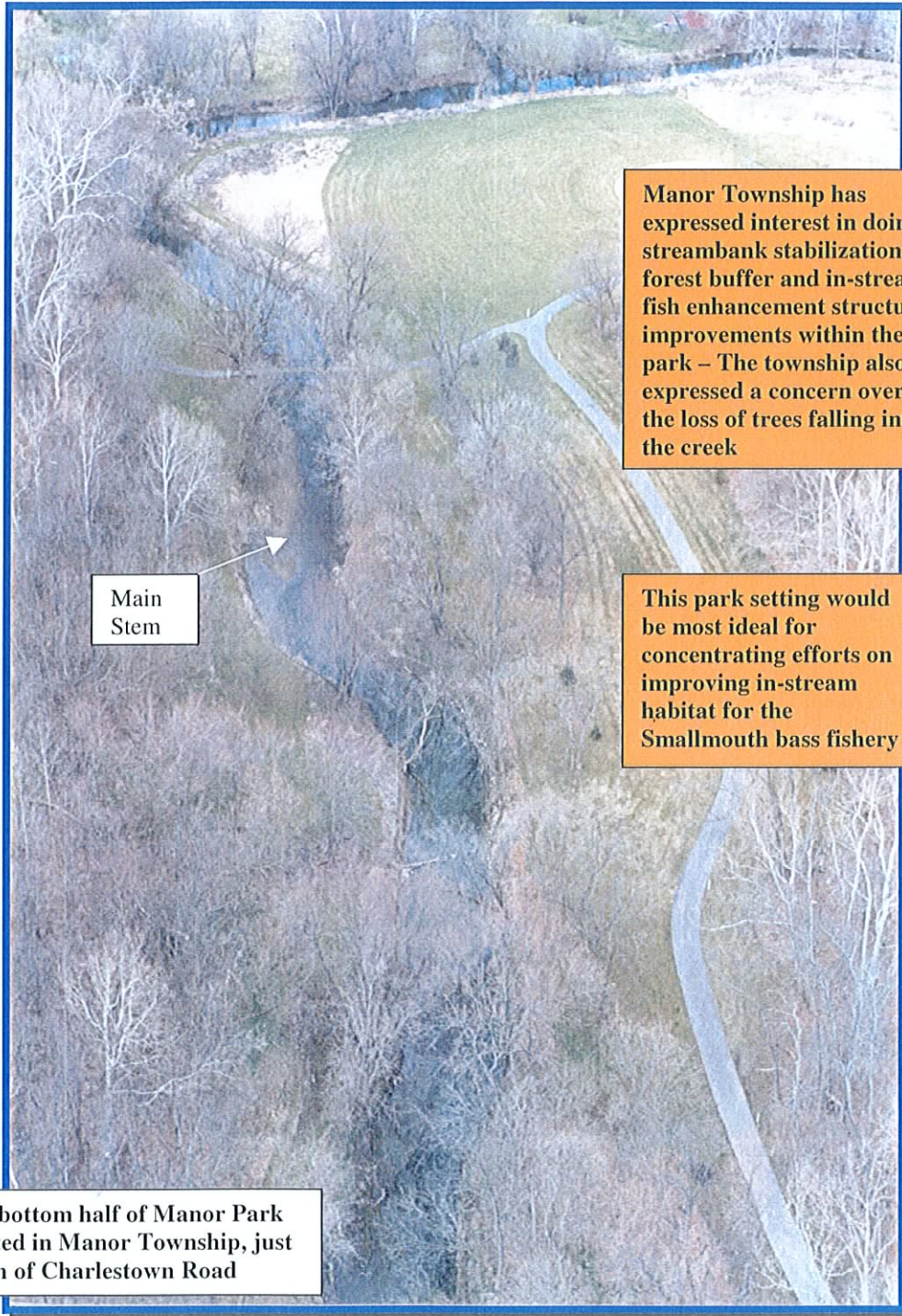


Stream flows starting to be rerouted around the log blockage causing the formation of a new channel and tons of soil introduction to the Main Stem

Log jam

A serious log jam located upstream from the previously pictured dam and downstream of Manor Park south of Charlestown Road





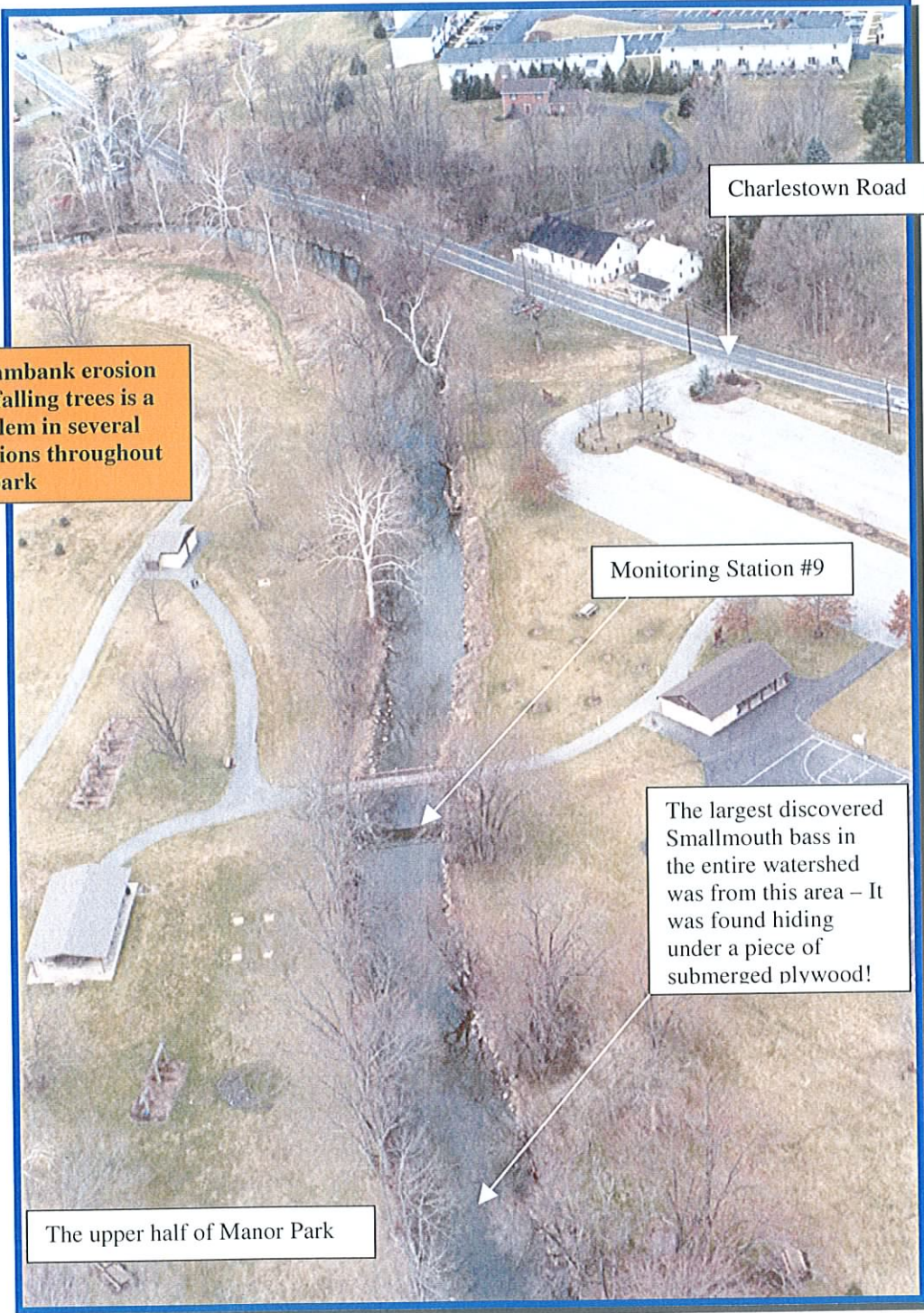
Manor Township has expressed interest in doing streambank stabilization, forest buffer and in-stream fish enhancement structure improvements within the park – The township also expressed a concern over the loss of trees falling into the creek

Main Stem

This park setting would be most ideal for concentrating efforts on improving in-stream habitat for the Smallmouth bass fishery

The bottom half of Manor Park located in Manor Township, just south of Charlestown Road





Streambank erosion and falling trees is a problem in several locations throughout the park

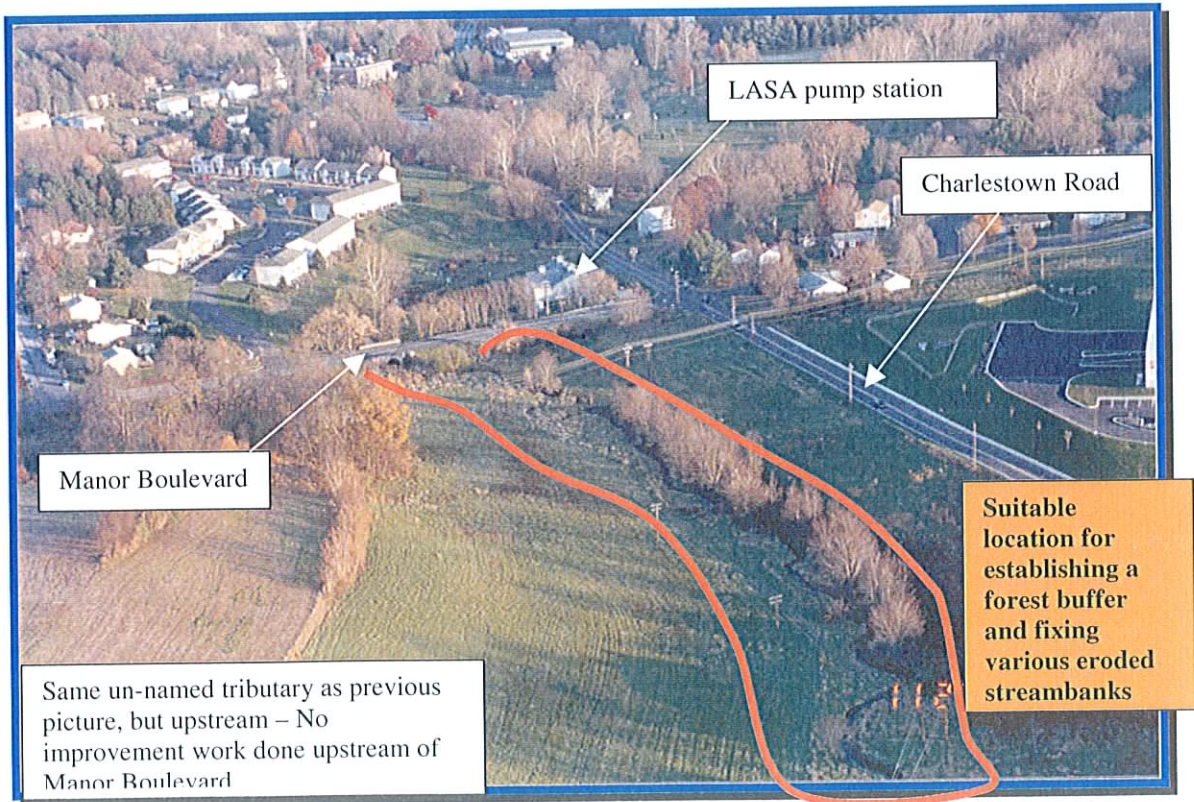
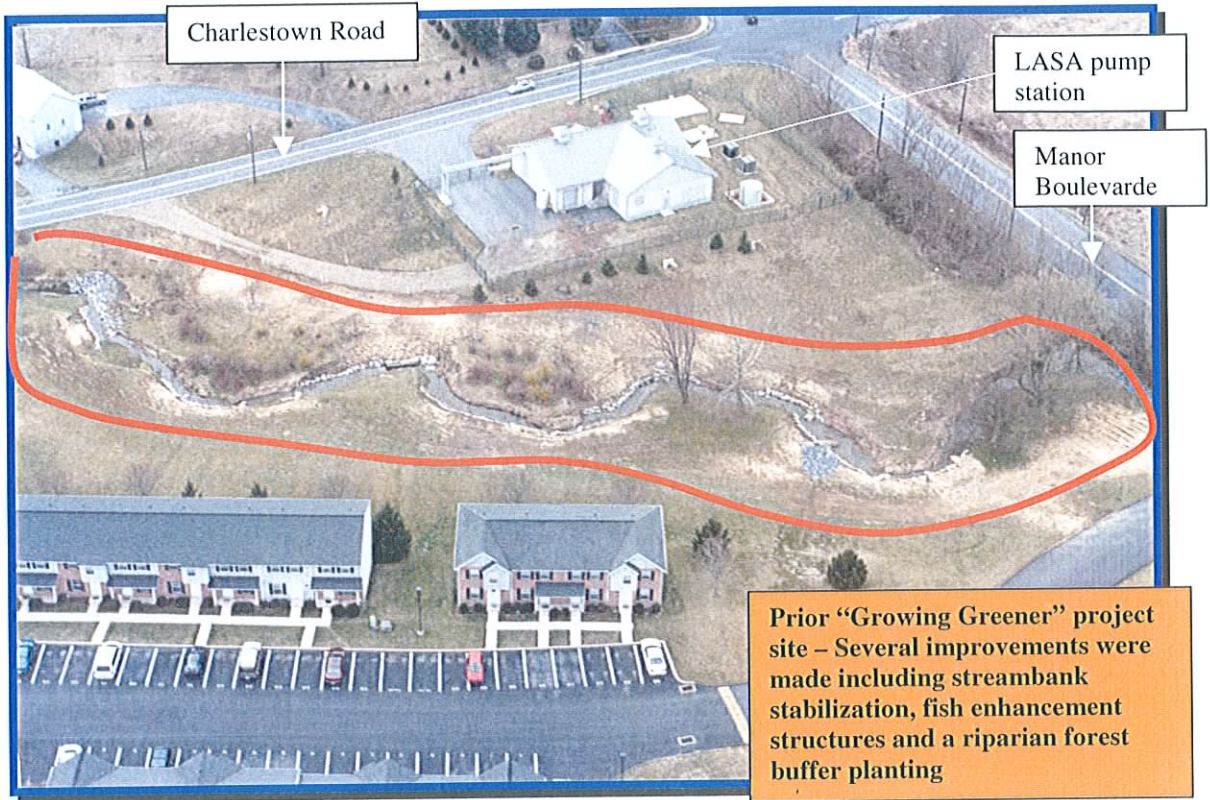
Charlestown Road

Monitoring Station #9

The largest discovered Smallmouth bass in the entire watershed was from this area - It was found hiding under a piece of submerged plywood!

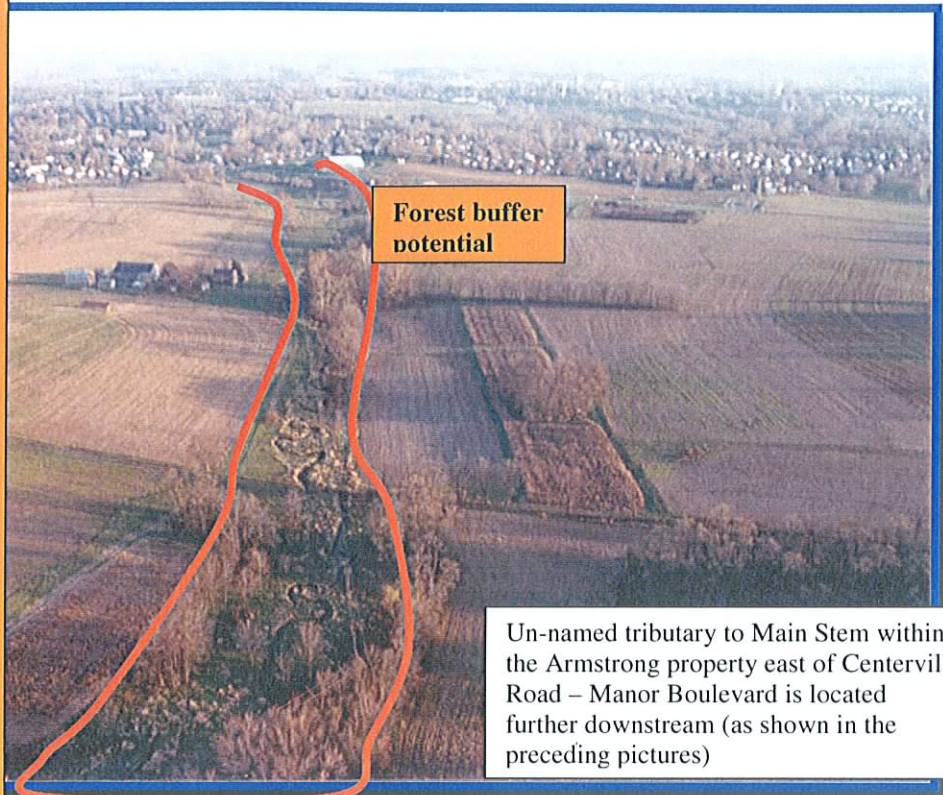
The upper half of Manor Park





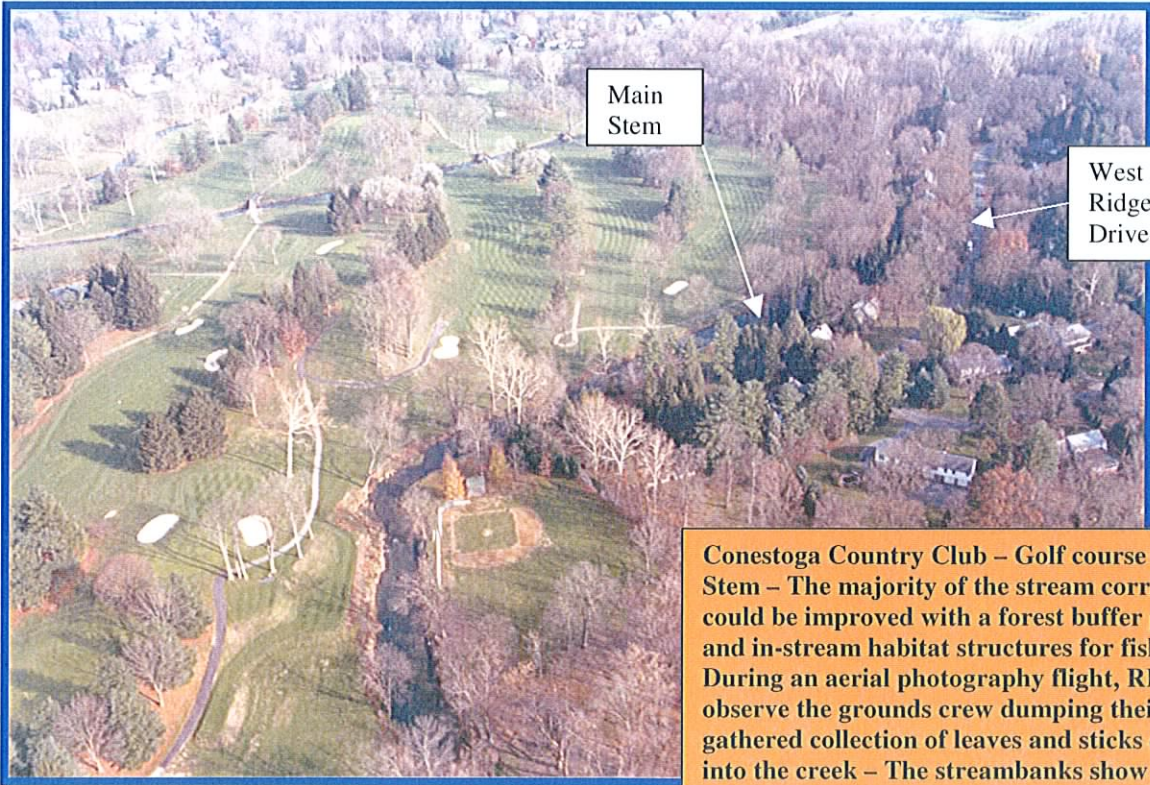


Lack of forest buffer, sediment introduction from fields at various locations, eroded streambanks in various locations – Two wetlands located just east of Centerville Road (near the beginning of this tributary) have fairly good plant diversity and serve as valuable habitats in the headwater area – Wood's Edge development and a large wetland complex are located on the west side of Centerville Road – The Armstrong property supports a White-tailed deer population



Forest buffer potential

Un-named tributary to Main Stem within the Armstrong property east of Centerville Road – Manor Boulevard is located further downstream (as shown in the preceding pictures)

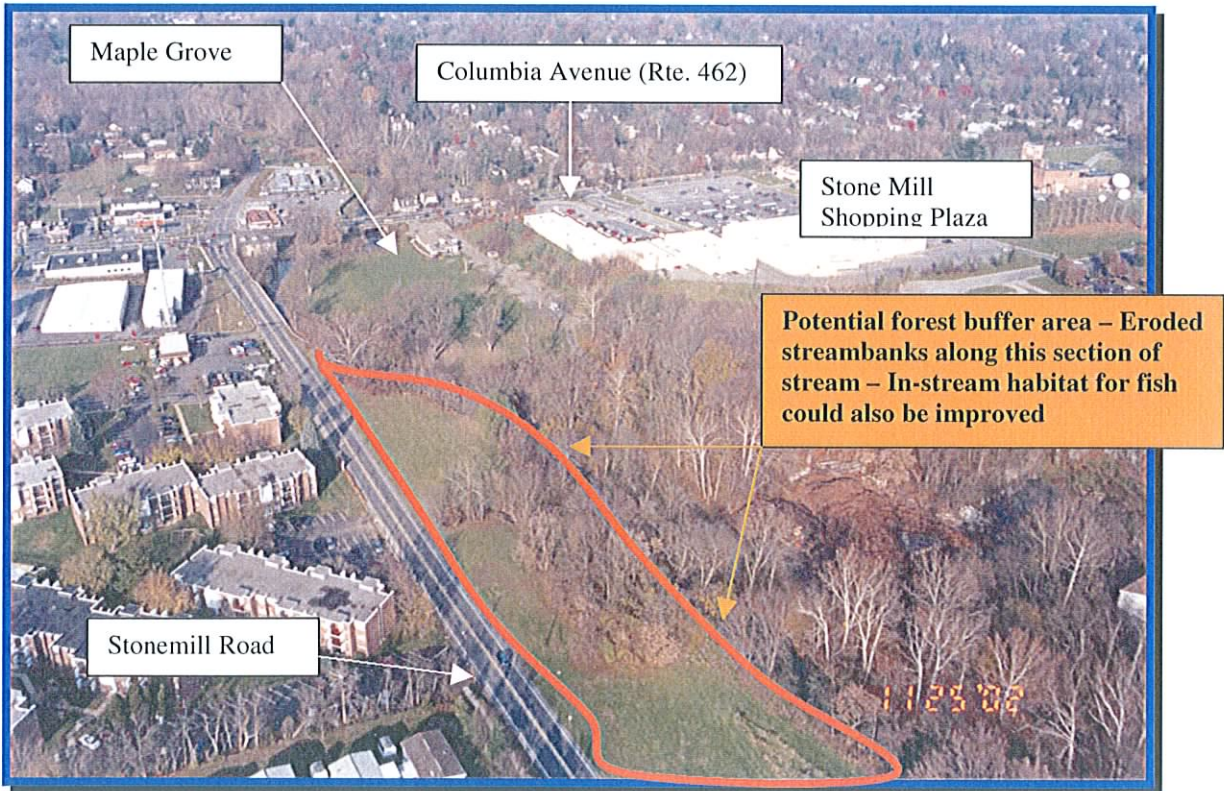
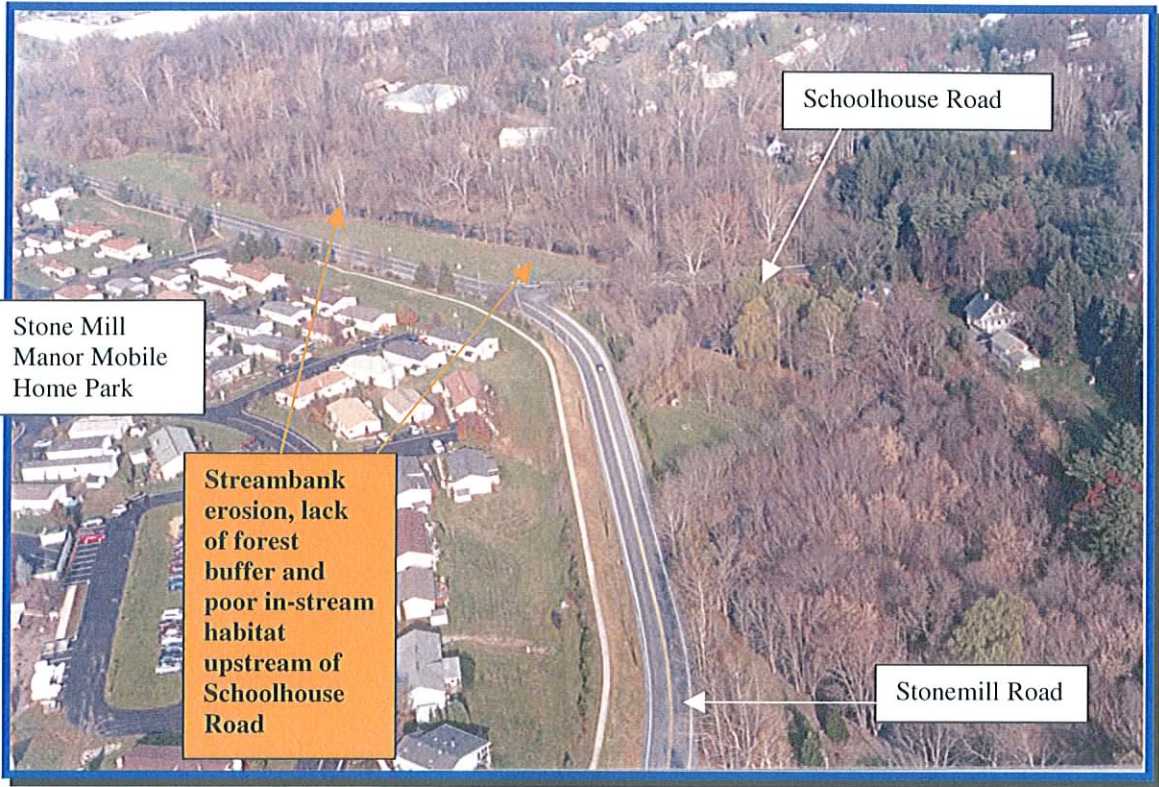


Main Stem

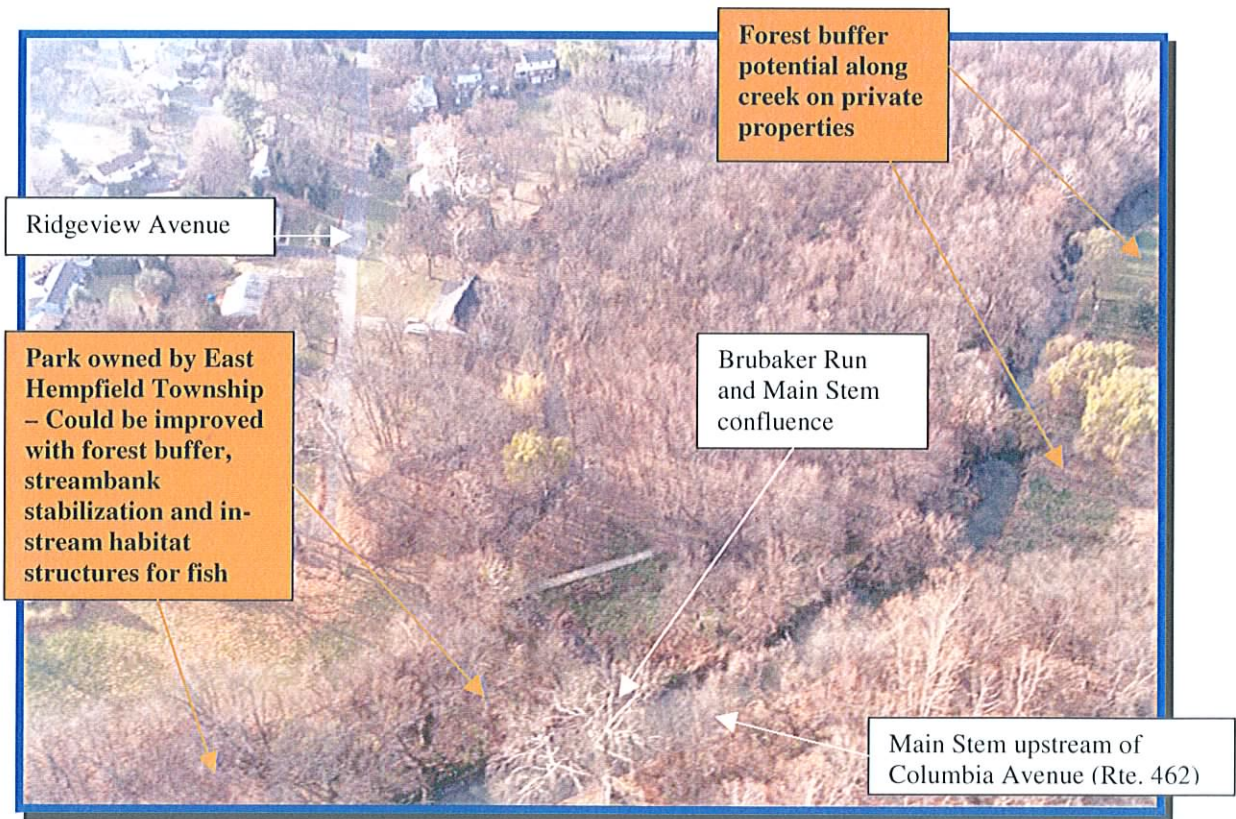
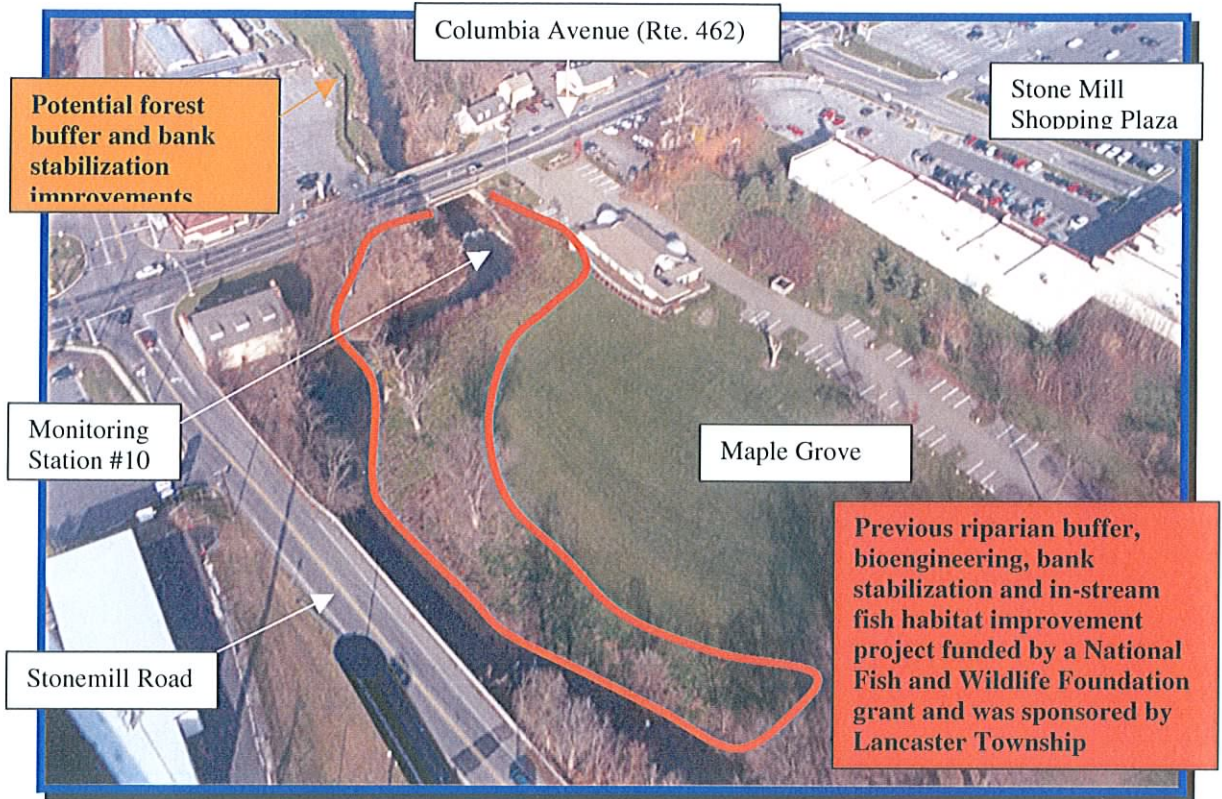
West Ridge Drive

Conestoga Country Club – Golf course on Main Stem – The majority of the stream corridor could be improved with a forest buffer planting and in-stream habitat structures for fish – During an aerial photography flight, RETTEW observe the grounds crew dumping their gathered collection of leaves and sticks directly into the creek – The streambanks show signs of routine mowing and spraying

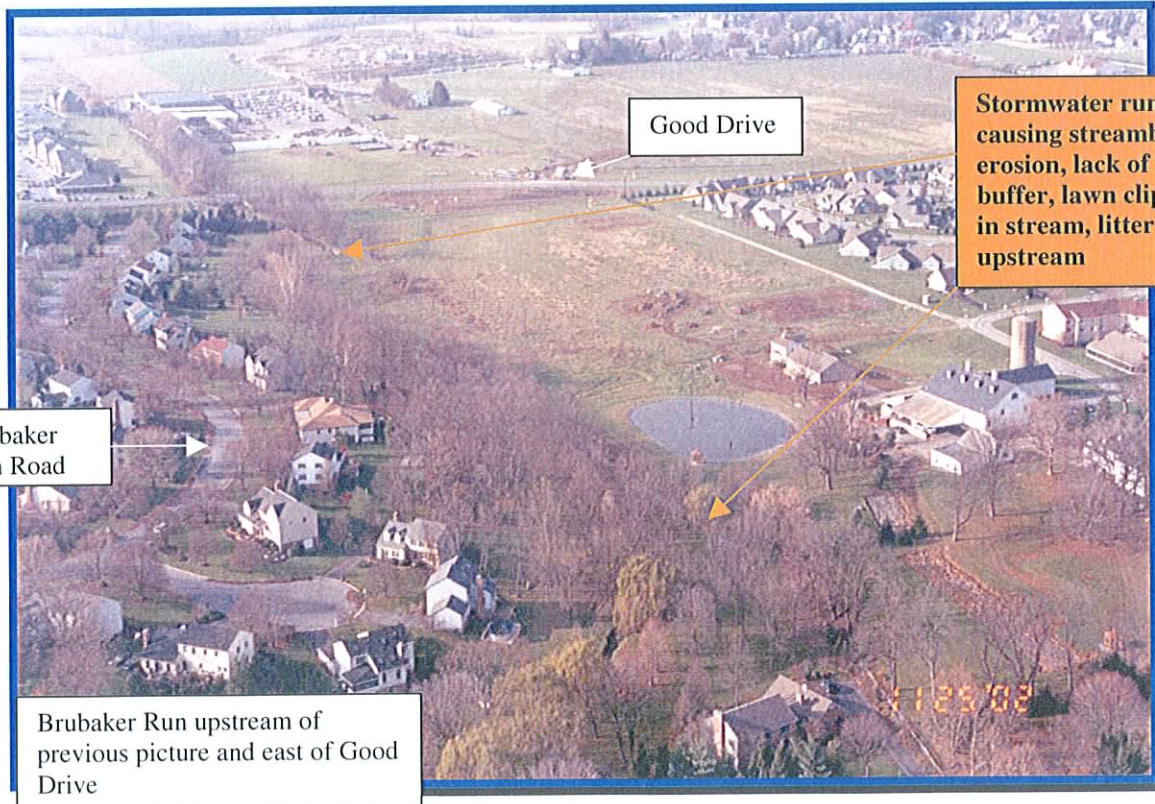




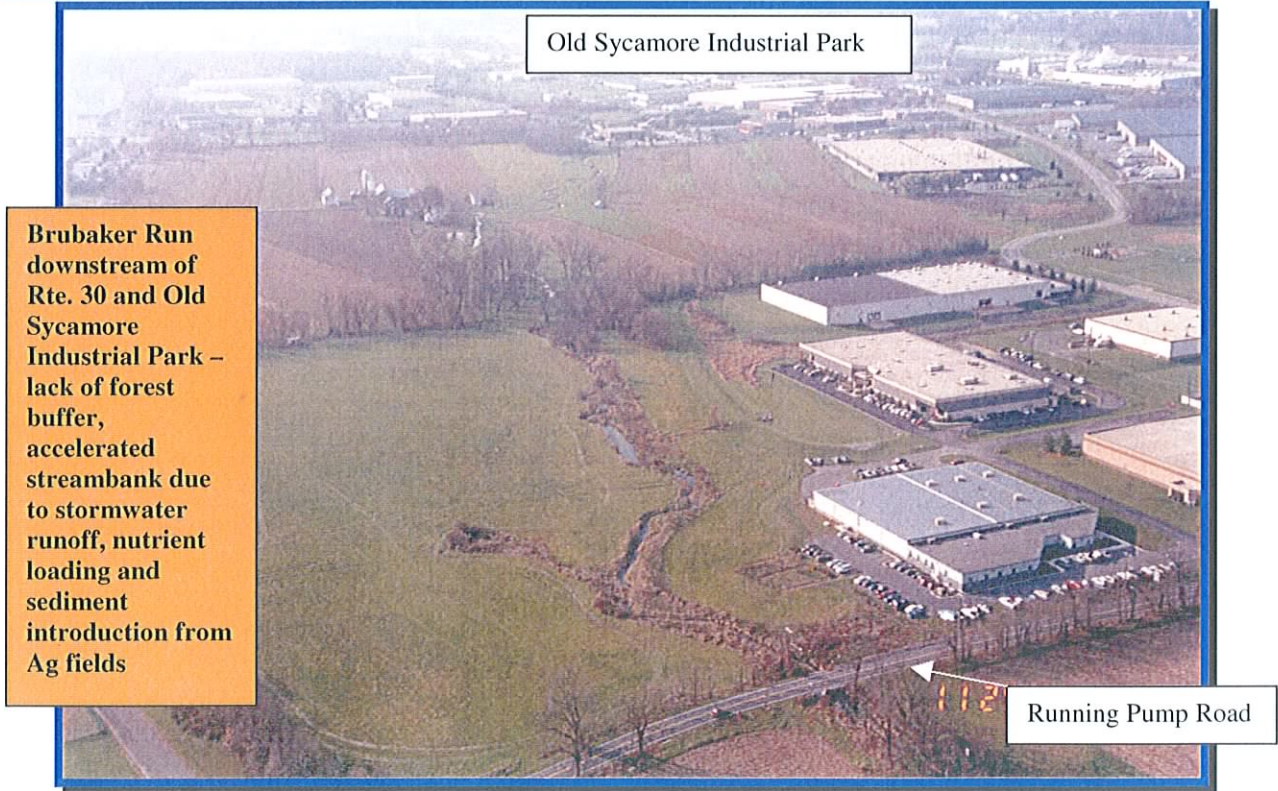
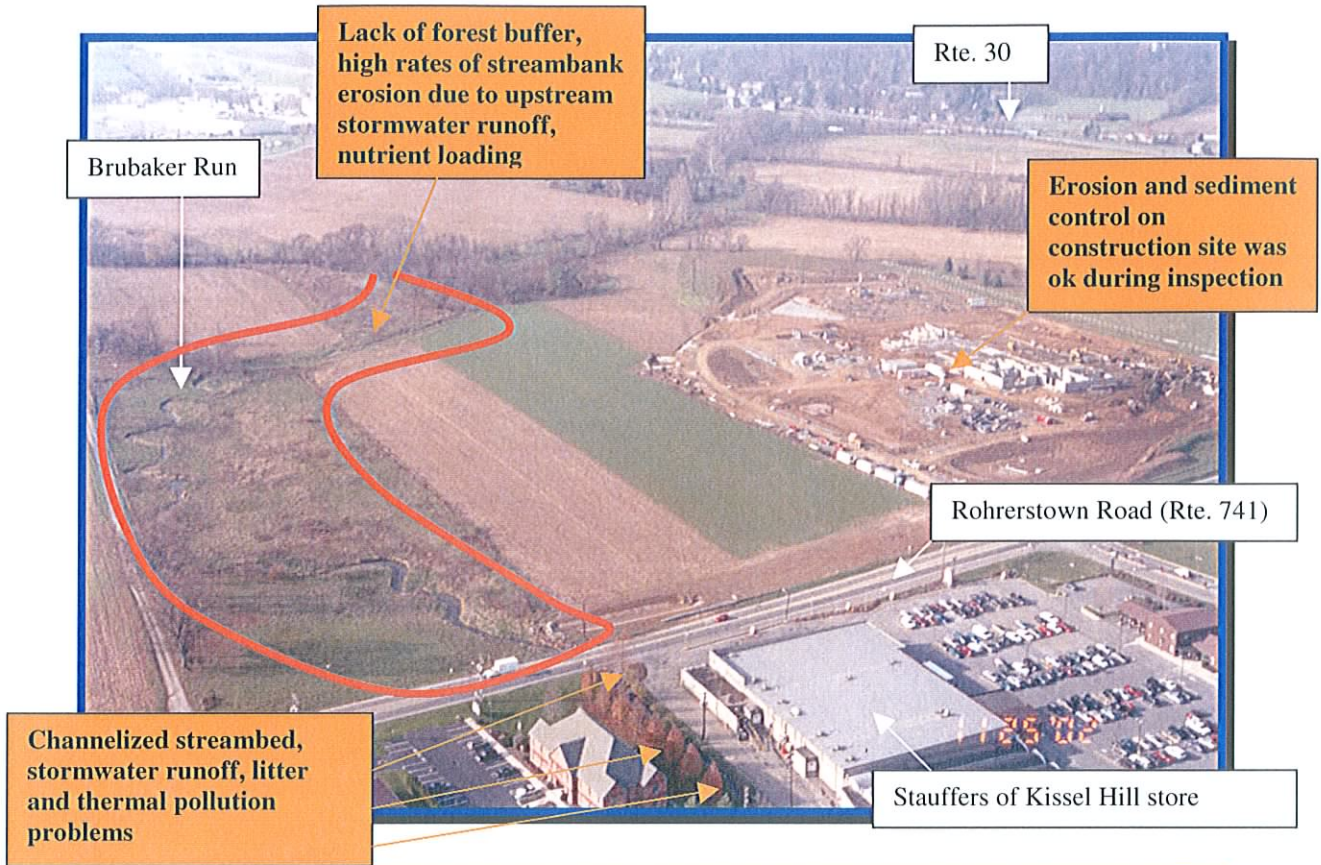




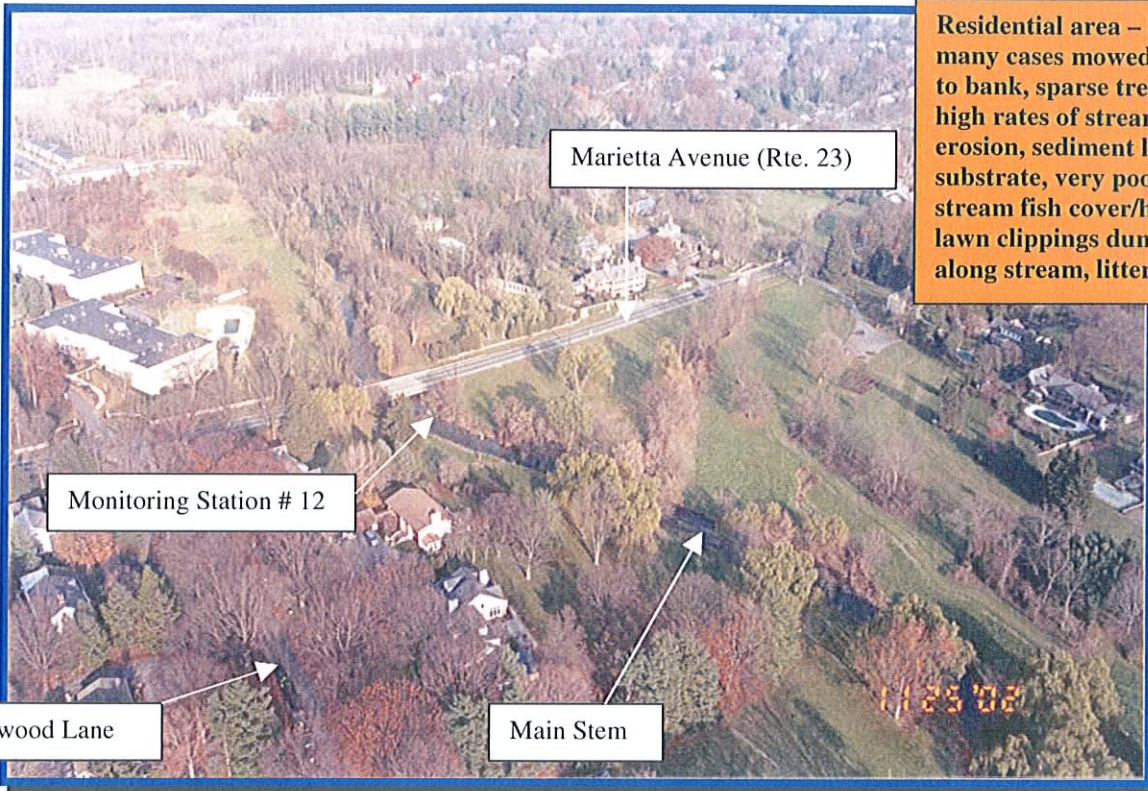












Residential area – Lawns in many cases mowed right up to bank, sparse tree cover, high rates of streambank erosion, sediment laden substrate, very poor in-stream fish cover/habitat, lawn clippings dumped along stream, litter

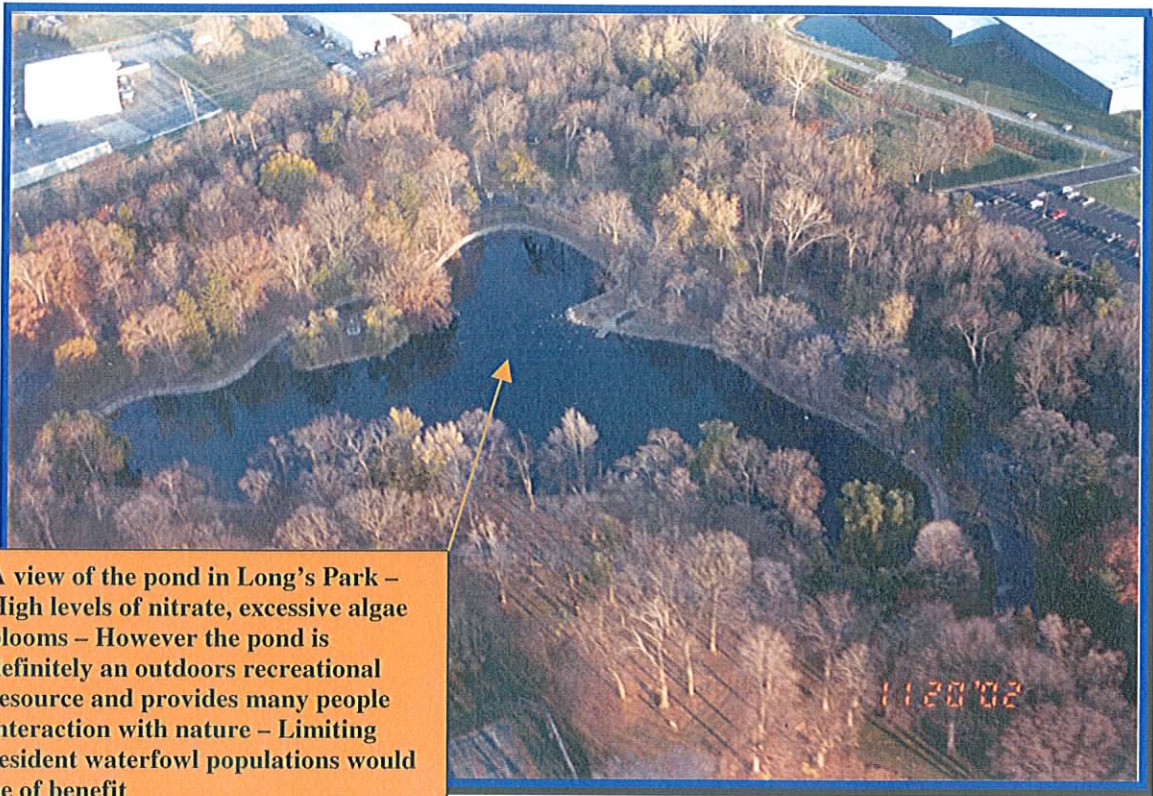


Good forest buffer and fairly good in-stream habitat

Conrail Rail Road

Main Stem





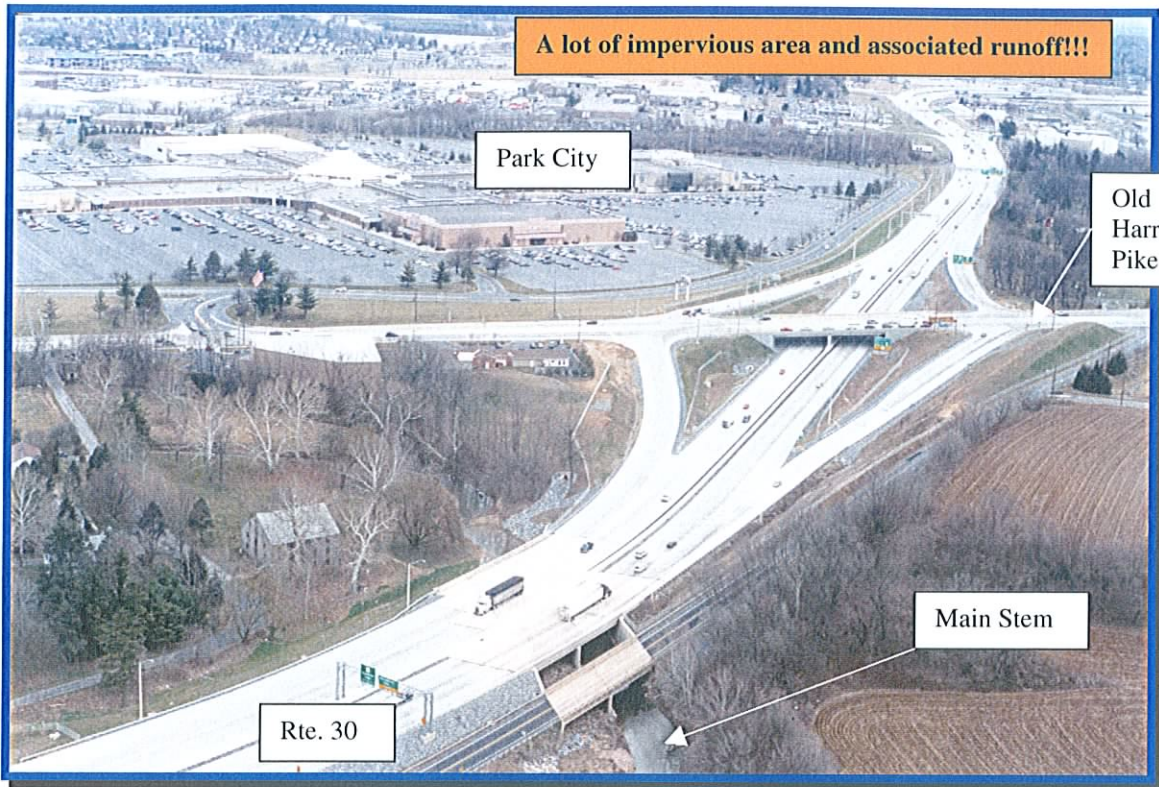
A view of the pond in Long's Park – High levels of nitrate, excessive algae blooms – However the pond is definitely an outdoors recreational resource and provides many people interaction with nature – Limiting resident waterfowl populations would be of benefit



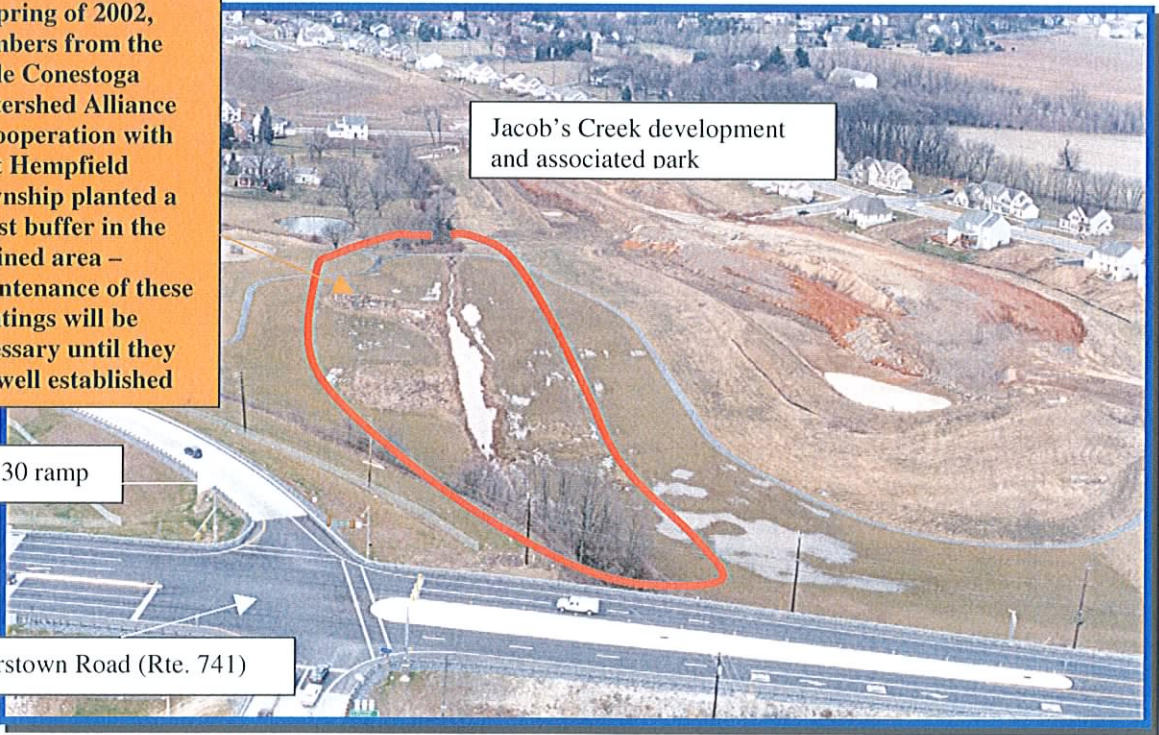
Red Rose Commons

A view of Dillerville Swamp and Red Rose Commons – See plans for spraying and controlling invasive Purple loosestrife in “Completed Restoration Projects” chapter of this report for further details – Dillerville Swamp is now but a fraction of the once incredibly diverse wetland habitat it once was – Franklin and Marshall College had in the past completed extensive flora investigations within the swamp and had identified several rare, threatened and endangered plant species – Recent investigations indicate a loss of these plant species – A unique opportunity exists for restoring the original plant community

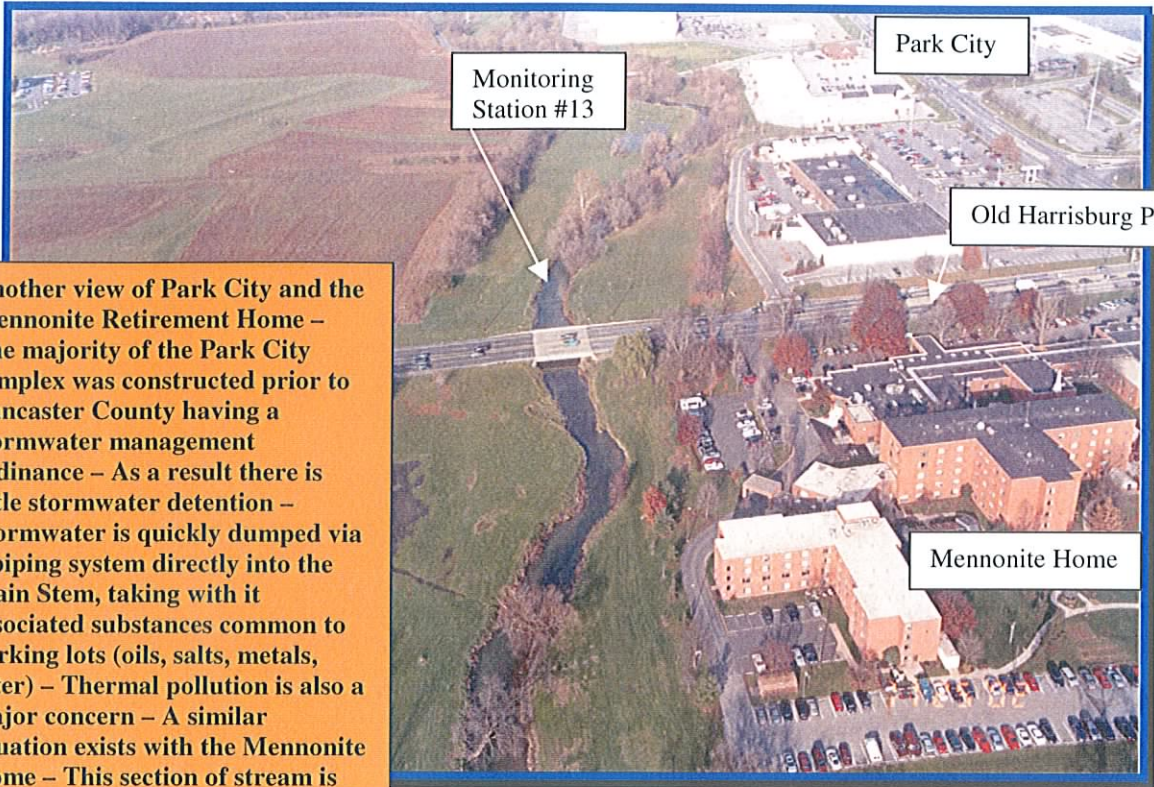




In spring of 2002, members from the Little Conestoga Watershed Alliance in cooperation with East Hempfield Township planted a forest buffer in the outlined area – Maintenance of these plantings will be necessary until they are well established

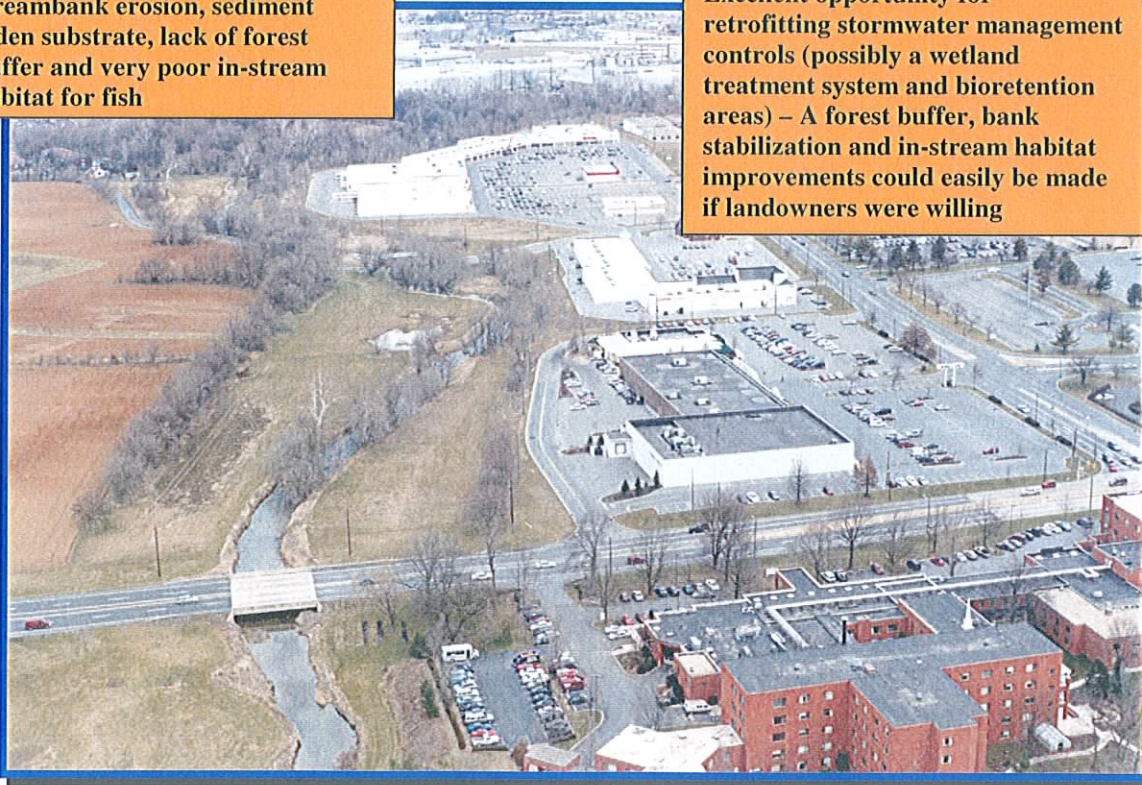




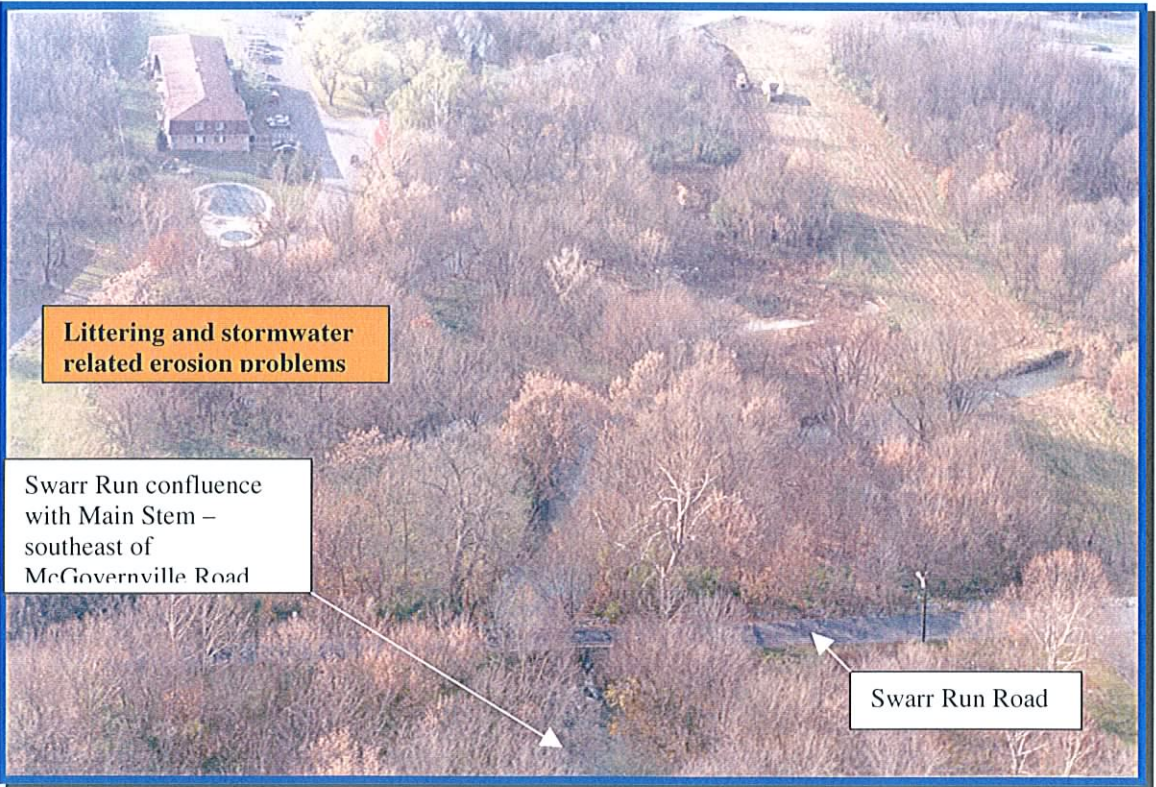


Another view of Park City and the Mennonite Retirement Home – The majority of the Park City complex was constructed prior to Lancaster County having a stormwater management ordinance – As a result there is little stormwater detention – Stormwater is quickly dumped via a piping system directly into the Main Stem, taking with it associated substances common to parking lots (oils, salts, metals, litter) – Thermal pollution is also a major concern – A similar situation exists with the Mennonite Home – This section of stream is severely degraded – High rates of streambank erosion, sediment laden substrate, lack of forest buffer and very poor in-stream habitat for fish

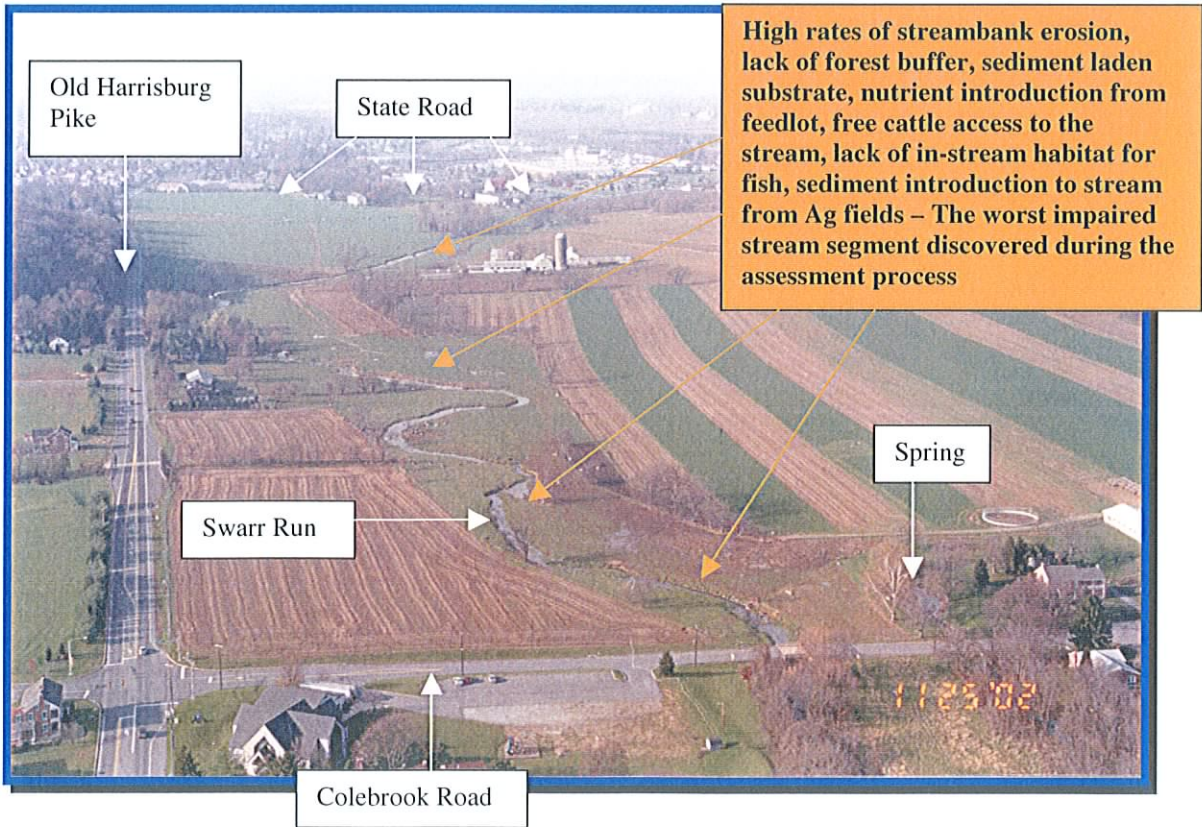
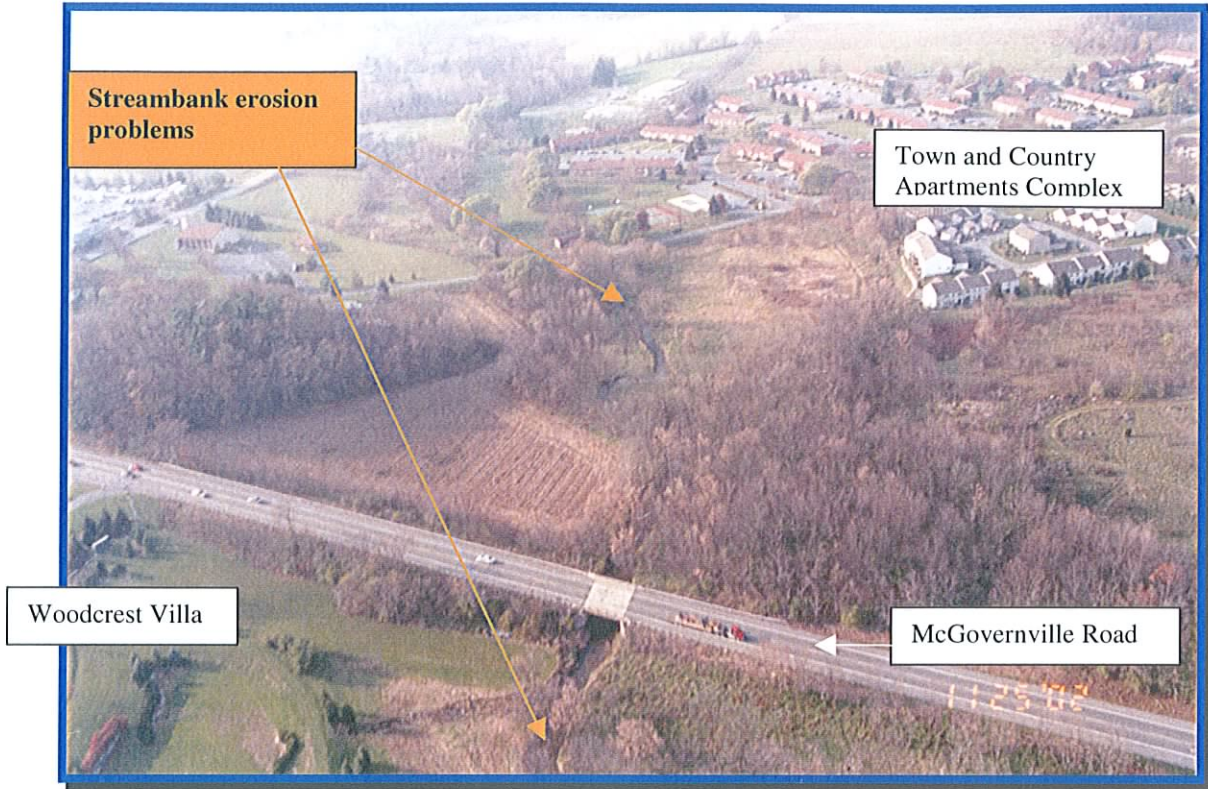
Excellent opportunity for retrofitting stormwater management controls (possibly a wetland treatment system and bioretention areas) – A forest buffer, bank stabilization and in-stream habitat improvements could easily be made if landowners were willing



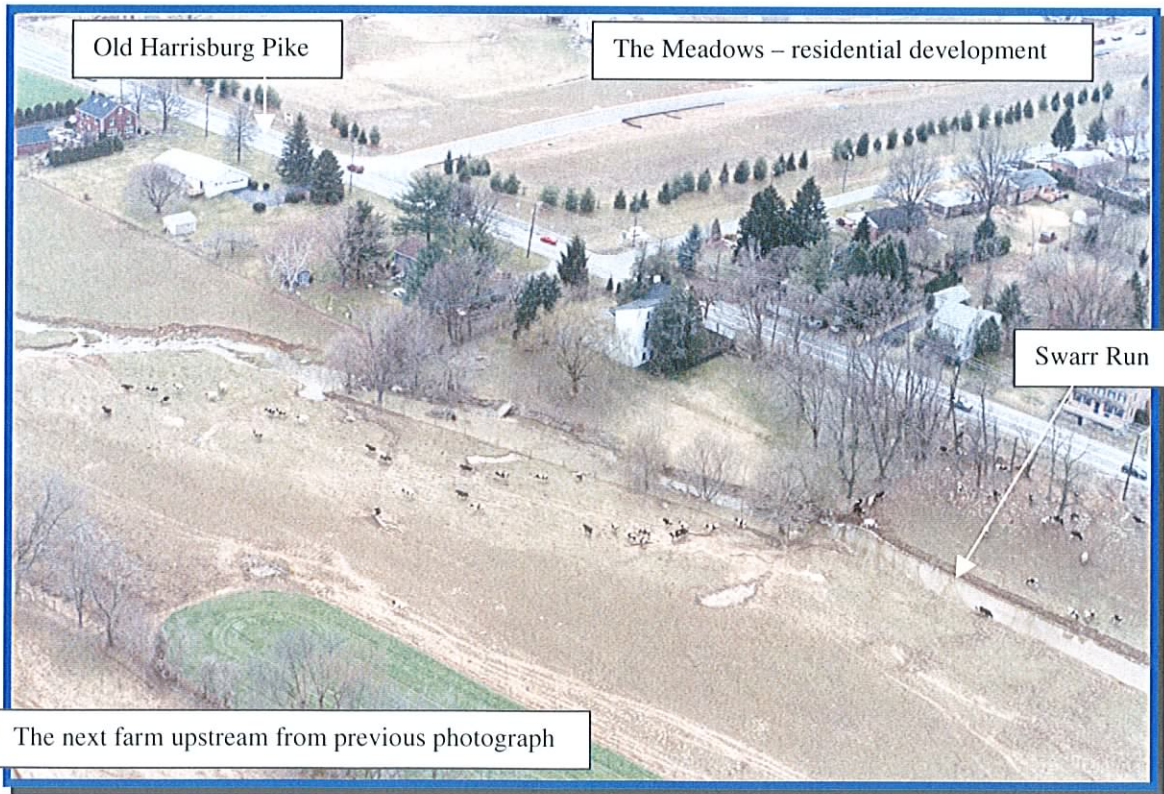
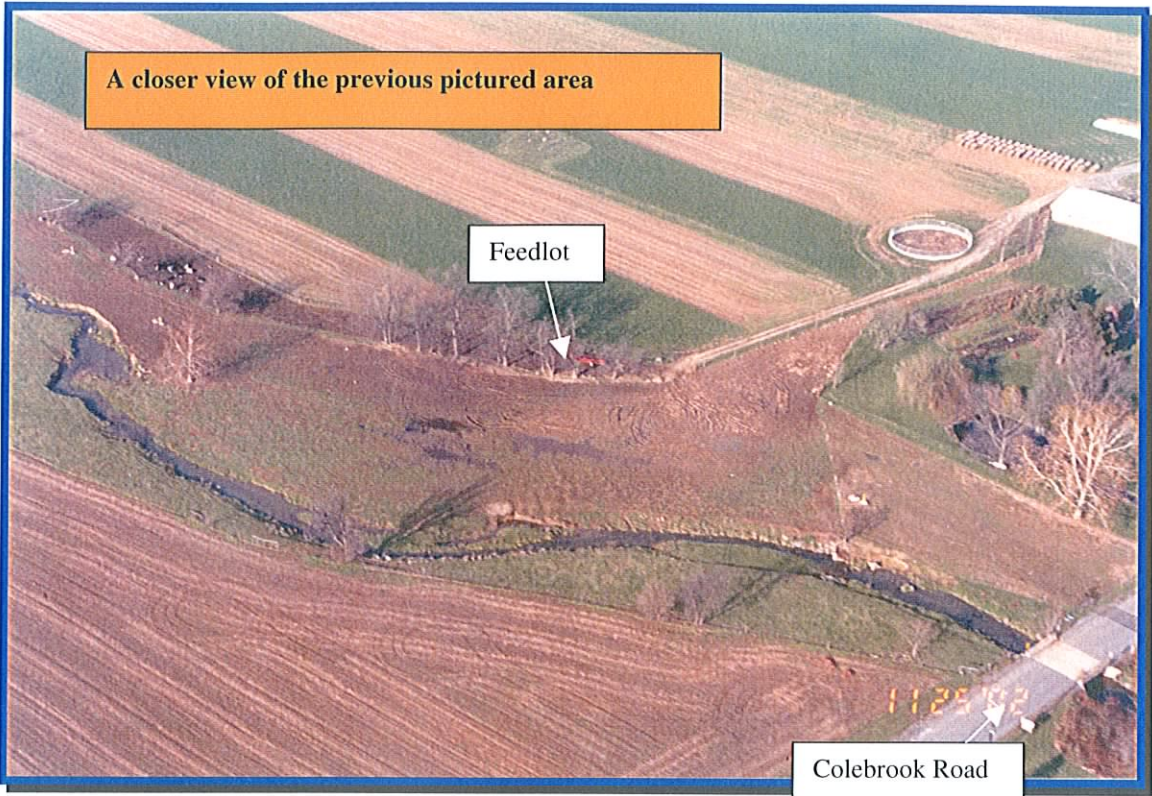






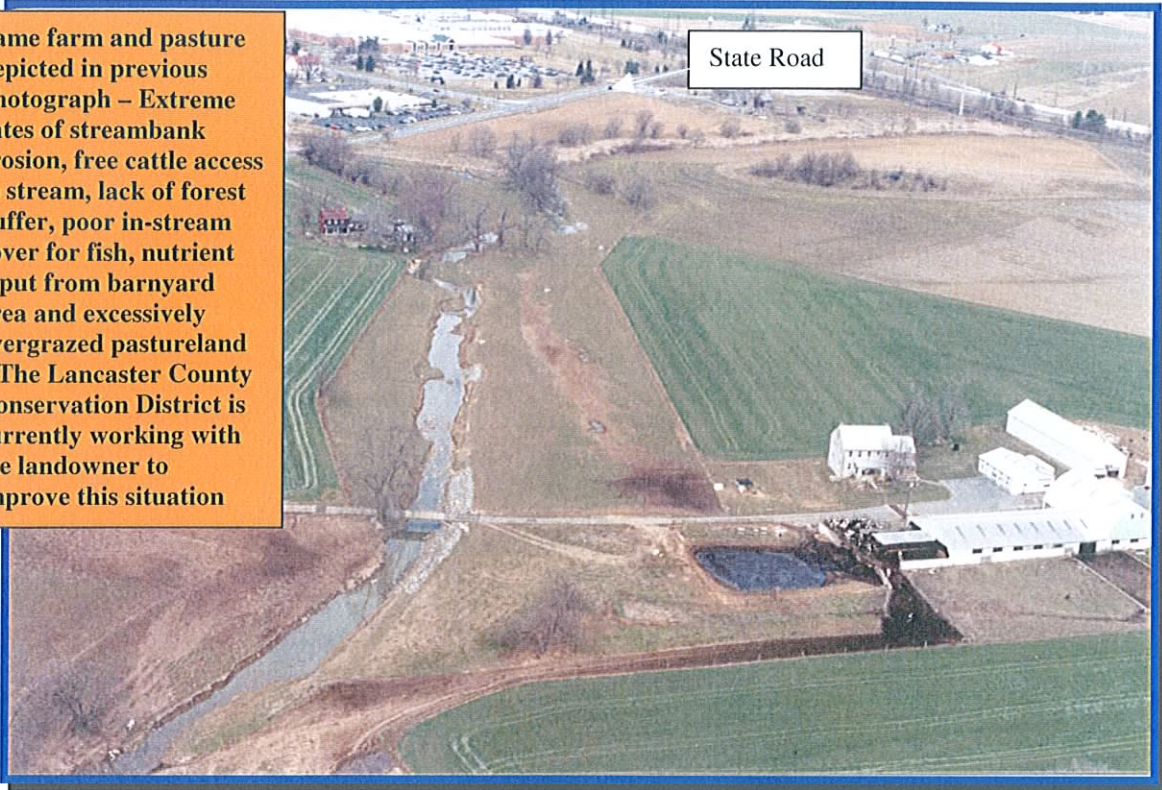




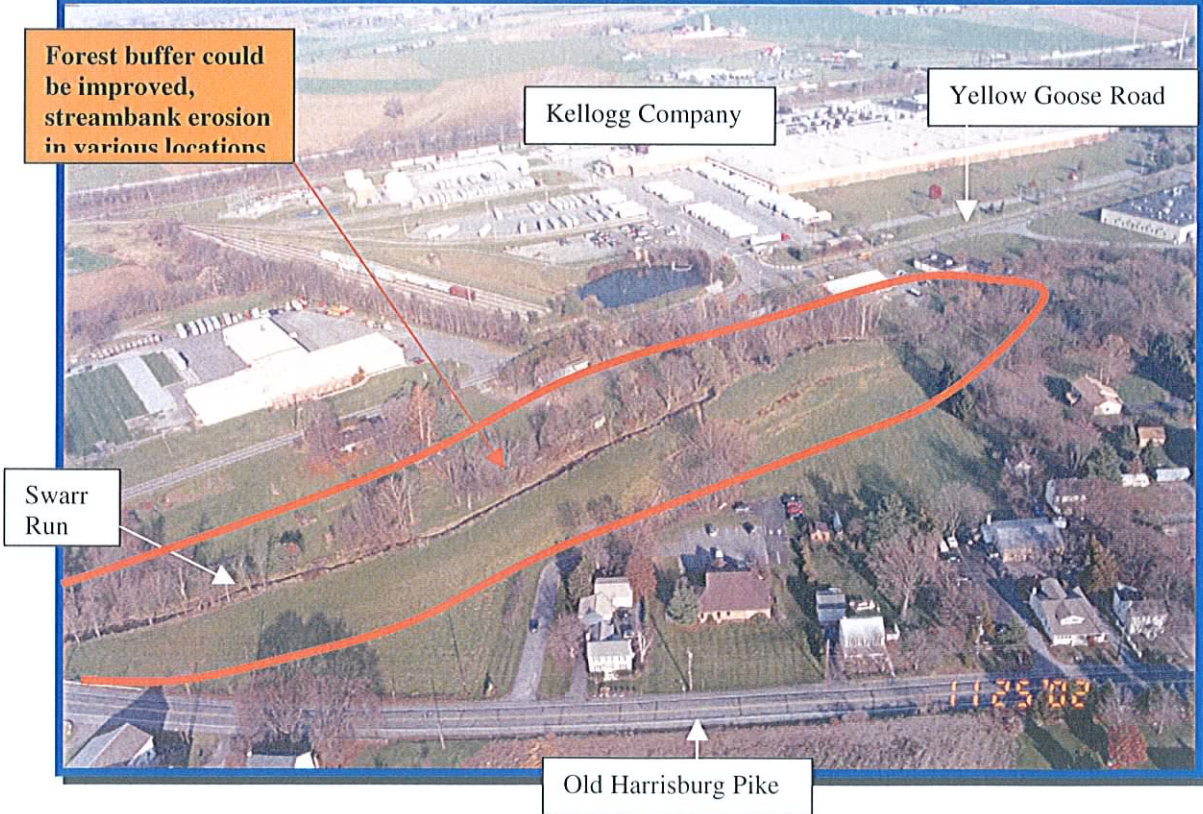




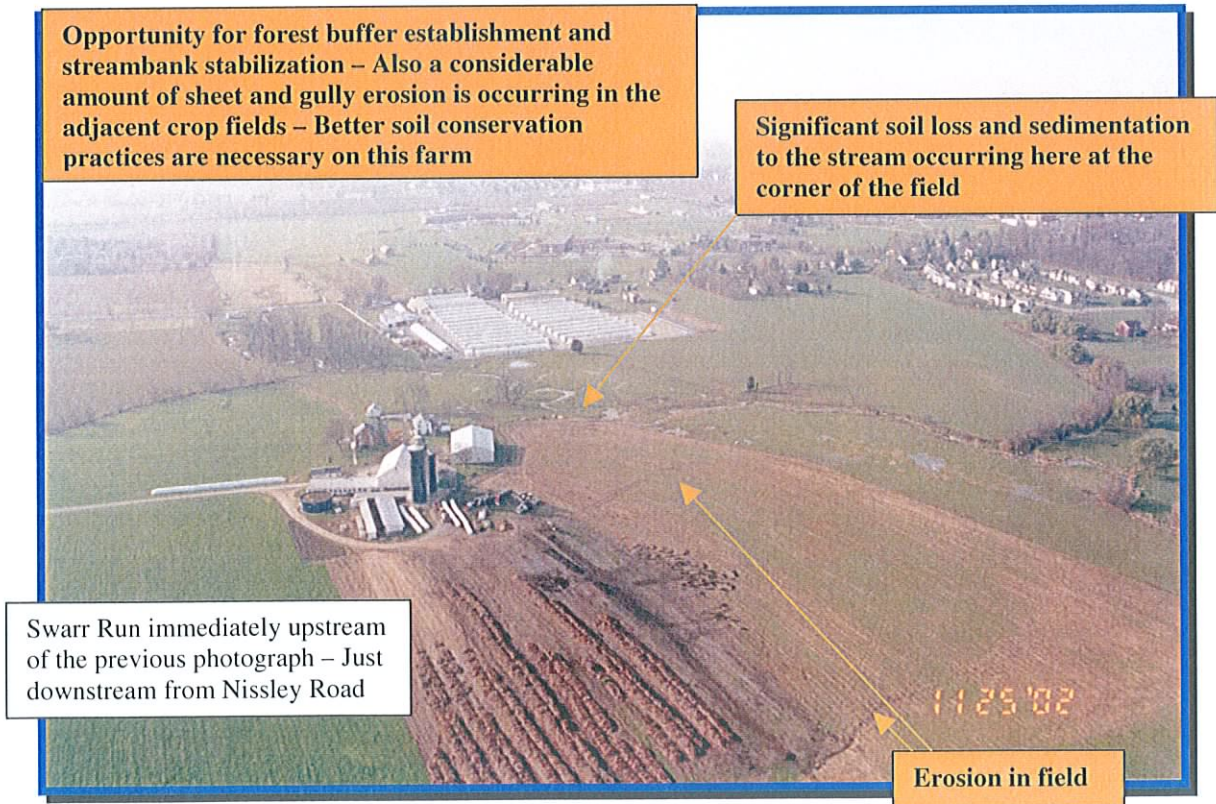
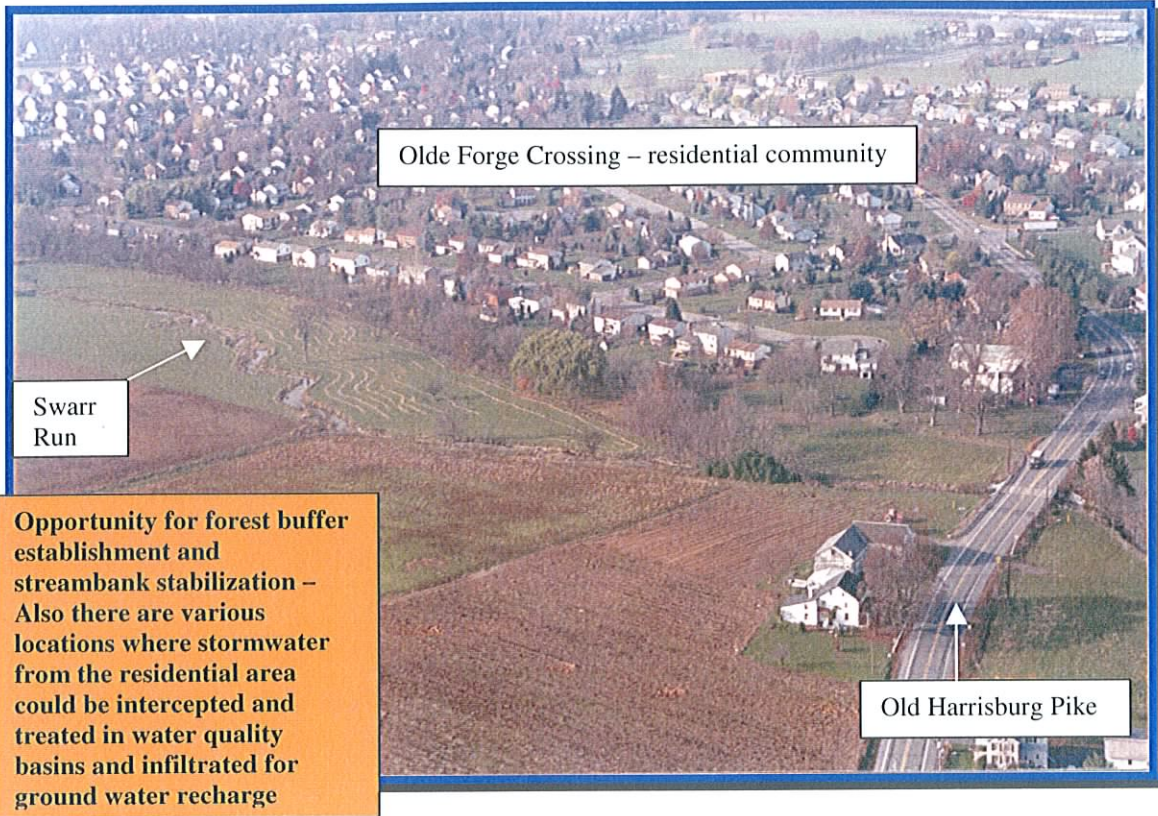
Same farm and pasture depicted in previous photograph – Extreme rates of streambank erosion, free cattle access to stream, lack of forest buffer, poor in-stream cover for fish, nutrient input from barnyard area and excessively overgrazed pastureland – The Lancaster County Conservation District is currently working with the landowner to improve this situation



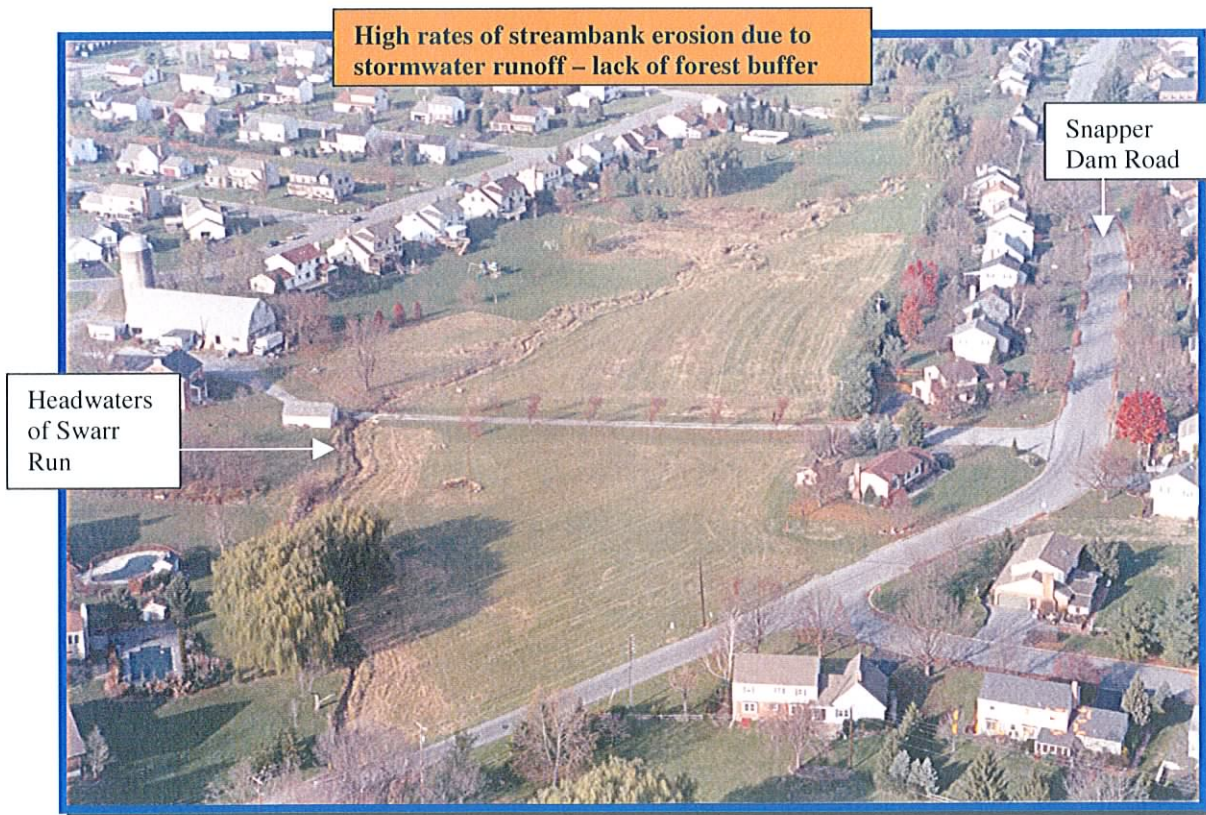
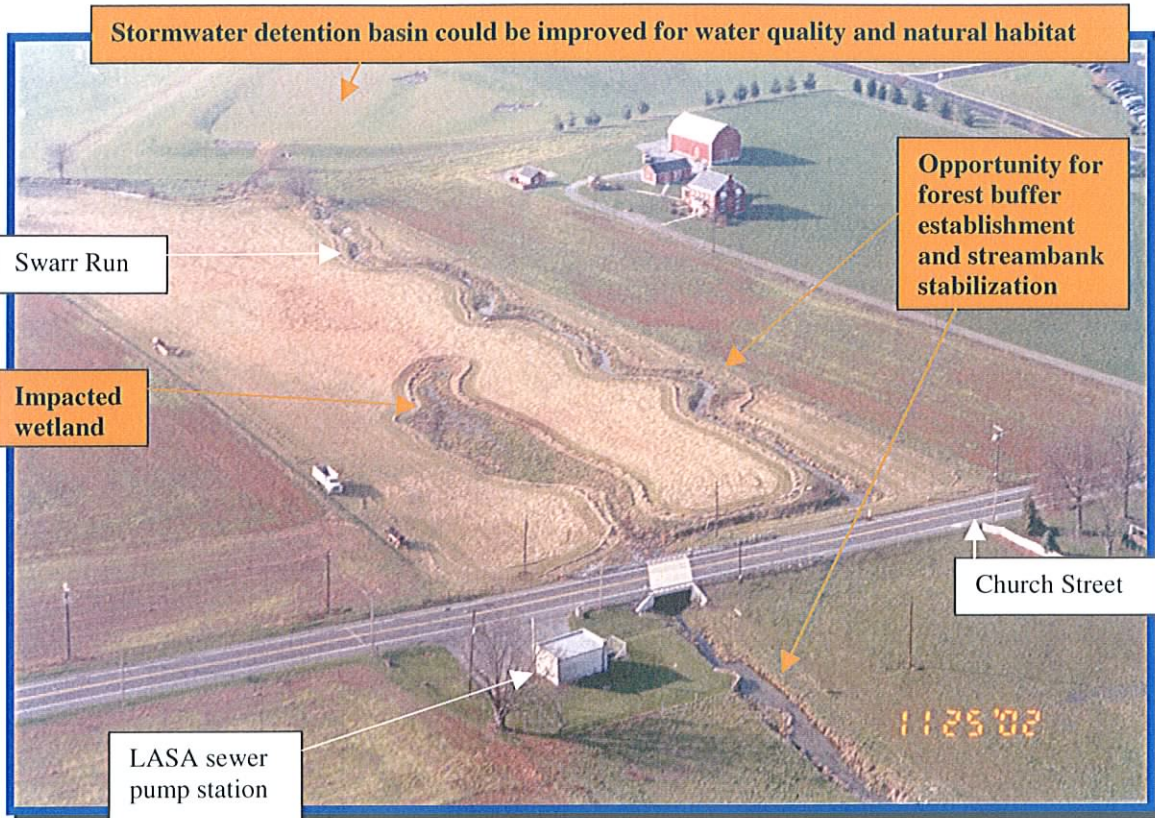
Forest buffer could be improved, streambank erosion in various locations









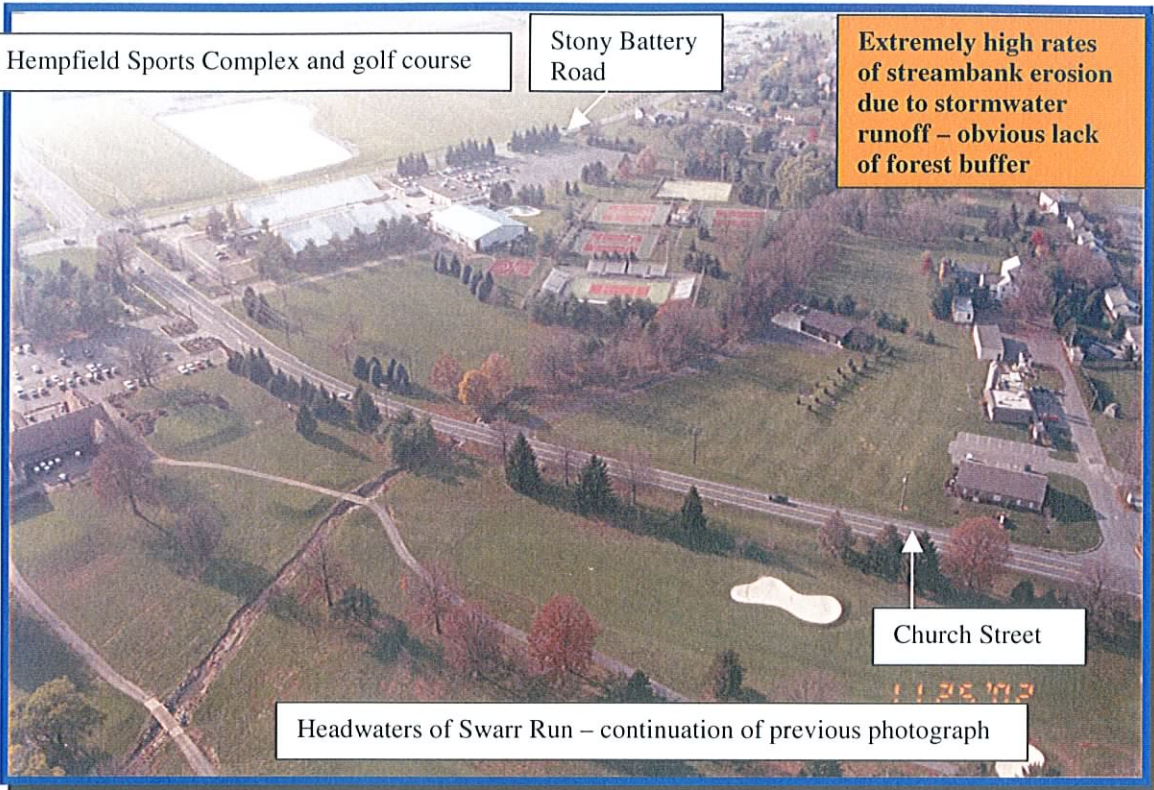




East Hempfield Sports Complex and golf course

Stony Battery Road

Extremely high rates of streambank erosion due to stormwater runoff – obvious lack of forest buffer



Headwaters of Swarr Run – continuation of previous photograph

Restoration plans being developed at this time for this outlined area



Spring Valley Road

Millers Run – A tributary to Swarr Run

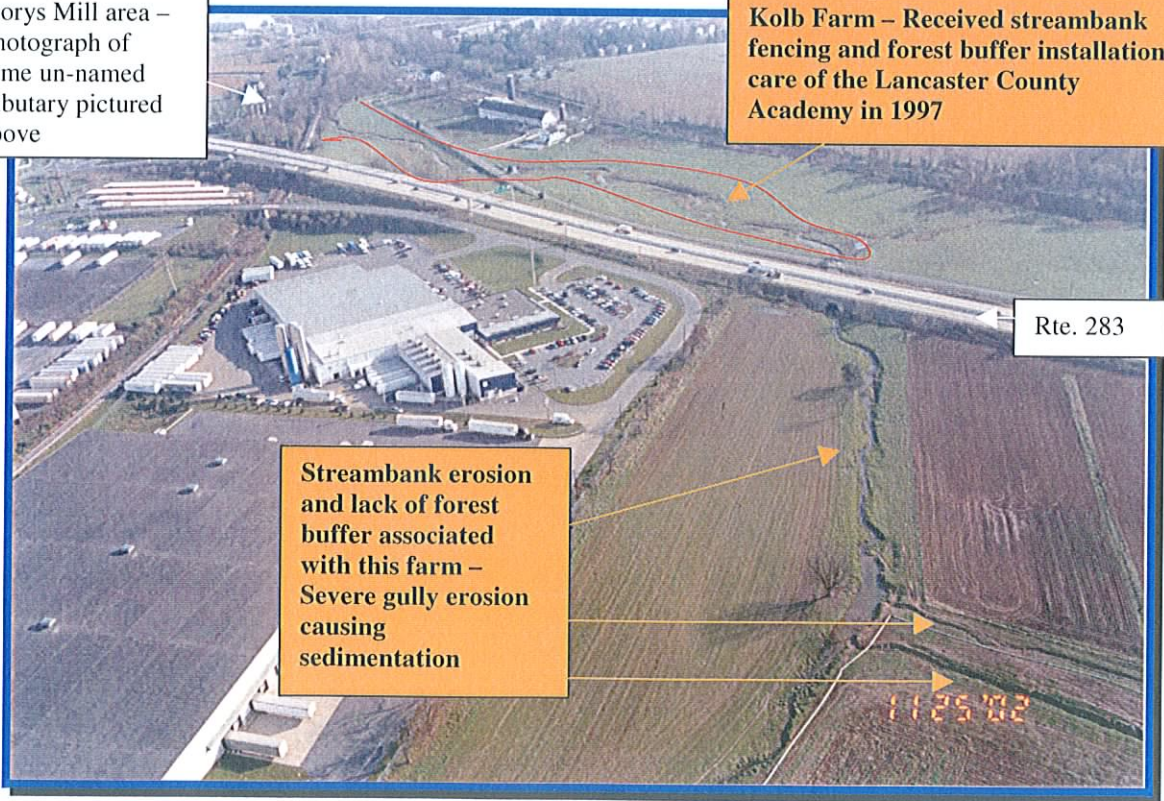
Site of future improvement work funded by received “Growing Greener” grant – This section of Millers Run as well as downstream reaches are severely eroded due to stormwater erosion – Much of the area was developed prior to Lancaster County adopting a stormwater management ordinance – Retrofitting stormwater management facilities, stream bank erosion repairs and forest buffer installations are needed throughout much of this sub-watershed





Florys Mill area – Photograph of same un-named tributary pictured above

Kolb Farm – Received streambank fencing and forest buffer installation care of the Lancaster County Academy in 1997





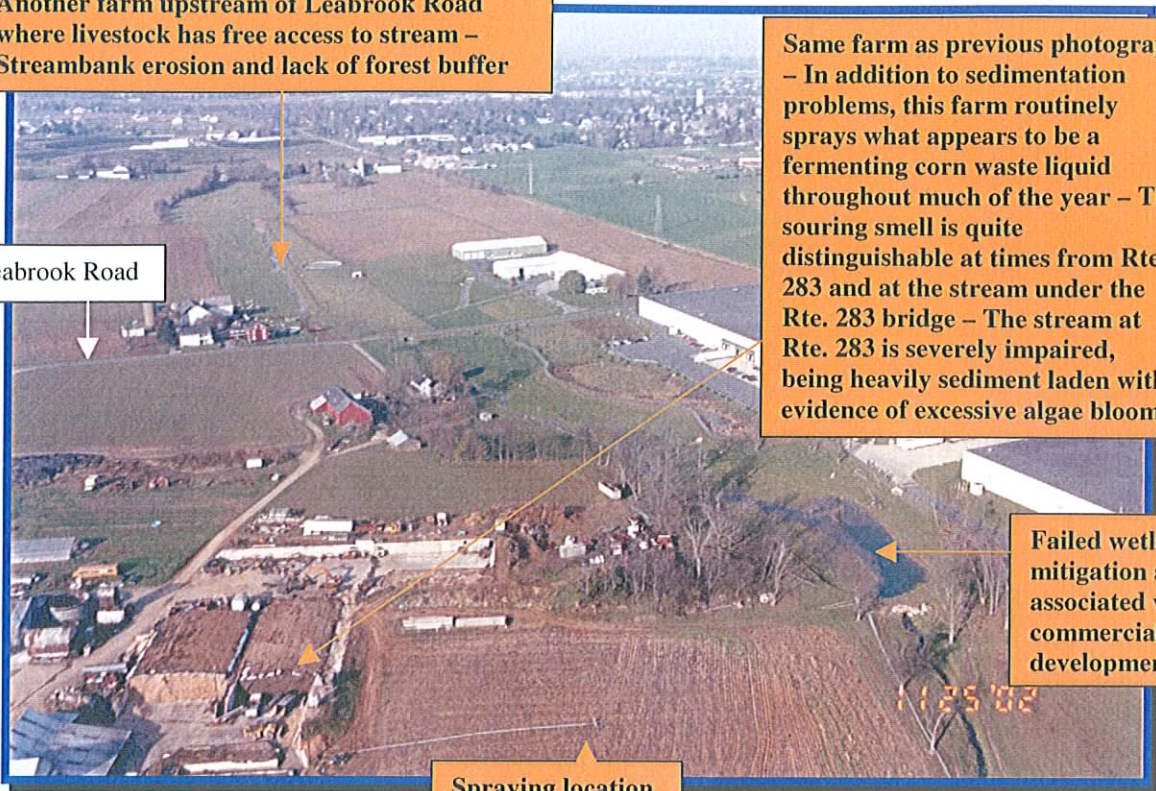
Another farm upstream of Leabrook Road where livestock has free access to stream – Streambank erosion and lack of forest buffer

Leabrook Road

Same farm as previous photograph – In addition to sedimentation problems, this farm routinely sprays what appears to be a fermenting corn waste liquid throughout much of the year – The souring smell is quite distinguishable at times from Rte. 283 and at the stream under the Rte. 283 bridge – The stream at Rte. 283 is severely impaired, being heavily sediment laden with evidence of excessive algae blooms

Failed wetland mitigation area associated with commercial development

Spraying location

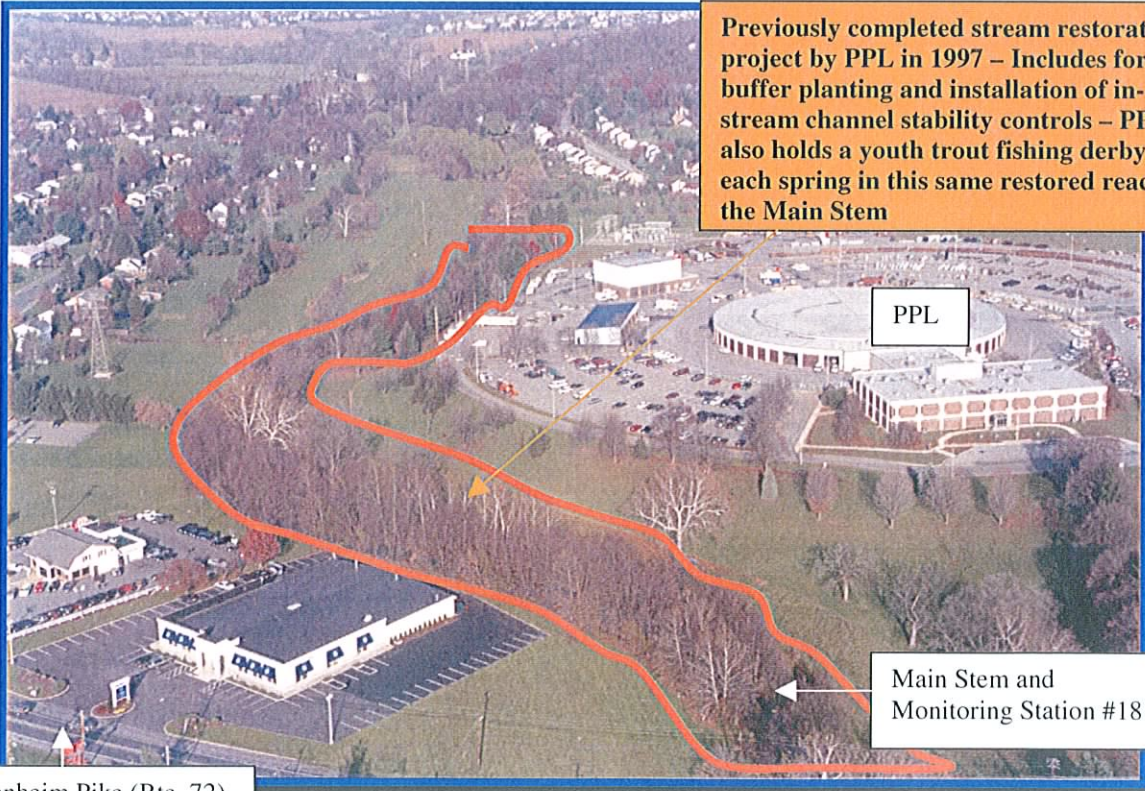


Previously completed stream restoration project by PPL in 1997 – Includes forest buffer planting and installation of in-stream channel stability controls – PPL also holds a youth trout fishing derby each spring in this same restored reach of the Main Stem

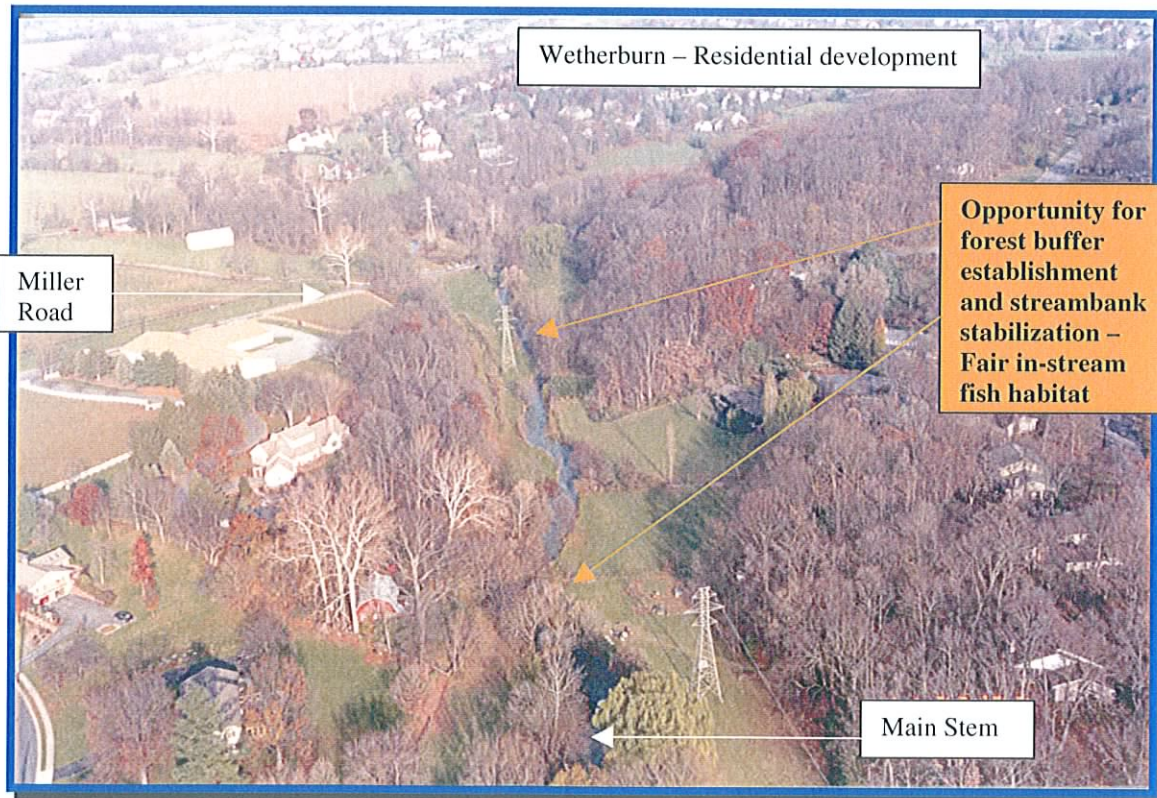
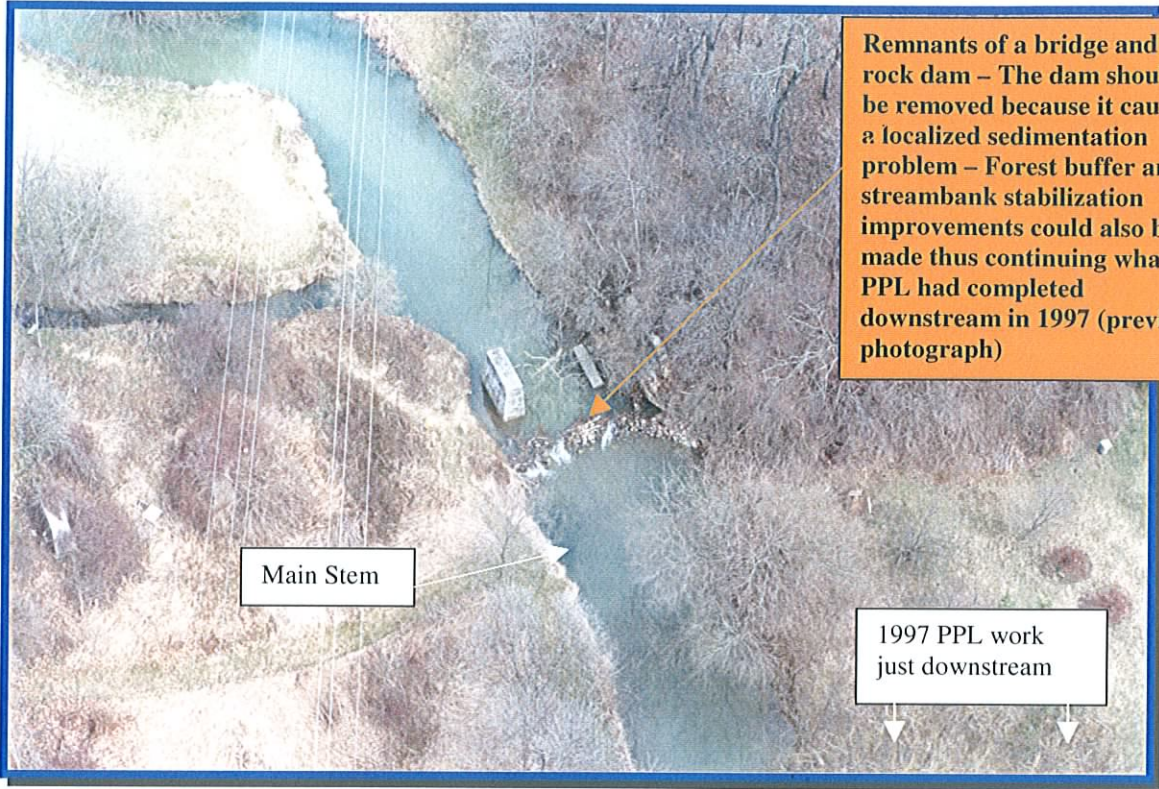
PPL

Main Stem and Monitoring Station #18

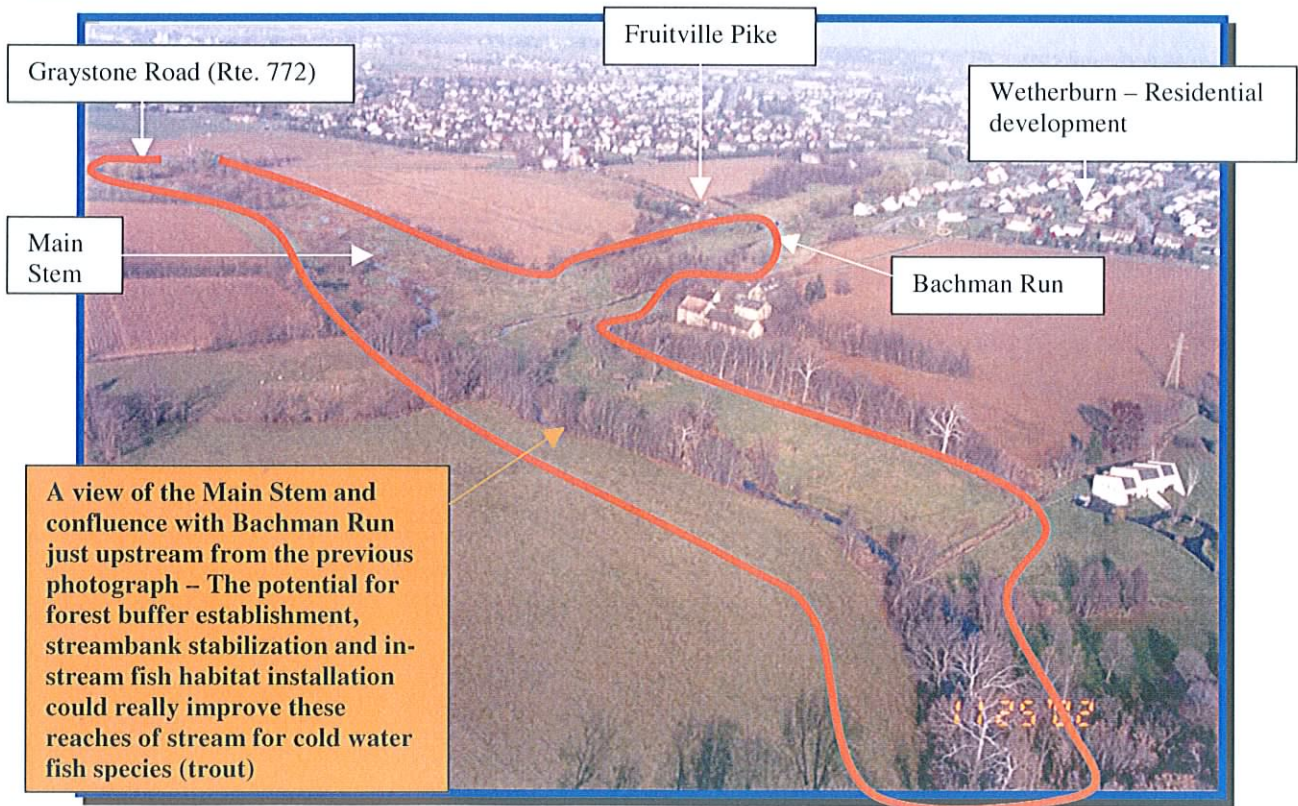
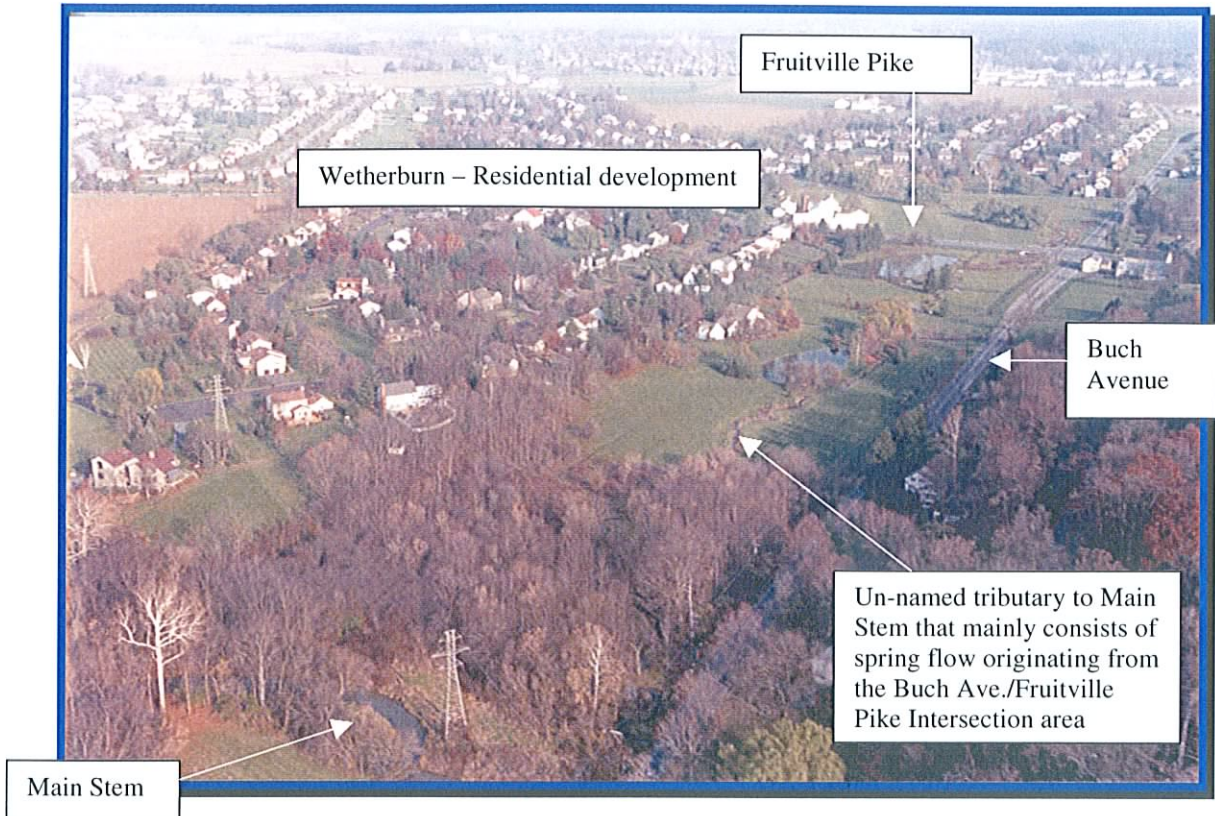
Manheim Pike (Rte. 72)



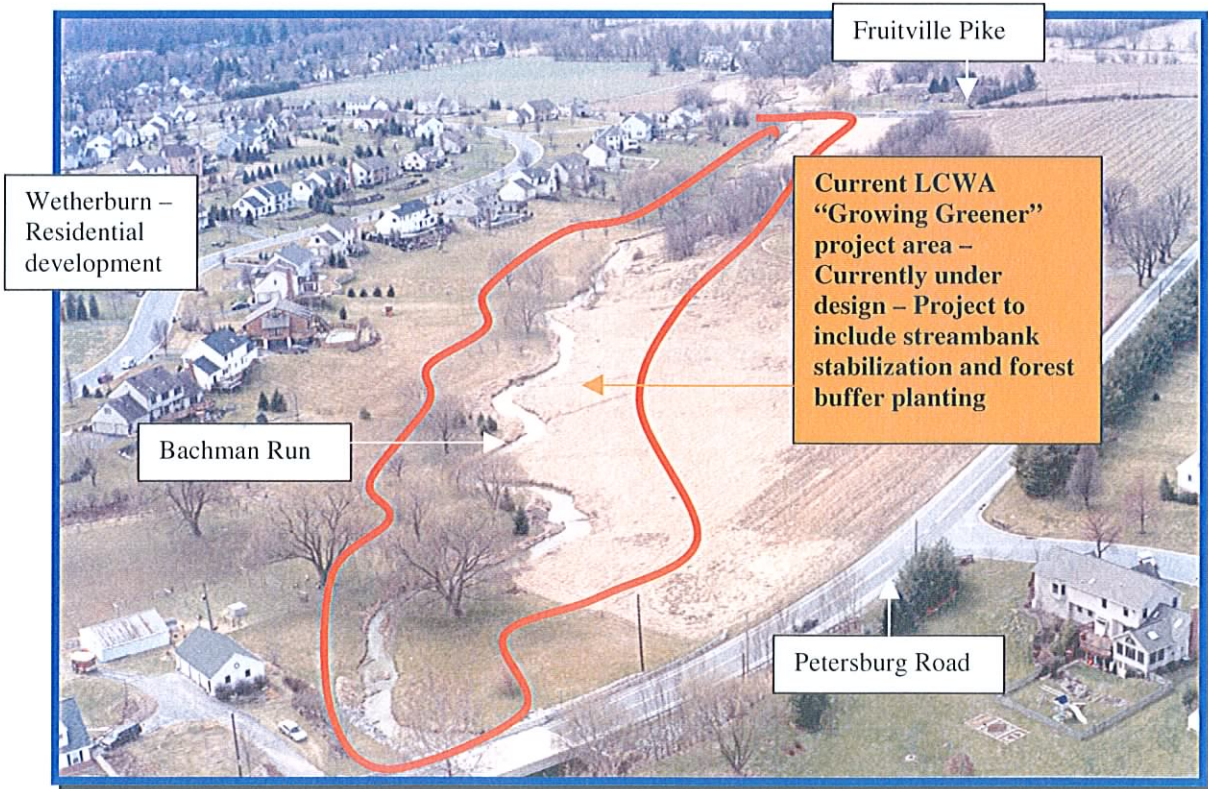
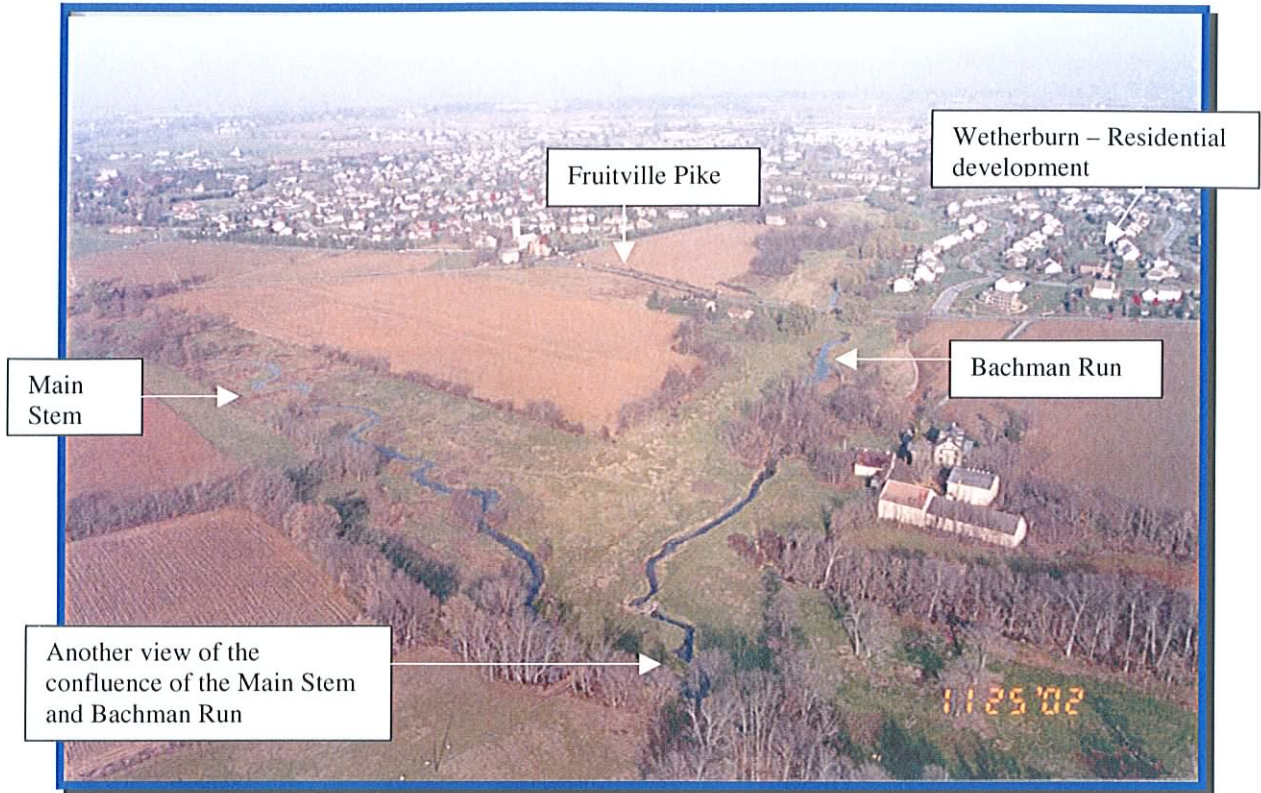














Lack of forest buffers and sediment laden substrate



Flyway Business Park

Kingspointe – Residential development

Headwaters of Bachman Run's east branch

Stormwater detention basins that could be improved for water quality

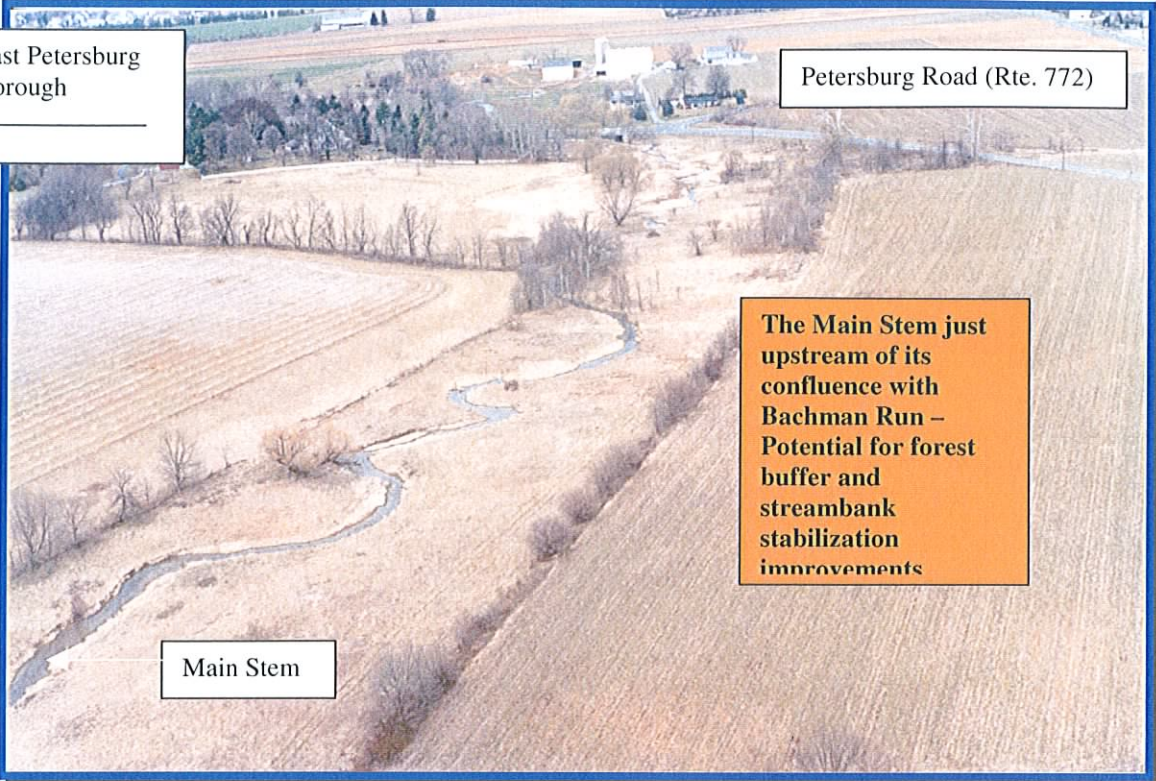


A view of an Amish farm and Rohrer's Quarry at the headwaters of Bachman Run's west branch – The farm is a source of nutrients and sediment mainly through the barnyard area – The quarry is currently in the midst of upgrading their sediment basin and handling of pumped water from the quarry pit to allow for a more consistent flow to the stream rather than periodic surges due to pumps turning on and off



East Petersburg  
Borough  
←

Petersburg Road (Rte. 772)



Main Stem

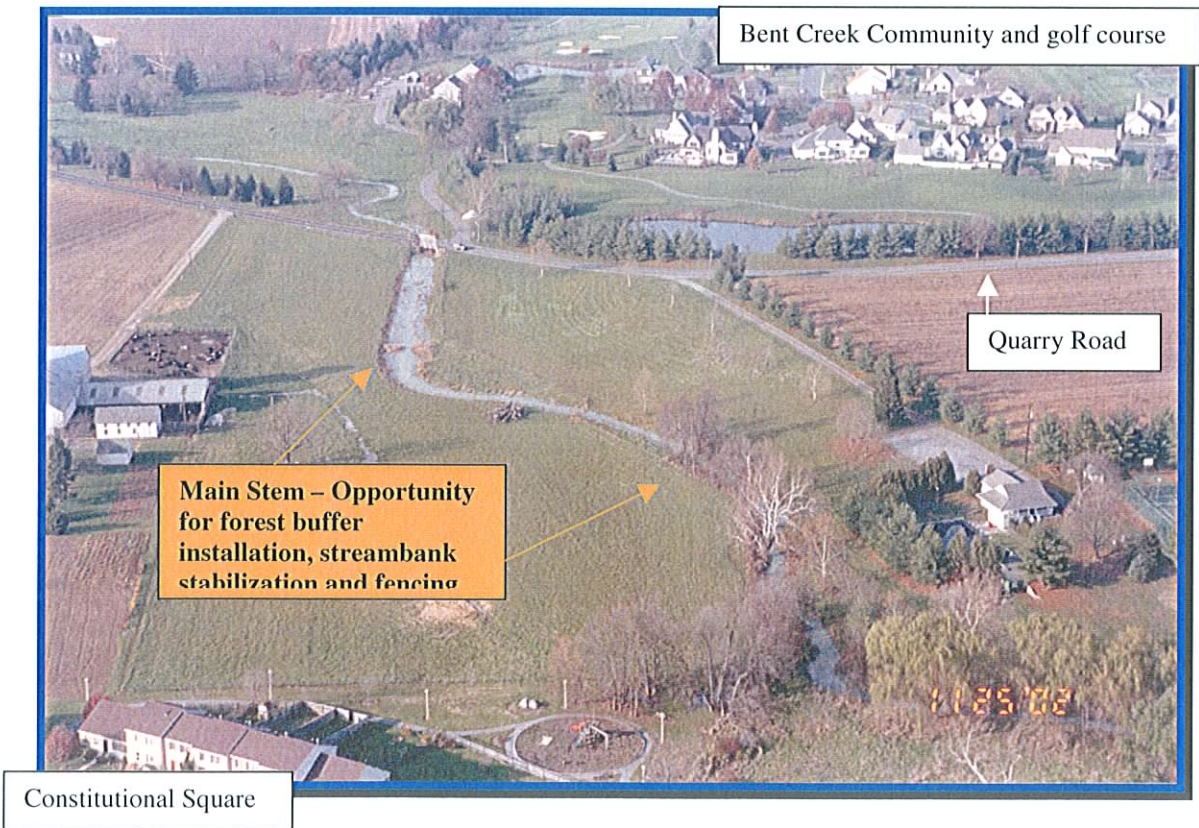
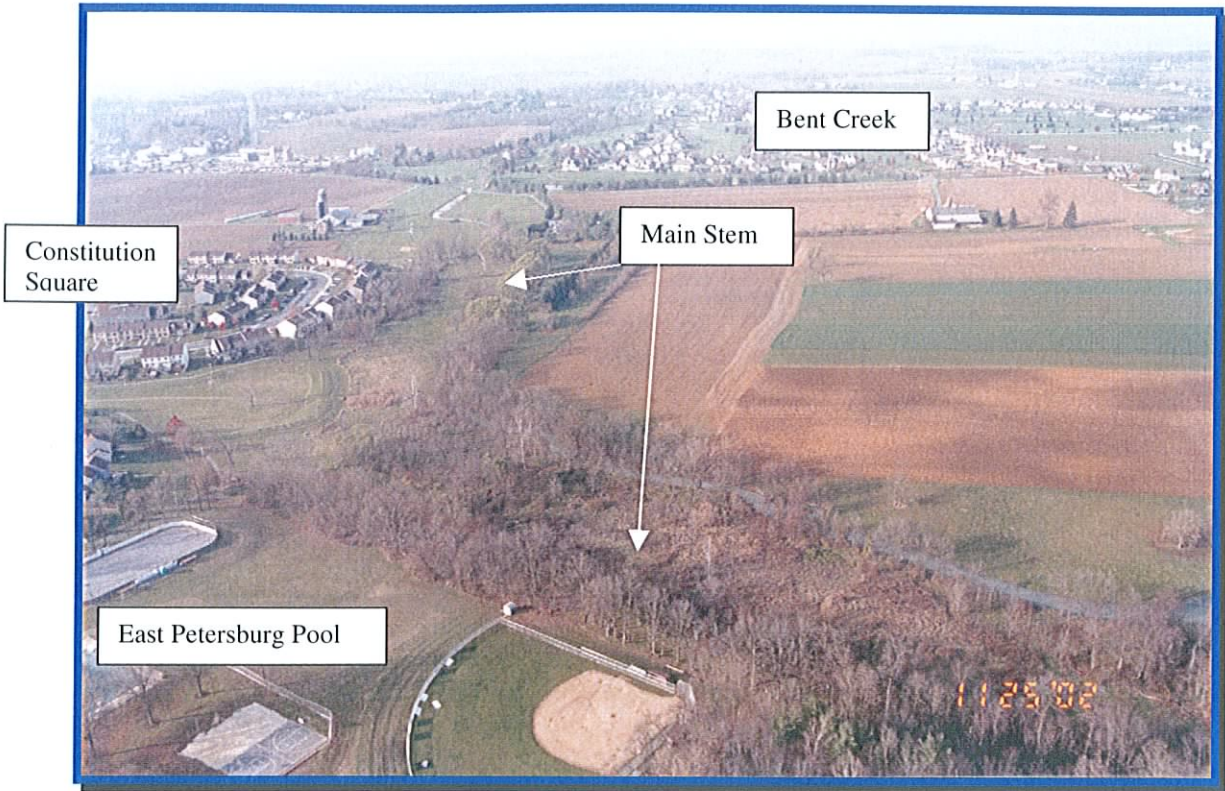
**The Main Stem just upstream of its confluence with Bachman Run – Potential for forest buffer and streambank stabilization improvements**

**Amish farm upstream of Petersburg Road – The free cattle access to the stream is creating significant streambank erosion – Also a lack of a forest buffer, lack of in-stream fish habitat and sediment laden substrate make this a severely impaired reach**



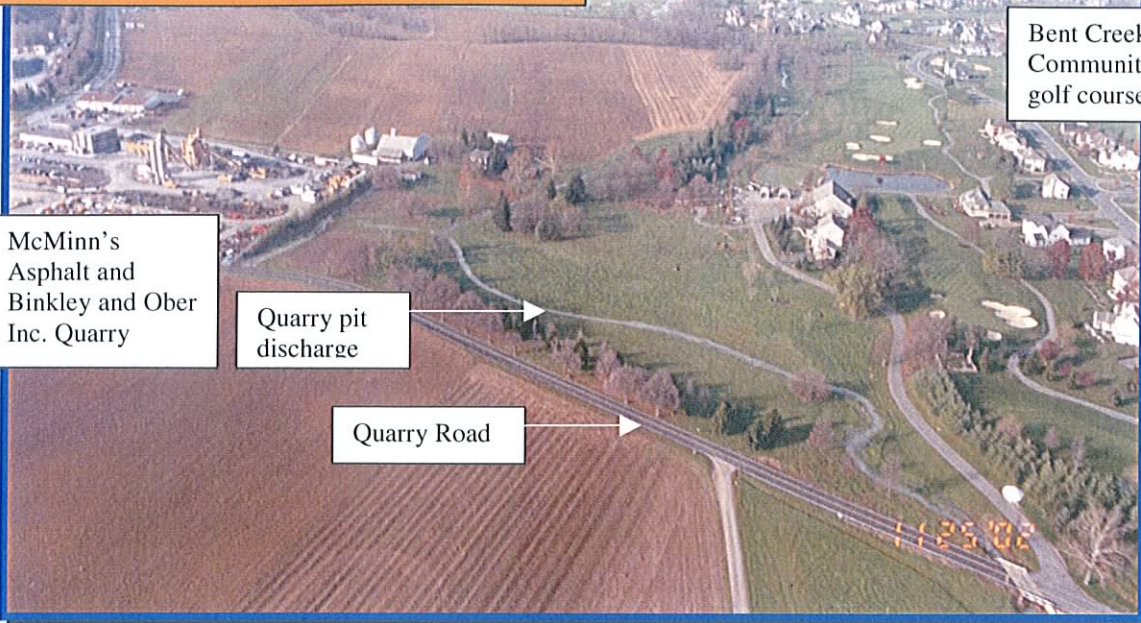
Property of the East Petersburg Sportsmen







The Main Stem above the quarry discharge is often dry during the summer months mainly due to sinkholes within the channel – The riparian corridor throughout much of the gold course is well preserve and protected



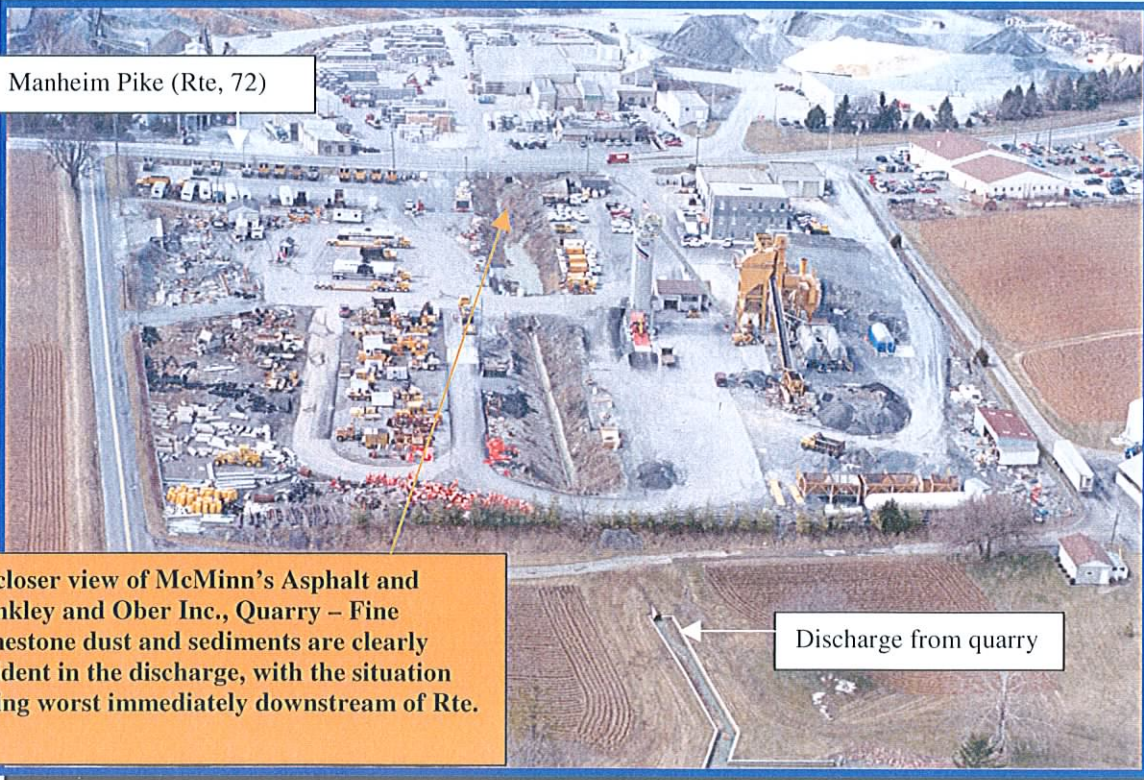
Bent Creek Community and golf course

McMinn's Asphalt and Binkley and Ober Inc. Quarry

Quarry pit discharge

Quarry Road

Manheim Pike (Rte, 72)



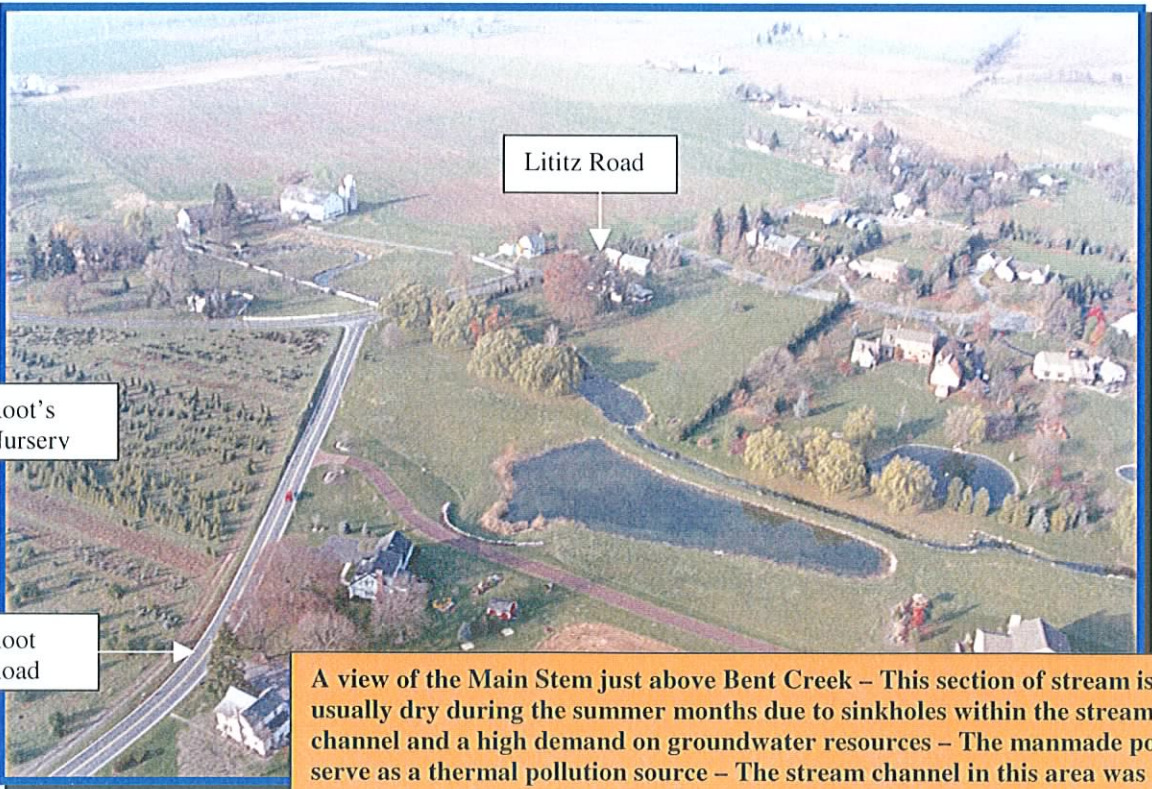
A closer view of McMinn's Asphalt and Binkley and Ober Inc., Quarry – Fine limestone dust and sediments are clearly evident in the discharge, with the situation being worst immediately downstream of Rte. 72

Discharge from quarry



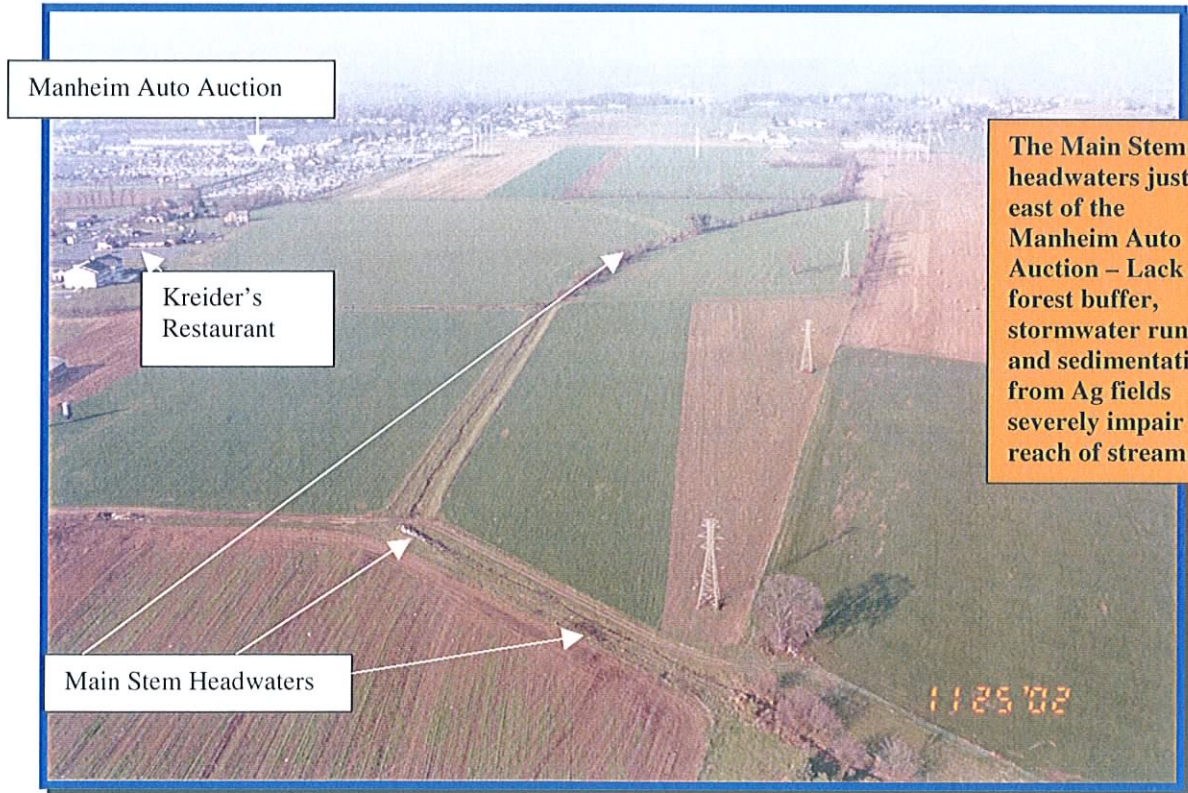


A closer view of the Bent Creek golf course – Wetland areas protected though a forest buffer planting would certainly be of benefit



A view of the Main Stem just above Bent Creek – This section of stream is usually dry during the summer months due to sinkholes within the stream channel and a high demand on groundwater resources – The manmade ponds serve as a thermal pollution source – The stream channel in this area was heavily landscaped and is maintained in a most unnatural state







The beginning of the Little Conestoga Creek – South of Manheim, east of the Manheim Auto Auction

Lack of forest buffer, streambank erosion due to stormwater runoff and cattle access to stream

Bucknoll Road

