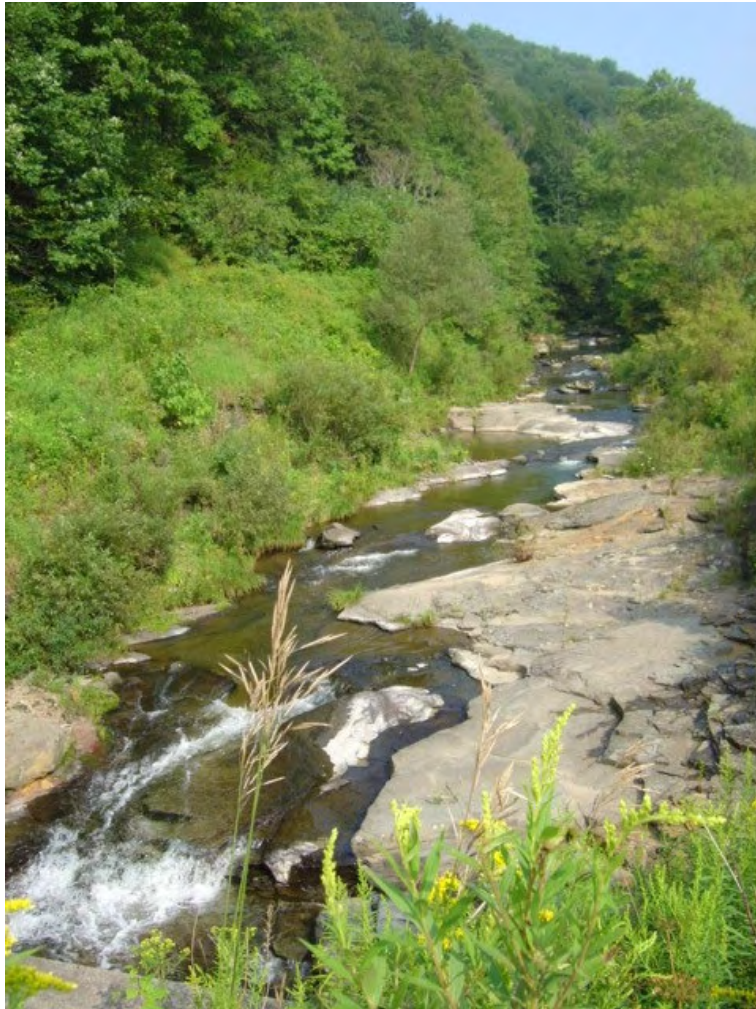


Tioga County Chesapeake Bay Tributary Strategy



Written March 11, 2005
By the Tioga County Conservation District

Approved March 16, 2005
By the TCCD Board of Directors

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Background

Tioga County is located in the Northern Tier of Central Pennsylvania. The county encompasses 1,137 square miles and has a population of 42,000 people. It is located entirely within the Susquehanna River Basin. Tioga County is unique in that it is drained from the south by Pine Creek, Kettle Creek and Lycoming Creek, tributaries of the West Branch of the Susquehanna, and from the north by the Cowanesque and Tioga Rivers, tributaries of the North Branch of the Susquehanna. There are distinct differences in the stream types in these major drainage basins, and as a consequence the critical resource issues in these watersheds differ greatly. The West Branch tributaries contain most of our High Quality and Exceptional Value streams, while the North Branch tributaries are predominantly Cold and Warm Water Fisheries (CWF and WWF, respectively). The following paragraphs, taken from the Tioga County Comprehensive Plan, describe how the county was settled and developed and most likely will continue.

Since the beginning of the settlement period in this county, the landforms, underlying geology, flow of water and natural resources of the region have guided how and to large extent why the county was developed. Since the primary mode of transportation for early settlers was by river, it stands to reason that the natural division of the county by major watersheds was followed. The county was settled from two different directions. The North Branch of the Susquehanna River was settled from the northeast, while the West Branch of the Susquehanna was settled from the south. The vast, seemingly endless forests and mineral resources (coal) of the West Branch brought loggers and miners. The fertile and (for the most part) farmable lands of the North Branch brought farmers. To this day the distinct differences in land use influence how the land is used and developed.

The West Branch consists of the Pine Creek watershed and is predominantly forested, undeveloped and mostly State Forest. Route 6 East-West bisects this region of the county, which is foremost a tourist destination, with abundant trout fishing and opportunities for hunting, camping and hiking. Several areas have excellent soils, and dairy farming is a major form of agriculture. The county seat of Wellsboro is located in this watershed and is also a major tourist town.

The North Branch consists of the Tioga and Cowanesque Rivers and is predominately agricultural and commercially developed land. Large tracts of forested land also occur in this watershed, which offer excellent hunting and fishing opportunities. This part of the county is bisected by Route 15 (future I-99 corridor) North-South and has the greatest development potential. The streams and resources of this region show the most impact from development and therefore will require more stringent protection measures to ensure stream channel stability, flood protection and maintenance of designated uses for water quality.

As the transportation, land use, and economic development components of the Comprehensive Plan are implemented, their interrelated nature must be integrated into a seamless whole. “The natural resources of this area have influenced how the land was settled, as well as how it has been and will be developed. Conditions throughout the watershed, including soils, steep slopes, water quality, and economic development have all dictated land use around the river corridors of the county. As the recommendations for each of the components of the plan are implemented, they will have a profound affect on the quality of life, the forms of production and the future resource base of the county. Each of the components is interrelated and influential upon the others. Without attention to the common links between them and the influences of each in turn, the implementation and development of the county will not reach its full potential.”¹

If the Comprehensive Plan for the county addresses the development and protection of resources from a holistic perspective, so too must our Tributary Strategy. We must shift from thinking that the solutions to sediment and nutrient impacts are impossible, (Tier 4 / E3 Everybody, Everything, Everywhere) to possibilities thinking. “So, what would this look like if it *were* possible?” We would like to suggest that E3 is possible and it involves another E3 Strategy – Education, (E)nclusion, Enforcement. We must stop looking at simply finding solutions to specific problems, because in the end that’s all we’ll have to show for our work (the solutions to problems). Instead we must start looking at quality of life issues, how we will support them, and what we want our community to look like far into the future. This holistic perspective and framework for making decisions can be successful, even if it has nothing to do with the Chesapeake Bay and some poor little blue crab.

How are we to begin to engage the public in some altruistic theory that the BMP’s we have prescribed to solve sediment and nutrient pollution for 30 years are going to all-of-a-sudden bring back the Bay and provide a habitat for a little crustacean that most people have never seen, some people don’t like or haven’t tasted and will never bother to clean up their own act for the sake of *Callinectes sapidus*. The heart of our Tributary Strategy, while geared ultimately toward the health of the entire Chesapeake Bay, is focused on improving the health of our natural and human communities here in Tioga County.

¹ Tioga County Commissioners, Tioga County Comprehensive Plan, Draft 2004.

Introduction

Tioga County is composed primarily of headwater streams. It is a rule of thumb that as the first order tributaries go, so goes the watershed. We are in a position in space and time to affect the tributary strategy the most by working in these 1st order watersheds - everybody's backyard. By shifting our perspective to why it's important to us here in Tioga County - to improve our water quality (we all drink it), reduce topsoil loss (our largest export!) and reduce nutrients (they grow our food) from leaving the land - we can adopt actions and strategies to implement these reductions. By stressing the importance of our quality of life and our future resource base, we can change our behaviors and deeply held beliefs on why we need to become good stewards. Once again, this starts in the first order tributaries, everybody's backyard.

In 2002, after participating in a process called Local Motion developed by NACD and facilitated by the PACD, the Tioga County Conservation District developed a Strategic Plan, which we called our Business Plan. This planning process was the first step in our discovery that we could incorporate all of the social, economic and environmental factors in our framework of conservation. The following Business Plan and Geographical Priorities Map show the details of this planning process. When we started we knew it would not be something we could complete in just a few years, and we also knew we would need to refine and amend this plan as time moved on.

This strategic plan, with amendments, includes two annual plans that have moved the District to measure the results of our work in the county. It has also given us the ability to identify agencies and other partners to expand our influence and get the message of conservation and the importance of our natural resources to an ever-widening sphere of residents in the county.

Our work with farmers, developers, and the public has improved and increased because of our planning process. We have also increased our participation with agencies with similar missions in the county. One recent improvement has been to increased communication and participation of the County Planning Department. We now have a direct link with the Planning Director for the County sitting on the Conservation District Board of Directors. As a result, the draft Comprehensive Plan for Tioga County has direct links to conservation and watershed based resource planning.

The Tioga County Comprehensive Plan that is before the County Commissioners for public comment includes the Tributary Strategy as part of the Natural Resources component of the plan.

► Assist the Tioga County Conservation District in the implementation of the Chesapeake Bay Tributary Strategy.¹

¹ Tioga County Commissioners, Tioga County Comprehensive Plan, Draft 2004.

In addition, since Governor Ridge's institution of Growing Greener, we have gone from two watershed associations in Tioga County to eleven, with an ever-expanding knowledge base and activity at the watershed level. Our partners have increased the effectiveness of the work the District does and also increases the educational opportunities of the staff. We routinely work with these groups through our watershed specialist, directors, and others on the staff to increase awareness of water and land resources in the county.

Based on this work, we are developing a Tributary Strategy that is inclusive, holistic and closely linked to the health of the Bay. We haven't deluded ourselves in thinking this will be easy or that we have completed this process. There will be bumps in the road and gaps in what we said we would do and what we actually complete. It is an iterative process, as we do it we get better; as we get better, we accomplish more things and reach more people. The overall effect is to make E3 doable, and the following documentation will describe how we will attempt to do it. The only impossibility is the deadline we've been given!

Tioga County is fortunate in that we have a wealth of natural resources. We have large expanses of forestland, clean high quality streams and rivers, and a population with a strong environmental ethic. Our streams and landscapes are clean and green. We will strive to protect the quality of our home and restore and mitigate the areas and resources impacted by development and human activity. This will only occur when everyone, everywhere does everything they can to protect preserve and enhance biological integrity.



Conservation District Business Plan Tioga County Conservation District

I find the great thing in this world is not so much where we stand as in what direction we are moving. – Oliver Wendell Holmes Sr.

Organization: Tioga County Conservation District; A political subdivision of the Commonwealth of Pennsylvania

Function: To take available technical, financial and educational resources, whatever their source, and focus or coordinate them so that they meet the needs of the local land manager with conservation of soil, water, and related resources.

We Serve: All land users of Tioga County

Purpose: To provide education and seek voluntary compliance for natural resource conservation including biodiversity, soil, water and cultural resources.

Mission Statement: Provide for the Conservation of Natural Resources of Tioga County through Leadership, Education and Technical Assistance

Critical Natural Resource Issues:

1. Soil Erosion
2. Land Use
3. Water Quality
4. Storm Water Management
5. Riparian Buffers

Critical Geographic Areas: See attached Map.

Statements of Intent (Outcome) for each of the Natural Resource Issues:

1. By 2005, every high school junior will be educated to the cause and effect and abatement of soil erosion.
2. By 2010, all municipal officials will be educated to the use of BMPs and existing laws and regulations pertaining to land use issues and comprehensive planning.
3. By 2005, compile all data available on all bodies of water in Tioga County.
4. By 2003, the District will cooperate with other groups and agencies to hold educational meetings on storm water management.
5. By 2012, 70% of impaired riparian areas will be restored.

Tioga County Geographic Priorities

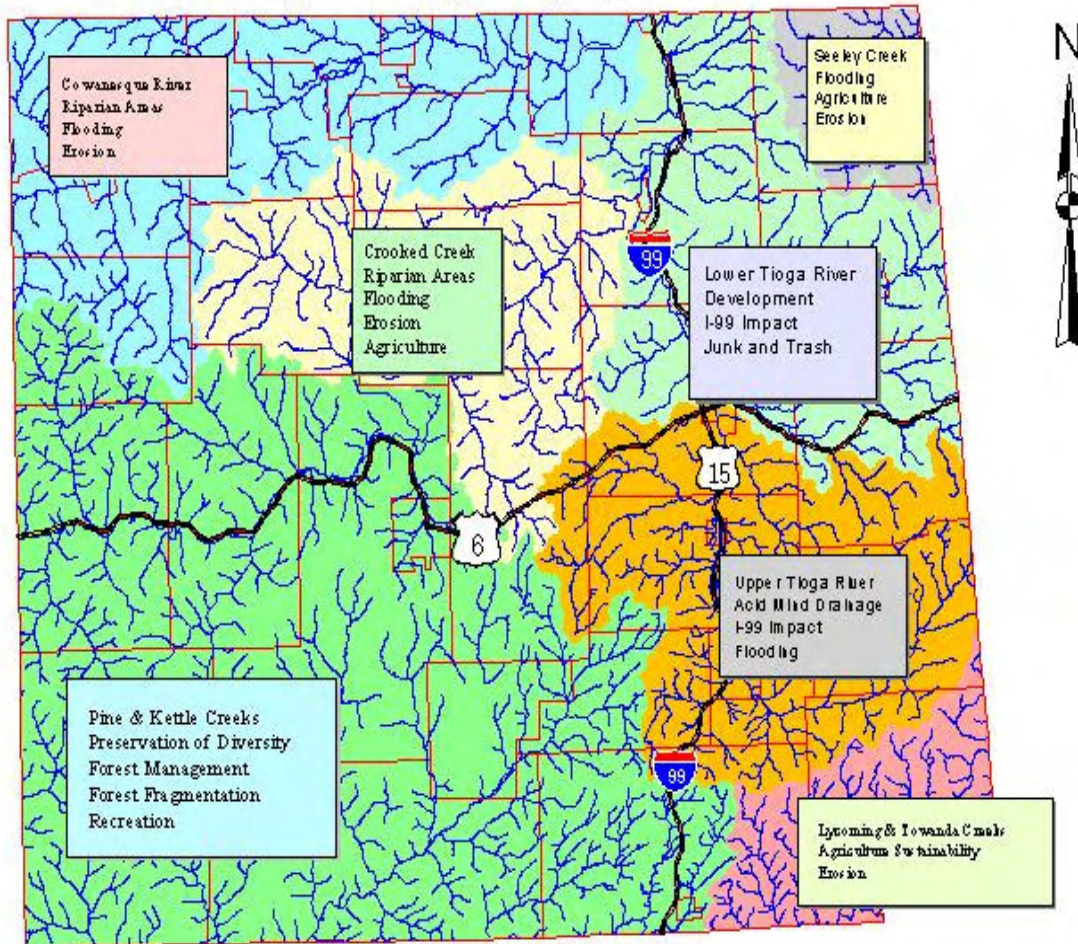


Figure 1: Map of the Geographic Priorities in Tioga County. TCCD, 3/11/2005.

Tioga County Land Use Trends

Land Development, Agriculture, Dirt and Gravel Roads, and Logging

Tioga County is home to a varied abundance of natural resources, and there are several types of land uses and resource extraction operations that exist here. Since the turn of the century our forests have matured and reached harvestable size. Over the last 10-20 years, logging has picked up speed in Tioga County. Because of this logging, more earth disturbances are occurring, causing more erosion, which is impacting the streams in Tioga County and ultimately the Chesapeake Bay. Agriculture, which we will discuss later in this section, is still a dominant land use in the county with significant impacts to streams as well. Increasing development caused by changing demographic pressures, tourism, and industry also have the potential to impact streams throughout the county. The completion of the Route 15 Highway Corridor, as one example, is expected to increase development and runoff issues.

Babb Creek: Logging is very active in this watershed. There is privately owned land and State Forest land. The watershed is not highly developed in terms of commercial, residential, or industrial uses, except for projects pertaining to the treatment of acid mine drainage. Many dirt and gravel roads directly discharge into Babb Creek. Other than stream bank erosion and agriculture, logging and dirt and gravels roads are probably the most active causes of erosion in the watershed. Babb Creek drains into Pine Creek, which is an exceptional value stream. Wilson Creek and Stony Fork also drain into Babb Creek and they are cold-water fisheries. Acid Mine Drainage is being treated at the Rattler Mountain AMD Site.

Charleston Creek: Logging is very active in this watershed, as is commercial, industrial, and residential development. The watershed is just a few miles from the borough of Wellsboro and therefore, a lot of development is occurring. Subdivisions are rampant. There is a lot of highway runoff (storm water) from U.S. Route 6, as well as many dirt and gravel roads that impact Charleston Creek. There have also been various logging complaints over the years that the TCCD has handled. There is a lot of stream bank erosion occurring on this creek, which flows into Marsh Creek and then into Pine Creek.

Wilson Creek: Logging occurs in this watershed, but agriculture and urban runoff probably have the biggest impact on the watershed. Residential development is occurring but minimal compared to the Charleston Creek watershed. Acid mine drainage is being treated by an NPDES General Permit Site (Anna S. Mine Complex AMD Treatment Site). The TCCD did a stream assessment of this creek three years ago, and another assessment of the tributaries to Wilson Creek is currently being conducted. Numerous dirt and gravel roads directly discharge into Wilson Creek, which feeds into Babb Creek and then Pine Creek.

Marsh Creek: This is probably the most unique stream in Tioga County. After the last glaciation period, the course of the stream has completely reversed. This change in course has created unique management challenges and land use issues. Wetlands, agricultural drainage, stream flooding and debris are all important components of the watershed. It has the biggest sewer plant in the county (Wellsboro Borough), and water quality from urban stormwater complicate and compound the solutions.

Logging occurs on the tributaries of this stream, and urban runoff (storm water) is also a major problem (Route 6, commercial, residential development). Marsh Creek runs parallel to Route 6. The creek has been channelized over the years, mostly because of its proximity to Route 6. Stream bank erosion is rampant and dirt and gravel roads directly discharge into the streams causing sediment pollution.

Pine Creek: This creek is considered an exceptional value stream. It is located in the Tioga County State Forest and really the only direct impact is by its tributaries (Wilson Creek, Babb Creek, Stony Fork, Marsh Creek, and Charleston Creek). Some logging occurs by the DCNR Agency. Recently, the Francis –Leetonia Road was relocated so that it did not impact Kramer Run, a high-quality tributary stream in the watershed. Dirt and gravel roads are the biggest impact to Pine Creek.

Tioga River: The biggest impact to this river is the Route 15 Highway Corridor. The storm water runoff is tremendous. Because of this new 4-lane highway, more residential and commercial development is occurring, causing increased runoff. Also, the dirt and gravel roads create tremendous sediment pollution when rainstorms occur. This all ends in the Tioga Dam or the Hammond Dam from Crooked Creek. Logging and agriculture are also dominant in this watershed. Mining and acid mine drainage also impact several streams near the headwaters.

Crooked Creek: Logging and agriculture are very common in this watershed, as is residential development. Storm water runoff from highway roads and dirt and gravel roads is the most common erosion and pollution problem.

Cowanesque River: Agriculture is the major land use in this watershed. Dirt and gravel roads are probably the biggest problem as far as erosion and pollution. Logging is a major factor in this watershed. Cowanesque River drains into the Cowanesque Dam, which drains into the Tioga River.

Farms in Tioga County - Trends in Agriculture

Agriculture is changing in Tioga County. The U.S. Census of Agriculture was researched for data on Tioga County farms. The data was compiled from 1959 through 2002. The following trends have been identified from the data:

- ▶ The total number of farms has been reduced from 1,577 to 973, a 48% reduction since 1959. See Chart 1-9. Note that the number of farms actually increased by 150 between 1997 and 2002.
- ▶ The amount of land in farms has been reduced from approximately 324,000 to 202,000 acres, a 38% reduction since 1959. See Chart 1-10.
- ▶ The amount of land classified as cropland has been reduced by approximately 10,000 acres, 123,703 acres in 1959 versus 113,966 acres in 2002. The amount of harvested cropland has dropped by 12% since 1959, from 102,501 acres in 1959 to 89,851 acres in 2002 (Chart 1-13).
- ▶ The average value of land and buildings per farm has increased dramatically, from \$13,771 in 1959 to \$454,735 in 2002, a 3,202% increase. The value of land and buildings per acre has increase from \$68 (1959) to \$2,328 (2002), a 3,324% increase. See Chart 1-14.
- ▶ The market value of products sold for the entire county has increased from nearly \$12 million (1959) to more than \$48 million (2002), a 300% increase (Chart 1-15).
- ▶ For 2002 the average market value per farm for products sold was \$49,958 (Chart 1-16). The average total production expense per farm was \$40,024 and the average net cash return per farm was \$11,075.
- ▶ Another interesting statistic is the number of days that operators worked off the farm. In 2002 a total of 558 of the farm operators (57%) reported some employment off the farm and 391 (40%) worked away from the farm more than 200 days per year.

Other changes to agricultural and rural settings have occurred in recent years in Tioga County:

We have lost 100,000 acres of farmland since 1960 (Tioga Co. Comprehensive Plan, 2005). Dairy farms are getting more animals, and many small Dairies are going out of business.

There are many more horse farms in the county than there have been in the past. Horse farmers haven't participated in conservation programs, as often as crop and Dairy farms have.

There has been a large enrollment of crop and pasture lands in many of the conservation programs, CRP, CREP, Debt for Nature etc. 311 sign ups for CREP this year so far.

Many more small hobby beef operations tend to have feeding areas near streams. Also tend to not participate in conservation programs; there has been progress in grazing with some of these beef operations.

Dirt and Gravel Roads continue to be a sediment problem. Use of unsuitable driving surface materials continues, the roads are being widened. There is little use of conservation practices in the maintenance of many of the roads. Converting the roads to tar and chip has reduced sediment from these roads.

Large animal operations are continuing to increase. Many are becoming Concentrated Animal Operations (CAOs). Nutrient management planning has been good for these large operations. There is a need for assistance to the large operations to implement those plans.

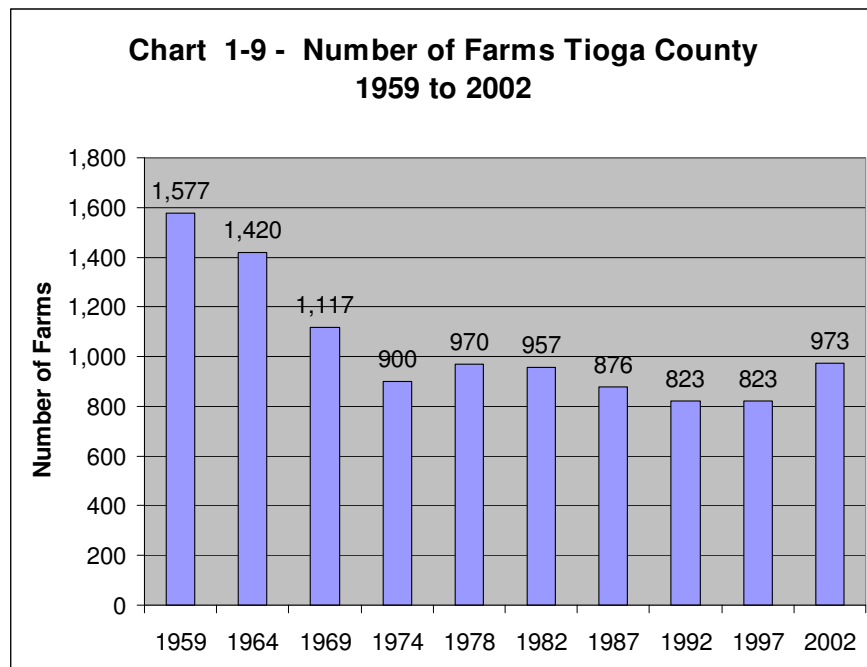


Chart 1-9: Number of Farms in Tioga County, 1959-2002.

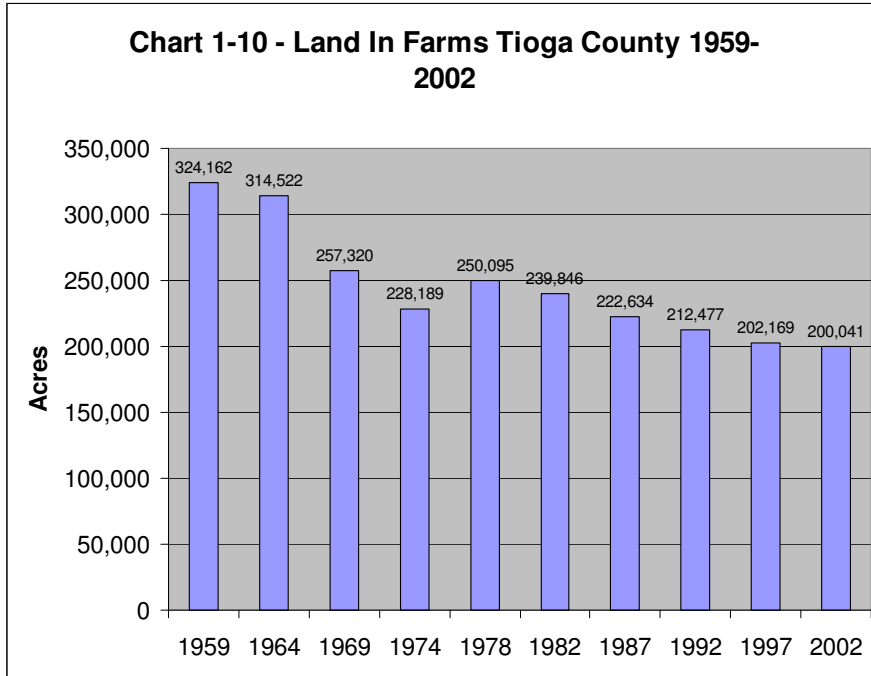


Chart 1-10: Amount of Land in Farming in Tioga County, 1959-2002.



Figure 2: Photo of a Farm in Tioga County.

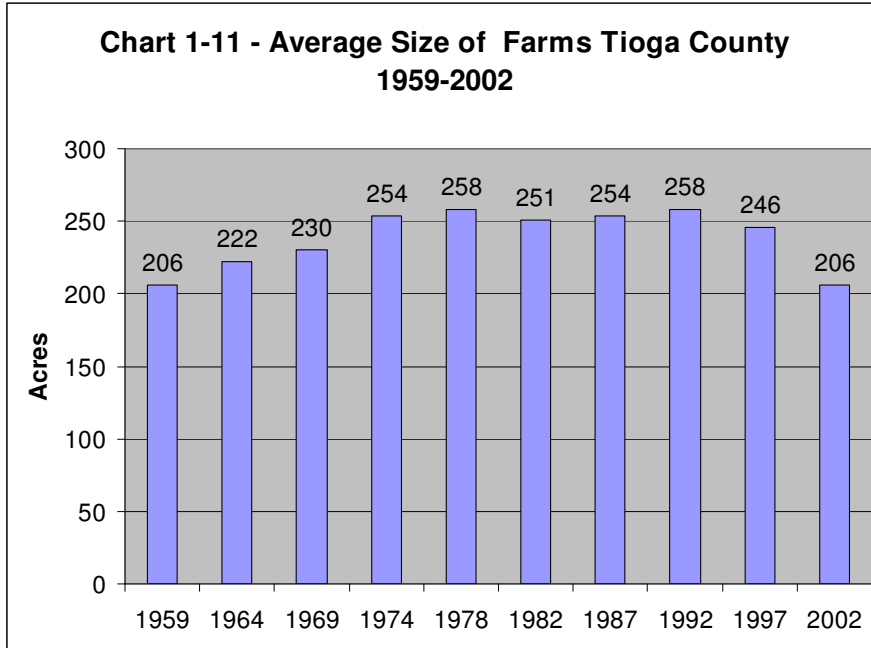


Chart 1-11: Average Size of Farms in Tioga County, 1959-2002.

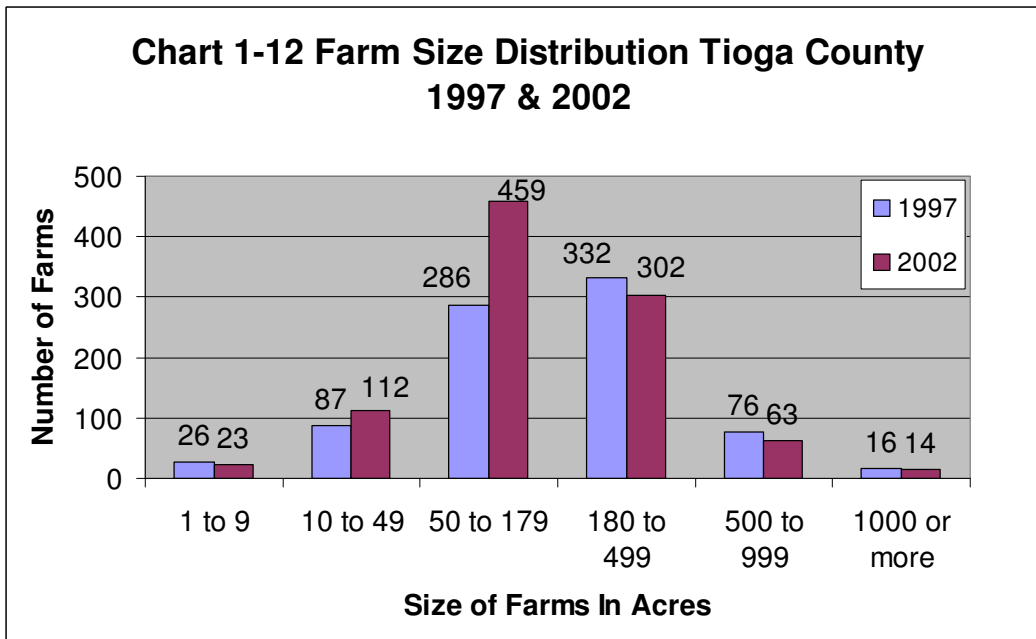


Chart 1-12: Farm Size Distribution in Tioga County, 1997-2002.

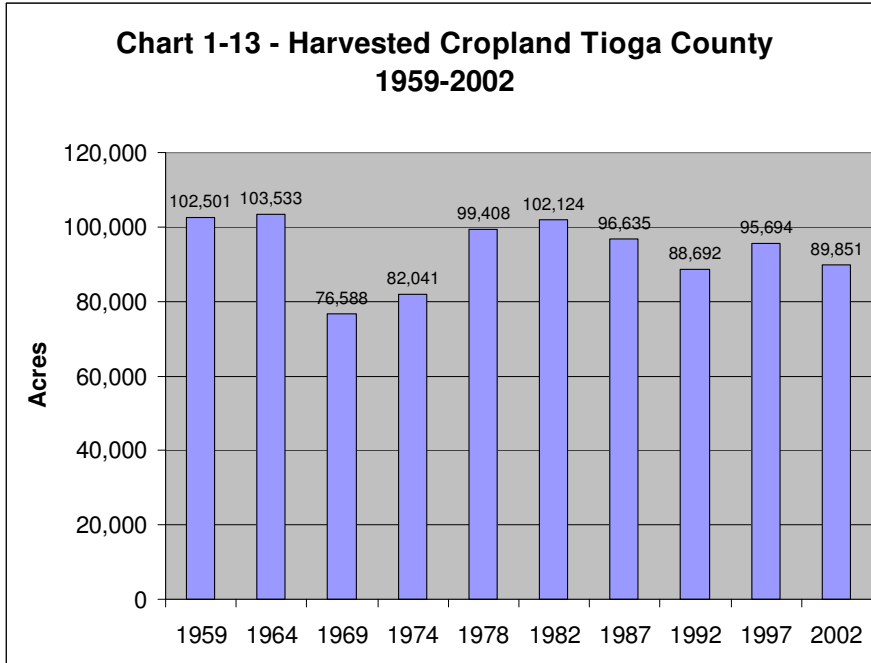


Chart 1-13: Harvested Cropland in Tioga County, 1959-2002.

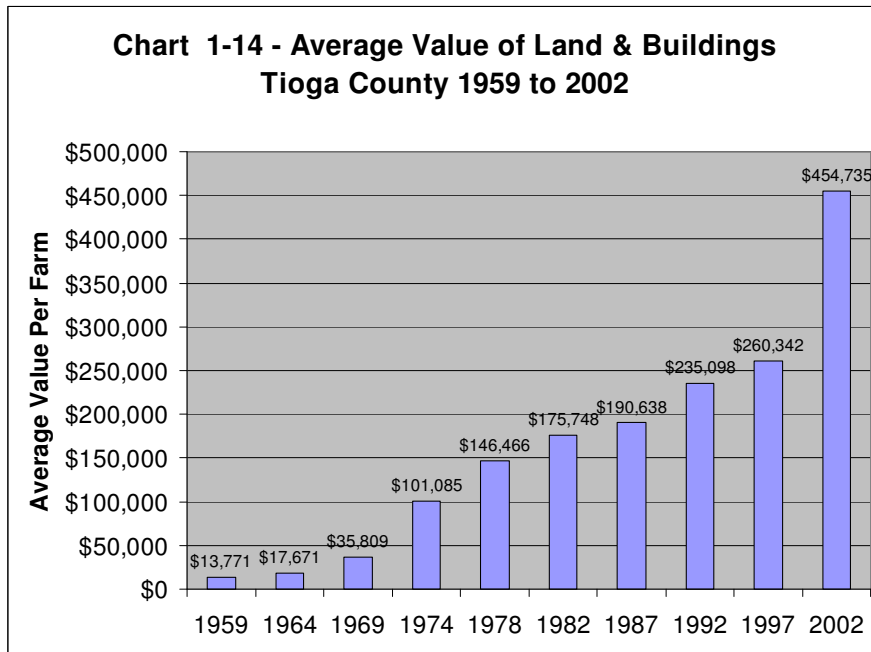


Chart 1-14: Average Value of Land and Buildings, 1959-2002.

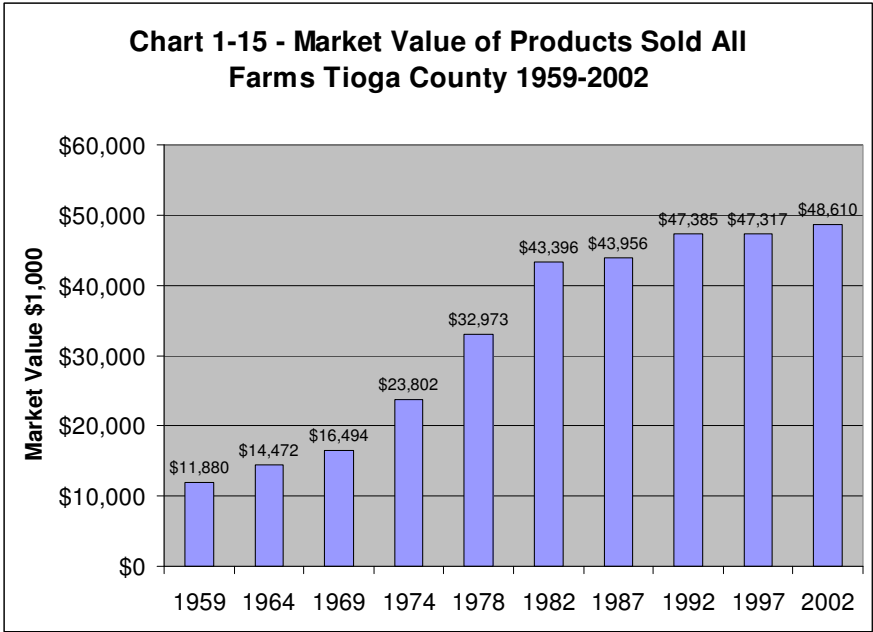


Chart 1-15: Market Value of Products Sold on All Farms in Tioga County, 1959-2002.

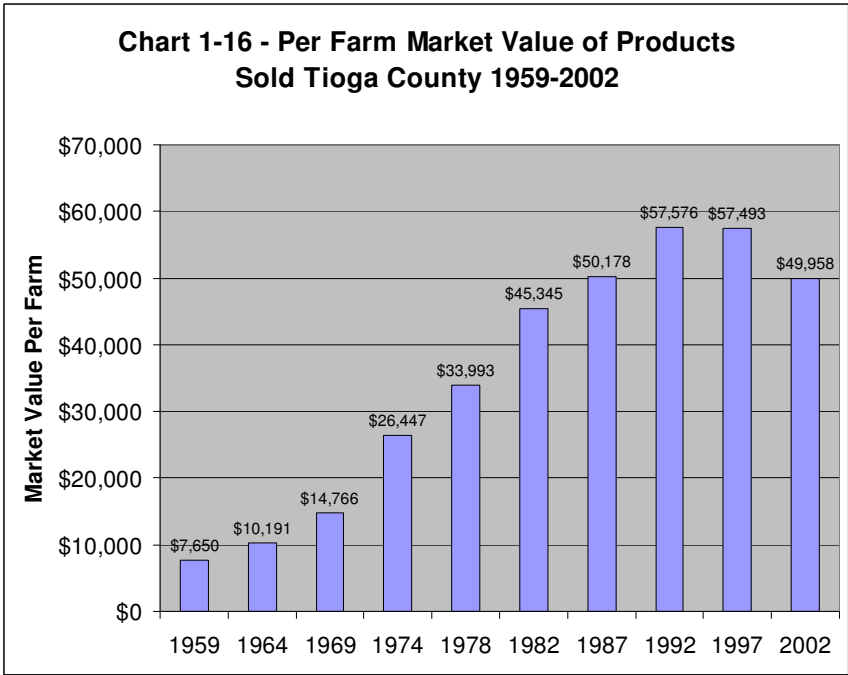


Chart 1-16: Per Farm Market Value of Products, 1959-2002.

Introduction to Water Quality Trends

Historically, the water quality of Tioga County has been impacted by two major anthropogenic influences: logging of the vast forests in the late 1800's, and the concurrent mining of coal. The impacts of harvesting and mining both resources are still evident within our streams. Every stick of marketable timber and timber by-products were removed from the hillsides and valleys of the county, allowing for significant erosion. Meanwhile, deep and strip mining to fuel the industrial revolution created a continuous flow of acid mine drainage.

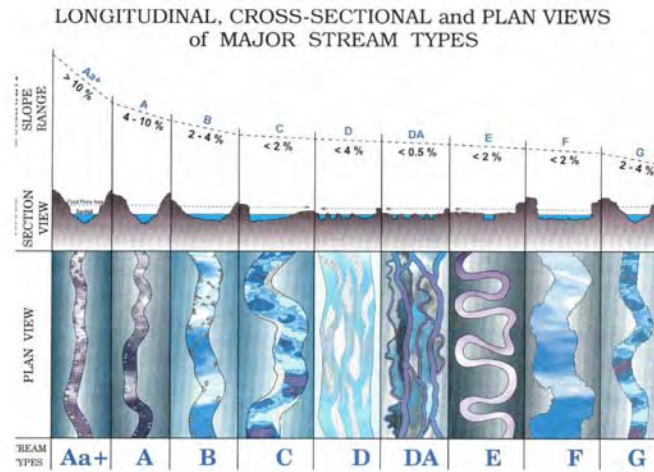
The extent of increased sediment loads to our waters due to erosion created by the complete denuding of the landscape can only be guessed at. We can barely imagine the effects of logging every stand of timber and the attendant fires that consumed the organic matter from the land. It is believed by some that our streams are still adjusting to the impacts from this widespread and complete loss of ground cover. By one account, "Pine Creek was deep, narrow, completely shaded and boulder strewn." Now it is wide and choked with gravel bars and shifting sediments. Mark Gutshall, the President of Land Studies has this to say about the situation, "The leading cause of degradation in the Bay comes from poor land use practices that were undertaken over one hundred years ago, which created a problem known as "legacy sediments.""



Postcard – photo taken around 1910 in Ansonia on Pine Creek, in the West Branch, showing the complete removal of the forest and resulting erosion (note gully erosion across the entire face of the mountain) *Photo credit: Dell Calkins, itinerant photographer at the turn of the 20th century from the archives of Grant Cavanaugh, Mayor of Stokesdale.*

Figure 3: Photo showing deforestation and erosion, Ansonia, PA, 1910.

Fortunately, a majority of the tributaries to the West Branch of the Susquehanna are classified as B streams (Rosgen 1996) and have returned to relatively stable channels. Contrast this to the C streams of the North Branch, which are located in the glaciated low plateau physiographic province and are composed of very unstable, unconsolidated glacial outwash. The Cowanesque River, which is in the North Branch of the Susquehanna watershed, has been described by one fluvial geomorphologist as “a disaster.”



From Rosgen

Figure 4: David Rosgen’s Diagram of Major Stream Types.



Photo of major erosion site at Phillips Station on the Cowanesque River East of Westfield, PA.

Photo credit: Cowanesque River Assessment Team

Figure 5: Photo of erosion site on Cowanesque River.

With the discovery of coal in North Central Pennsylvania, a second major impact to water quality occurred. Unattended mine drainage has left many streams in the County dead or severely degraded. The legacy of strip-and-move-on has left us our current “orange rocks and blue water.” Only within the last decade, with the help of many partners, have we started to remediate the effects of AMD to our waters. Babb Creek, a tributary to Pine Creek, has received substantial restoration work and is on its way to full recovery. The Tioga River in the North Branch is just starting their efforts at remediation.

Now include, from the “Green Revolution”, the changes in agricultural production. After WWII, the industrialization of agriculture and attendant increases in tillage, drainage and use of chemical fertilizers has increased agriculture’s impacts to the waters of the county. We have increased the runoff dramatically from our farmland with diversion ditching, tile drainage, and channelization of watercourses throughout the tillable lands. Our unique combinations of relatively impermeable glacial tills on the hill slopes and the unconsolidated bottomlands have combined to produce an extremely unstable condition with respect to stream channels and sediment transport. This problem is exacerbated by agricultural drainage that reduces the time of concentration of surface runoff and causes premature conversion of concentrated flow into our streams.

The last piece of this puzzle is our insistence on settling and developing in the floodplains of these tributaries. The “legacy sediments” from the past, combined with our continued efforts to keep the streams in their channels to protect infrastructure has led to continual flooding and channel instability. Compounding the problem with over 800 miles of Dirt and Gravel Roads that intercept surface runoff, concentrate flow, increase velocities and mobilize sediment and we’ve created a monster.

No one is to blame for this. These are the facts of the matter and are dynamic unforeseen consequences of our actions over the last one hundred plus years. No one has the answer to these problems either. It will take a large dose of human creativity, time, and most probably money to get our watersheds back to some type of stability, as well as a concerted effort from everyone to make things happen.

Watersheds within Tioga County

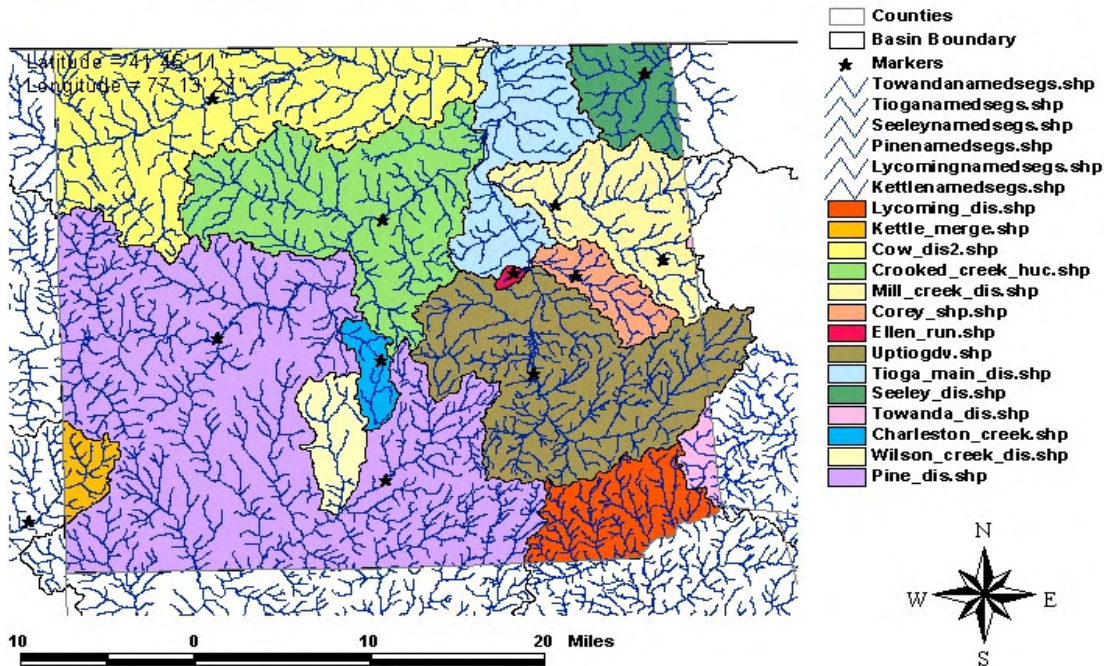


Figure 6: Watershed Map of Tioga County, each color represents a watershed association or group that has undertaken restoration efforts in their home watershed.

West Branch of the Susquehanna River

Pine Creek Watershed

As discussed above, the distinct differences in the landscape and soils between the West and North Branch portions of the Susquehanna River in Tioga County account for the distinctions in the water quality issues that exist respectively in the Pine and Tioga watersheds. Pine Creek as a whole is relatively pristine in comparison with many streams within the county. The West Branch of Pine Creek, which runs parallel to Route 6 and begins in Potter County, was recently upgraded to an Exceptional Value stream. The main stem of Pine Creek is designated a High Quality/Cold Water Fishery. Much of the explanation behind the water quality of Pine Creek lies in the fact that a majority of the watershed is publicly owned by the Bureau of Forestry and the Game Commission. Public awareness of water quality and conservation efforts in the Pine Creek watershed have been long standing, due largely to recreation opportunities in the watershed. The mission of the Pine Creek Headwaters Protection Group, which formed in 1987 (long before Growing Greener), is to promote local awareness of water quality, take an active role in the preservation of Pine Creek’s high quality waters, and to cooperate with local, county, and state agencies and individuals for the betterment of Pine Creek.

Surprisingly, many of Pine Creek's tributaries are impaired from a variety of causes that belie the health of the main stem. The water quality conditions, impairments, and current efforts of the major tributaries to Pine Creek are outlined below, including Marsh Creek, Charleston Creek, Babb Creek, and Wilson Creek.

Marsh Creek is one of the largest streams in the headwaters of Pine Creek and receives all of the runoff from Wellsboro and the surrounding area. Under Chapter 93, Marsh Creek is a Warm Water Fishery from its source to Strait Run and a Cold Water Fishery from Strait Run to its mouth. The upper portion is rather developed while the lower end is more rural and the stream has ample access to its floodplain. The upper end is also much more channelized while the downstream part of Marsh Creek is very sinuous and allows for filtering of sediments and slowing of floodwater velocities. Multiple impaired tributaries enter Marsh Creek, including Charleston Creek, Kelsey Creek, Morris Branch, Horse Thief Run, Dantz Run, Heise Run, and Darling Run. Sediment is the main cause for impairment, although issues of flow alteration, organic enrichment, and low dissolved oxygen are also prevalent. Please see Table 1 for more information on impaired streams in the Pine Creek Watershed. In contrast to the impaired streams, numerous High Quality Coldwater Fisheries feed Marsh Creek once it turns the corner at the Junction and flows West/Southwest, including: Baldwin Run, Strait Run, Canada Run, and Asaph Run. The watersheds of these headwater streams are almost entirely held within State Forest land. Currently, there is a small group of citizens working to increase watershed awareness and to acquire funding for streambank stabilization in and around Marsh Creek. In addition, Pine Creek Headwaters Protection Group has established a monitoring program for Horse Thief Run, Dantz Run, Heise Run, and Darling Run.

Charleston Creek is one of the larger tributaries to Marsh Creek. Designated a Warm Water Fishery although it once held trout, the headwaters of Charleston Creek is mostly rural with some agriculture, although due to its proximity to Wellsboro the Charleston Creek watershed feels developmental pressures, too. Hamilton Lake, a local flood control dam, is located approximately half way down Charleston Creek and serves as Wellsboro's secondary source of water for the Borough. Because of the impoundment of Charleston Creek, the downstream portion suffers from organic enrichment and low dissolved oxygen impairments. Below the dam, all of the urban runoff and stormwater from Route 6 and the industry and commercial businesses that surround it drain into Charleston Creek, leading to significant impairments. It should be noted that the headwaters of the watershed contain a well field (in Brownlee) that serves as the Municipal water source and that Hamilton Lake is a secondary source of water for the Borough.

Historically, Babb Creek was impaired from acid mine drainage to the point that it was nearly dead. However, past and current efforts by the Babb Creek Watershed Association have brought back most of the main stem of Babb Creek. These associations have also been working to remediate portions of Wilson Creek by treating discharges on the Rattler Mountain side. Other than AMD impacts, the Babb Creek watershed is mostly forested with a majority of it being publicly owned by the Bureau of Forestry and the PA Game Commission. Nickel Brook and Long Run, both Exceptional Value streams, feed Babb Creek.

Stony Fork, which is a large tributary to Babb Creek, is roughly 38 square miles and is impaired by AMD and agriculture. The headwaters of Stony Fork are mostly agricultural while the lower portion is contained within State Forest Land and would most likely not be impaired if it were not for AMD issues in Paint Run.

Wilson Creek, like Charleston Creek, is close enough to Wellsboro to experience increased developmental pressures and subsequent urban impairments. The lower portion of Wilson is impaired by AMD. However, the BCWA is currently focusing efforts on treating the many discharges that drain to Wilson Creek. The Anna S Treatment Complex and the Rattler Mountain projects are very large systems that work to treat several large discharges. The group also is/or plans on working on the Mitchell Mine discharge. By contrast, the upper portions of Wilson Creek are impaired by agricultural activities. The BCWA, PCHPG, and Tioga County Conservation District have submitted a grant application to incorporate Ag BMP's through this stretch of the watershed in addition to the development of a watershed management plan for Wilson Creek.

Table 1: Impaired Streams in the Pine Creek Watershed as designated by the 303(d) list of Impaired Waters.

Stream Name	Length Assessed (mi)	Water Use	Source of Impairment	Cause of Impairment	Priority	Year Listed
Babb Creek	0.7	CWF	Abandoned Mine Drainage	Metals	Medium	2002
Babb Creek	7.8	CWF	Abandoned Mine Drainage	pH	Medium	2002
Babb Creek	2.6	CWF	Abandoned Mine Drainage	Metals	Medium	1996
Babb Creek	2.6	CWF	Abandoned Mine Drainage	pH	Medium	2002
Babb Creek	3.5	CWF	Abandoned Mine Drainage	Metals	Medium	1996
Babb Creek	3.7	CWF	Abandoned Mine Drainage	pH	Medium	1998
Babb Creek Rattler Run Slide Hollow Wilson Creek						
Basswood Run	1.0	CWF	Abandoned Mine Drainage	pH	Medium	2002
Basswood Run	1.0	CWF	Abandoned Mine Drainage	Metals	Medium	2002
Charleston Creek	2.0	WWF	Channelization	Flow Alterations	Low	2002
Charleston Creek	2.0	WWF	Upstream Impoundment	Organic Enrich./Low DO	Medium	2002
Charleston Creek	2.0	WWF	Urban Runoff/Storm Sewers	Siltation	Medium	2002
Charleston Creek	2.0	WWF	Urban Runoff/Storm Sewers	Water/Flow Variability	Low	2002
Dantz Run	4.2	CWF	Road Runoff	Siltation	Medium	2002
Darling Run	0.8	HQ- CWF	Road Runoff	Siltation	Medium	2002
Darling Run	0.8	HQ- CWF	Road Runoff	Water/Flow Variability	Low	2002
Heise Run	2.1	CWF	Road Runoff	Siltation	Medium	2002
Heise Run	2.1	CWF	Highway, Road, Bridge Const.	Siltation	Medium	2002
Horse Thief Run	1.0	CWF	Road Runoff	Siltation	Medium	2002
Kelsey Creek	0.7	WWF	Channelization	Flow Alterations	Low	2002
Kelsey Creek	0.7	WWF	Urban Runoff/Storm Sewers	Siltation	Medium	2002
Kelsey Creek	0.7	WWF	Urban Runoff/Storm Sewers	Water/Flow Variability	Low	2002
Lick Creek	4.1	CWF	Abandoned Mine Drainage	Metals	Medium	2002
Lick Creek	4.1	CWF	Abandoned Mine Drainage	pH	Medium	2002
Marsh Creek	1.4	WWF	Urban Runoff/Storm Sewers	Water/ Flow Variability	Low	1996
Marsh Creek	1.4	WWF	Upstream Impoundment	Organic Enrich./Low DO	Medium	2002
Marsh Creek	1.4	WWF	Urban Runoff/Storm Sewers	Siltation	Medium	2002
Morris Branch	0.7	WWF?	Urban Runoff/Storm Sewers	Water/Flow Variability	Low	2002
Morris Branch	0.7	WWF?	Urban Runoff/Storm Sewers	Siltation	Medium	2002
Morris Branch	0.7	WWF?	Channelization	Flow Alterations	Low	2002
Paint Run	4.0	CWF	Abandoned Mine Drainage	Metals	Medium	2002
Paint Run	4.0	CWF	Abandoned Mine Drainage	pH	Medium	2002
Stony Fork	0.4	CWF	Abandoned Mine Drainage	Metals	Medium	2002
Stony Fork	0.4	CWF	Abandoned Mine Drainage	pH	Medium	2002
WestBranch Stony Fork	3.6	CWF?	Agriculture	Siltation	Medium	2002
Wilson Creek	2.3	CWF	Abandoned Mine Drainage	pH	Medium	2002
Wilson Creek	2.3	CWF	Abandoned Mine Drainage	Metals	Medium	1996
Wilson Creek	0.9	CWF	Abandoned Mine Drainage	Metals	Medium	1996
Wilson Creek	0.9	CWF	Abandoned Mine Drainage	pH	Medium	2002
Wilson Creek	11.1	CWF	Agriculture	Siltation	Medium	1996

Lycoming Creek Watershed

The headwaters of Lycoming Creek drain the southeast corner of Tioga County and are mostly south of Route 414. All of the headwater tributaries located in the Tioga County portion are High Quality Coldwater Fisheries. Much of the land that drains the Tioga County tributaries to Lycoming Creek is in agriculture. In places where steep slopes exist, the land use adjacent to these tributaries are mostly forested land.

Tioga River Watershed

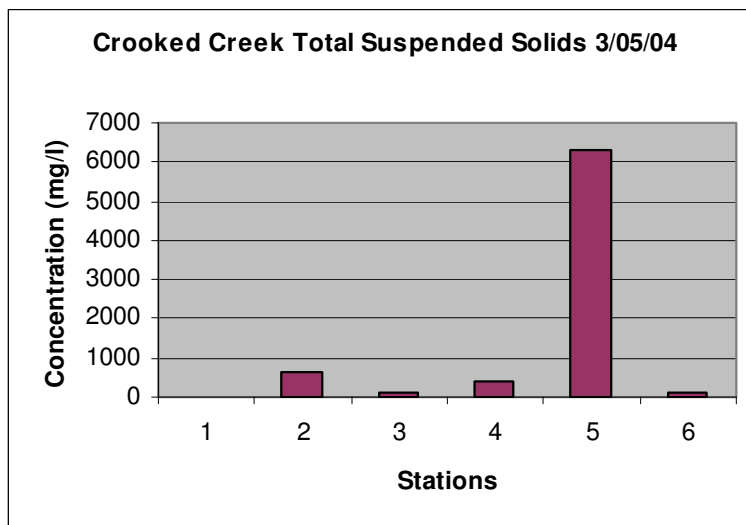
As discussed above, the differences in geology, landforms, soils, and land use has made the Tioga River watershed very different from Pine Creek. Even sub watersheds within the Tioga have considerable variability. The headwaters of the Tioga are severely degraded from acid mine drainage. Areas and streams that would ordinarily be pristine are essentially dead. The lower portion of the Tioga has much better water chemistry, but it's facing ever-increasing pressures from development. The wide valleys of the Crooked Creek and Cowanesque River watersheds provide for the best agricultural grounds in the county. Insufficient riparian buffers coupled with unconsolidated glacial till have made these river valleys unbelievably unstable. Massive erosion occurs on such a level that remedying the situation seems impossible in places. However, while the Tioga on a whole is more impaired, there are still many beautiful streams in the watershed, including Mill Creek, Corey Creek, portions of Elk Run, Norris Brook, and the Jemison. Many watershed organizations exist in the Tioga River watershed with various missions to clean up the AMD, alleviate erosion problems, and provide education to our local students. The Tioga County Concerned Citizens Committee (TCCCC), in partnership with the Hillside Rod & Gun Club, has been working on trying to acquire funding to begin to remediate the AMD issues. The Crooked Creek Coalition, Cowanesque Valley Watershed Association, and Corey Creek Watershed Association have all had assessments completed to inventory the extent of erosion and begin to prioritize sites for restoration.

The Corey Creek watershed on a whole has good water quality. Erosion and developmental pressures are the largest issues in the watershed, although none of the streams are impaired. Much of the watershed, which was dominated by agriculture during the 1950's, 1960's and 1970's seems to be actively reverting back to forestland. While none of Corey Creek is impaired, there are still issues of erosion and sedimentation in the watershed. The Corey Creek Watershed Association has spent much time and effort trying to improve the mainstem of Corey Creek, working on stream clean-ups, annually stocking the stream, participating in the District's Ag BMP program for the watershed, and applying for grant money to construct an FGM project.

Mill Creek, which enters the River above Tioga Lake, has good water quality and no impairments. Designated a Trout Stocked Fishery, the Mill Creek watershed is mostly forested and publicly owned by the Corps of Engineers and the PA Game Commission. In addition, Mill Creek helps to dilute and neutralize the acid mine drainage impacted waters of the Tioga.

Overall, the lower Tioga River has much better water quality than the upper portion. The largest impacts to the River are from urban runoff, impervious surfaces and some agriculture. However, the potential for development in the lower Tioga is great, especially once I-99 is completed. This will undoubtedly increase stormwater runoff. There are parts of the Lower Tioga which are impaired due to siltation from the upstream impoundment of the Tioga Dam.

The Crooked Creek watershed is designated as a Warmwater Fishery, although it's upper reaches could possibly be considered a coldwater fishery if a healthy riparian buffer was intact. Crooked Creek and its tributaries have good water quality. The main issues seem to be lacking riparian buffers and the corresponding problems of bank instability and sediment transport. There are no impaired streams in the watershed as designated by 303d, however, the entire watershed has not been completely assessed yet. One possible source of impairment could be the impoundment of Crooked Creek waters by the Hammond Dam. The Crooked Creek watershed is another area that could experience developmental pressures in the future due to its proximity to Wellsboro in addition to its proximity to Route 15.



Results of a Stormwater Event sampled on Crooked Creek on March 5th 2004
 Chart 1-17: Crooked Creek Total Suspended Solids, 2004.

The Crooked Creek Coalition, a watershed group composed of municipal officials from Charleston, Chatham, Farmington and Middlebury Townships has just completed an assessment of the watershed. There is extensive erosion on all tributaries of the stream and sever flooding is routine at Middlebury Center at the confluence of Catlin Hollow and Crooked Creek. There is some agricultural activity in the watershed, which is located mostly along the main stem. Several of the farms have participated in the Chesapeake Bay Program and have had BMP's installed. Portions of the watershed are also publicly owned. The Norris Brook watershed is about half owned by the Bureau of Forestry. Portions of the Hills Creek watershed contain PA State Game Lands. The US Army Corps of Engineers owns land that surrounds Hammond Lake and the headwaters of Ives Run and Stephenhouse Run.

Table 2: Impaired Streams in the Tioga River Watershed (excluding the Cowanesque) as designated by the 303(d) List.

Stream Name	Length Assessed (mi)	Water Use	Source of Impairment	Cause of Impairment	Priority	Year Listed	Targeted for TMDL
Bear Creek, Coal Creek	3.9	CWF	Abandoned Mine Drainage Abandoned Mine Drainage	pH Metals	Medium Medium	2002 2002	2015 2015
Fellows Creek	3.4	CWF	Abandoned Mine Drainage Abandoned Mine Drainage	Metals pH	Medium Medium	2002 2002	2015 2015
Johnson Creek	5.2	CWF	Abandoned Mine Drainage Abandoned Mine Drainage	Metals pH	Medium Medium	2002 2002	2015 2015
Johnson Creek	2.8	CWF	Abandoned Mine Drainage Abandoned Mine Drainage	pH Metals	Medium Medium	2002 2002	
Tioga River	2.1	CWF?	Small Residential Runoff Road Runoff	Siltation Siltation	Medium Medium	2002 2002	
Tioga River	2.2	CWF	Atmospheric Deposition	pH	Medium	1998	
Tioga River	2.3	CWF	Atmospheric Deposition	pH	Medium	1998	
Tioga River	2.3	WWF	Upstream Impoundment	Siltation	Medium	2002	2003
Tioga River	19.6	CWF	Abandoned Mine Drainage Abandoned Mine Drainage	pH Metals	Medium Medium	1996 1996	2003 2003

Cowanesque River Watershed

The Cowanesque, although part of the Tioga River watershed, is large enough and has significant enough problems that it can be considered on its own. Overall, the water quality of the Cowanesque as determined in the assessment we conducted is good. Six tributaries and portions of the main stem are impaired by a variety of causes, including: agriculture, industrial point source discharges, municipal point source discharges, golf course runoff, upstream impoundments, removal of vegetation, and small residential development. The most notable issue in the Cowanesque is streambank instability. Due to the soils and landuse practices, mass erosion and deposition occurs throughout the entire Cowanesque River watershed. The potential for increased development exists as Route 49 is designated an Enterprise Zone and once Route 15 is completed. Significant improvement to the riparian buffers in the headwaters should be considered to increase stability in the tributaries and portions of the main stem.

Table 3: Impaired Streams in the Cowanesque River Watershed as designated by the 303(d) list of Impaired Waters.

Stream Name	Length Assessed (mi)	Water Use	Source of Impairment	Cause of Impairment	Priority	Year Listed	Targeted for TMDL
California Brook	3.4	WWF	Removal of vegetation Agriculture Small residential development	Siltation Nutrients Nutrients	medium	2002	2015 2015 2015
Camp Brook	3.1	WWF	Municipal point source	Nutrients	medium	2002	2015
Cowanesque River	2.0	WWF	Upstream impoundment	Organic enrichment/ Low D.O.	medium	2002	2017
Cowanesque River	6.6	WWF	Agriculture Municipal point source	Nutrients Nutrients	medium	2002	2015 2015
Cowanesque River Mill Creek	2.7	WWF TSF	Industrial point source Removal of vegetation Industrial point source	Thermal modif. Siltation Cause unknown	medium	2002	2017 2017 2017
Holden Creek	3.2	WWF	Agriculture Municipal point source	Siltation Nutrients	medium	2002	2015 2015
Jemison Creek	0.9	WWF	Golf course	Nutrients	medium	2002	2017
North Branch Cowanesque River	9.9	CWF	Agriculture Agriculture	Siltation Nutrients	medium	2002	
North Fork Cowanesque River	2.2	CWF	Upstream impoundment	Organic enrichment/ Low D.O.	medium	2002	

Seeley Creek Watershed

The headwaters of Seeley Creek drain the northeast corner of Tioga County. Much like the Cowanesque, Seeley Creek not only crosses county lines but also state lines as well. The main issues associated with Seeley Creek are streambank instability. The watershed is characterized by unconsolidated glacial till soils and agricultural activity is abundant. Lacking riparian buffers coupled with valley floor soils cause significant instability problems. Currently there are no active efforts, as no watershed association exists for this area. However, in New York State, much has been done to try to alleviate erosion and flooding issues by creating of wetlands for flood attenuation.

Kettle Creek and Towanda Creek Watersheds

Small portions of Kettle Creek and Towanda Creek drain from Tioga County. The total area of these drainages within Tioga County is relatively small. The Kettle Creek drainage portion is contained entirely within State Forest lands and is designated an Exceptional Value Cold Water Fishery. The Towanda Creek portion is mostly agricultural land use and is a Cold Water Fishery beginning at the basin source. Within Tioga County there are no impairments in either of the watersheds, however various impairments do exist further downstream in Potter and Clinton Counties for Kettle Creek and in Bradford County for Towanda Creek.

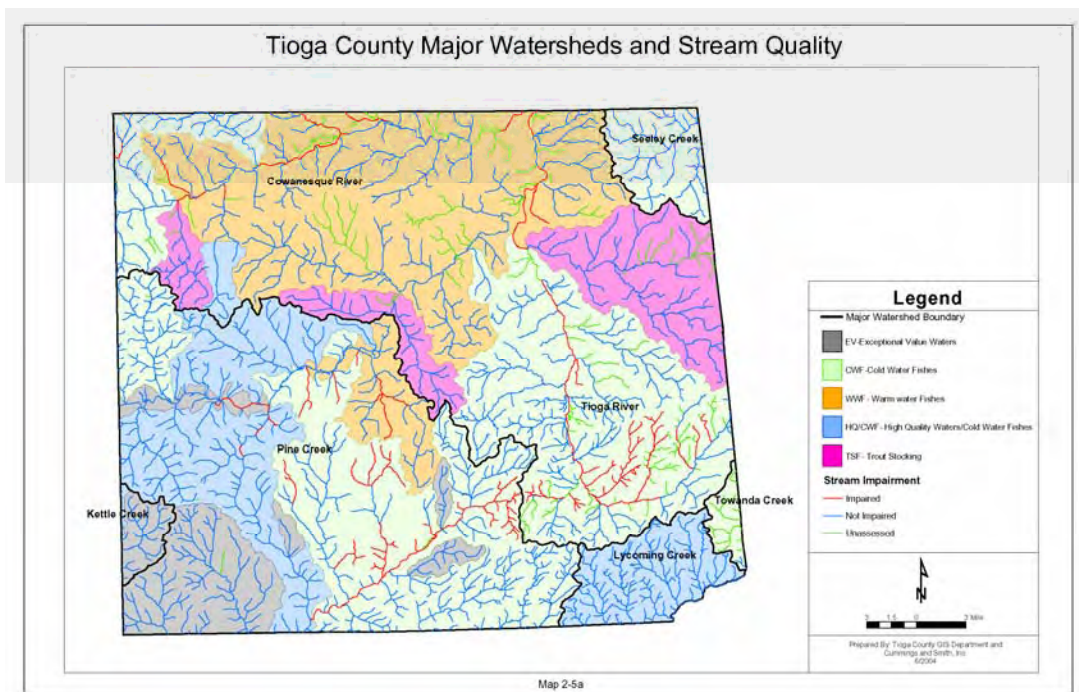


Figure 7: Map of Watersheds and Stream Quality, TCCD. 2005.

Tributary Strategy - Efforts to Date

The Tioga County Conservation District was established in 1946. The primary mission was to control and prevent soil erosion. In the words of our District Manager “we have been successful in keeping erosion from getting any worse but every time we feel we’re getting results somebody unravels it!” The following is the litany of programs and efforts the District has participated in, in one degree or another, and with varying success over that last (years).

Erosion Control

Agriculture

- Conservation Plans

 - NRCS, District

- Technical Assistance

 - District staff, NRCS, Cooperative Extension, DEP,

CBF

- Financial Assistance/BMPs

 - Growing Greener, CBP, EQIP, CRP, CREP, Act 6,

- WHIP, GRP, WRP, AMA, FLP,

Forestry

- Technical Assistance

- E&S Plan reviews

- Education

Construction

- E&S Plan Reviews

- Technical Assistance

- Education

Urban

- E&S Plan Reviews

- Technical Assistance

- Education

Nutrient Management

- Nutrient Management Plans

 - Act 6

 - Plan reviews,

 - Complaint handling

 - Act 6 Funding

- Technical Assistance

 - Act 6/ ACT technician

 - Private Technical Service Providers

 - DEP enforcement

Financial Assistance/BMPs
Growing Greener, CBP, EQIP, CRP, CREP, Act 6,
WHIP, GRP, WRP, AMA, FLP,

Land Use

Technical Assistance
Soils Information
Plan Reviews
Education

Water Quality

Assessments
Support to Watershed Association in remediation efforts

Storm Water Management

NPDES
Comprehensive Plan
Education
Act 167 (committee forming)

Riparian Buffers

Watershed Groups
Government Programs, CRP, CREP, CBP, CBF

Our Tributary Strategy

Introduction

Our strategy to reduce non-point source pollution including nutrients and sediment will be geared closely to our annual plan. Each of our technicians and the District Manager have developed action plans for the Objectives in the Annual Plan.

Tioga County Conservation District Five year Plan 2005

Critical Resource Issues Objectives

I. Soil Erosion

- Implement Ch 102, 105, programs as per delegation agreements
Measurable: # permits reviewed/acknowledged, complaints, projects reviewed program budgets, public assisted
Goal: 105 permits – 500
102 - 1,000 acres
Logger trainings – 5
Forest Landowner workshops - 5

- Assistance with Farm Bill Programs through CBP & ACT technicians.
Measurable: Time spent, BMP's installed, Individuals assisted, program budgets
BMPs:
Riparian Buffers -15 miles
Barnyard Systems - 10
Conservation Plans Implementation –200
Nutrient Management Plans & Imp. - 25
Grazing Plans - 25
Crop Rotation – 2,500 acres
Conservation tillage 15,000 acres
Cover cropping – 2,500 acres
Horse Pasture Management – 5

Goal: Service all request

- Provide assistance to Watershed Associations through Watershed Specialist Program in stream restoration and riparian buffers.
Measurable: Miles of Streambank treated, Grants secured for stream work
Goal: 50 miles of stream banks treated

II. Land Use

- Assistance with non-farm conservation planning of BMP's
Measurable: BMP's installed, number of people assisted.
Goal: 500 individuals
- Farmland Preservation
Measurable: number of applicants, number of acres protected.
Goal: 1000 acres
- Wetland restoration
Measurable: Acres restored
Goal: 50 acres
- NEMO (Non-point Education for Municipal Officials) through the Watershed Specialist program
Measurable: Number of municipalities adopting natural resource based comprehensive plans and ordinances.
Goal: 30 municipalities
Workshops –15

III. Water Quality

- Roads Program, Chapter 102 & 105
Measurable: MOU, Delegation agreements and contracts.
Goal: 30 MOUs with municipalities
- Assistance to Watershed Groups
Measurable: Watershed Specialist quarterly reports, Assessment reports, program and grant money.
Goal: 1.25 staff years
- Develop capacity in Watershed Associations.
Measurable: Number of Watershed Associations that have become autonomous watershed groups. ie. Assessment, Monitoring, Financial Stability
Goal: 12 Watershed Groups
- Compile all water quality & chemistry data available on all bodies of water in Tioga County
Measurable: Database and gap analysis.
Goal: 100%
- Abandoned Mine reclamation and treatment
Measurable: Discharges and acres treated
Goal: 50 discharges in Tioga River Watershed
Reclamation – 50 acres
Assist Babb Creek Watershed Association with maintenance of treatment facilities

IV. Storm Water Management

- Dirt and Gravel Roads Program
Measurable: Miles of dirt roads with environmentally sensitive road maintenance.
Goal: 50 miles
- Participation in Riparian Buffer programs and projects, CBF, DEP, NRCS, Watershed Associations
Measurable: Miles of Riparian Buffer treated
Goal: 100 miles
- Assistance to Watershed Groups and advocate Act 167 study & implementation
Measurable: Stream miles attaining designated use and Act 167 progress by county.
Goal: 75% Nutrient & sediment non-attaining streams
Goal: Assist 1 Act 167 Plan Started
- NEMO Programming through Watershed Specialist Program.
Measurable: Stormwater management ordinances and overlay zoning for stream buffers.
Goal: 20 Municipalities
- NPDES permitting, technical assistance
Measurable: Permitted acres
Goal: 1500 acres

V. Riparian Buffers

- Assist watershed groups in Assessments and Riparian Buffer Projects
Measurable: Miles of riparian buffer assessed
Goal: 300 Miles
- CBF, CBP, CREP programs
Measurable: Miles of riparian buffer treated and BMP's installed.
Goal: 100 miles
- District Tree Sale for riparian buffers
Measurable: Number of trees sold for riparian plantings.
Goal: 100,000 trees

VI. District Operations

- Office Administration
 - Nominating Organizations and Director Sustainability
 - Directory of Programs
 - Staff & Director Handbook, and Development Plans
 - Directory of District Policies
 - Annual Report
 - Director & Staff Progress Reports

- Education
 - Programs in the Five Critical Resource Areas
 - Public Relations and Marketing of TCCD

- Budget & Funding
 - Staff Promotion and Benefits
 - Grants
 - Sales
 - Donations
 - Negotiations with the County Commissioners

Conclusion

The strategy outlined here is meant to be flexible and adaptable to changing conditions on an annual basis. The Tioga County Conservation District has attempted to be as inclusive as possible in the development of our Tributary Strategy. We recognize the importance of the goal of sediment and nutrient reduction to the streams and waterways of the county and realize the necessity of doing more with less. That said, the prime directive of “keeping the dirt out of the creek” takes on a whole new meaning for how to accomplish it. We will give this plan the attention and focus it deserves and follow through with the scope of work as outlined here. During the implementation of this plan we will attempt the impossible keeping in mind that it is the only solution that might work and provide for a sustainable use of the resources of the county and protecting and conserving them for generations to come.

Appendix A

Job Description Chesapeake Bay Tributary Strategy Technician (CBTST)

Coordinate the Tioga County Tributary Strategy, Implementation Plan goals for sediment and nutrient reduction with other District programs and with cooperating agencies' programs. Including the Tioga County Planning Commission, Penn State Cooperative Extension, NRCS, FSA and others?

Assist local municipalities and municipal officials in understanding, adopting and implementing conservation practices and sediment reduction methodology at the local government level.

Provide education and outreach to the public on the Tioga County Tributary Strategy for sediment and nutrient reduction and other District Programs through watershed groups, agriculture groups, schools, and individual landowners. Identify, procure or produce materials and supplies for education and outreach.

Seek funding (Grant Writing) for and coordinate special projects to implement the Tioga County Tributary Strategy for sediment and nutrient reduction.

Assist the District Directors, staff and our partners in implementation of Conservation Plans, Nutrient Management Plans, BMPs and special projects with tributary strategy implications.

ie. EQIP, CREP, Riparian Buffers, Storm Water Management

Work with District Directors and staff on developing strategies and objectives in other program areas to ensure consistency and reduce duplication of effort.

Be certified as a public Pennsylvania Nutrient Management Specialist to review Nutrient Management plans for cooperators.

Attend trainings in conservation planning and BMP design and implementation and acquire job approval authority for BMPs.

Provide technical assistance to cooperators in Implementation Plan programs in design and installation of Best Management Practices (BMPs) for sediment and nutrient reduction.

Conducts annual follow-up with landowners to review the agreements, to assure that scheduled BMPs are installed on time, that necessary revisions are made to the Nutrient management Program, that the Nutrient Application Plan is correct and being followed and that previously installed BMPs are properly operated and maintained.

Attends and participates, and may represent the District Directors and Manager, at all Chesapeake Bay Program coordination meetings sponsored in part by the Bureau of Watershed Management (BWM).

Assist in maintaining all required record keeping relating to The Chesapeake Bay Tributary Strategy Implementation Plan contract(s) so that the District may make accurate and timely reports to the appropriate partner, agency, and/or officials.

Maintains daily record of time spent in all work activities, and accurately completes and submits monthly, quarterly, and annual reports.

Report to the District Directors and Manager regularly on progress, outcomes, barriers and deficiencies with the strategy.

Other duties as assigned.

Appendix B

Community Watershed Efforts

Appendix C

Acronym Glossary

Bibliography

Comp Plan

Rosgen

Gutshall

Savory