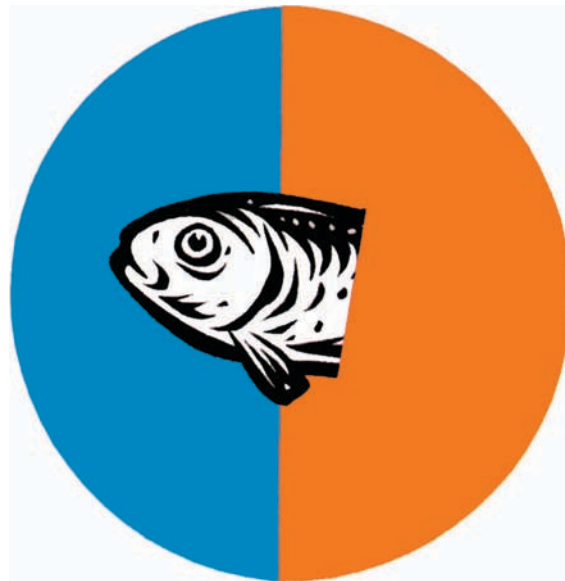


**A 20-Year (1990-2010) Review
of the Accomplishments of the
Mill Creek Coalition of Clarion and Jefferson
Counties, with a Five-Year Plan for 2011-2015**



Printed September 2011

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Dedication

This report is dedicated to John (Pokey) Pokrifka and his family. It was years ago that the Pokrifkas moved to Clarion County and built their dream home on a lovely piece of property near the Clarion River, Mill Creek, and Game Lands 74. However, it was not too many years later that stripmining occurred.

Over an extensive period of time and anguish for the family, several hundred acres of coal were removed on all four sides of their property. Years of nearly constant noise from heavy equipment and blasting ensued, along with dust and mud and hundreds of trucks entering and leaving the area. Afterwards, site reclamation gradually occurred. Unfortunately, AMD appeared and drained into both Mill Creek and the Clarion River.

With the formation of the Mill Creek Coalition, Pokey became a regular attendee of the monthly meetings. He brought intimate knowledge of the mining operations around his home and nearby areas. Pokey has walked many miles of Mill Creek with Coalition members to locate AMD sites, assist in water sampling, and in other ways. After 20 years of association with the MCC, he and his family are gradually seeing an improvement on the land and waters of the watershed.

Thanks Pokey and family for your friendship and assistance for so many years!

**Mill Creek Coalition
of
Clarion and Jefferson Counties**

Acknowledgements

Alliance for Wetlands
and Wildlife

Conservation District
Clarion County

Conservation District
Jefferson County

Federation of Sportsmen
Clarion County

Federation of Sportsmen
Jefferson County

Iron Furnace Chapter
of Trout Unlimited

League of Women Voters
of Clarion County

Mill Creek Chapter
Nat'l Wild Turkey Fed.

Natural Resources
Conservation Services

Northwest Pennsylvania's
Great Outdoors Tourist
Promotion Agency

Seneca Rocks
Audubon Society

As a 20-year-old organization, the Mill Creek Coalition of Clarion and Jefferson Counties has a nearly limitless number of individuals, politicians, businesses, agencies and other entities that are responsible for the MCC's successes.

Those individuals who represent the Coalition's member groups by attending monthly meetings or via correspondence are gratefully acknowledged. They have provided the leadership to the Coalition and informed their respective organizations and agencies of the Coalition's activities over the past 20 years. Other individuals have embraced the Coalition by allowing their property to be used for treatment systems or to be trekked upon for water sampling purposes, or by simply serving as an inspiration by the remarks about observing cleaner water and fish where fish have not been noted for decades. It is also the individuals who represent the businesses and agencies which are interacting with the Coalition; without exception, they have done and continue to play an important, supportive role.

Politically, the MCC has had experiences at all levels. Township supervisors in all four townships within the watershed have been supportive of the Coalition's effort by approving road bonding requests by contractors, assisting in some road modifications, etc. when necessary, and just by stopping by from time to time when site construction is underway to show their interest and support toward efforts to improve the waterways within their jurisdictions.

A series of county commissioners have been invaluablely supportive over the years. Of particular appreciation are those three commissioners each from Clarion and Jefferson Counties that placed their signatures on the NRCS PL83-566 document in 1999, so ably accomplished with the critical aid of NRCS personnel. This document provides a comprehensive and ambitious plan for the recovery of the Mill Creek Watershed. Since most of the Coalition's activities have

occurred in Jefferson County to date, their commissioners have been called upon for assistance and support from time to time; they have risen to the task in each instance.

On several occasions, state and federal legislators serving our area have been contacted with generally positive results. Most of those efforts were at the federal level while pursuing funding to support the PL83-566 program and Mill Creek stream recovery efforts. Whether funding occurred or not, the MCC acknowledges their interest and efforts to procure funding.

The MCC's business experiences are primarily of two types: environmental consulting firms and AMD passive system construction contractors. Over the years, the Coalition has relied upon three very competent environmental consulting firms, all of which have taken "ownership" of the watershed, often providing site visits, extra meetings and other services above and beyond contractual agreements. The two who have won design and construction oversight contracts in recent years are professionally recognized by their peers and incorporate the newest design concepts into the treatment systems.

Similarly, over the years, a half dozen construction firms have consistently provided competitive bids and excellent service. Invariably during the construction, unforeseen circumstances arise where such things as extra hours, changes in design and other challenges need to be addressed. These items, along with inclement weather, mean that the contractor may have unforeseen delays and need to rely upon a dose or two of additional patience to finish a job. A few have donated extra time of themselves and their equipment. Their job performance and enthusiasm are truly appreciated and acknowledged.

There are three governmental agencies which have been instrumental in MCC's water improvement successes: DEP, NRCS and OSM. DEP's involvement is varied. The Knox DMO has been extremely supportive in myriad and valuable ways from the very beginning. The office allows its members to attend MCC meetings when requested, has forwarded in lieu of civil penalty monies to the MCC, has spent many hours "in the field", either collecting water samples themselves or allowing MCC members to do so, with the water analyses conducted by DEP's lab, have on occasion provided emergency monies when a treatment system construction ran into a roadblock, have completed all the TMDLs on the watershed, and listened to our concerns when a mining application on the watershed is being considered. At the present time, the office and the Coalition serve on a committee to make recommendations on an updated treatment design to treat two discharges in which DEP will take over future responsibility. The MCC gratefully acknowledges the management and employees of the Knox DMO who have been involved with the MCC since its formation.

DEP's Growing Greener program has provided a significant amount of funding for Mill Creek, and it would be virtually impossible to have the successes in the watershed without that financial support. The Bureau of Oil and Gas investigated a number of possible abandoned gas wells itself or through contract and successfully plugged two documented wells. The EPA 319 monies transferred to DEP have been most helpful in meeting O&M needs of the passive treatment systems over the years. Lastly, BAMR and the personnel that interact with the Coalition have been instrumental in taking responsibility for the total design and construction costs of three passive treatment systems and one re-contouring, liming, etc. of a previous mining

site. In addition, many day long trips to the watershed in order to take water samples and flow rates have been conducted over the years. The interest and professionalism of these personnel in the office and field are gratefully appreciated and acknowledged.

The two conservation districts (Clarion, Jefferson), two RC&Ds (Penn Soil, Headwaters), two NRCS District Conservationists and Harrisburg NRCS have all been absolutely essential to the success of the MCC. Totally, the plethora of knowledge, expertise, enthusiasm and services provided are outstanding. Kudos are extended to the Headwaters Charitable Trust (Headwaters RC&D) because of the many grant writing and administrative services provided, simply because most of the treatment systems thus far are within their jurisdiction. The District Conservationist there (Jefferson County) has provided an extraordinarily huge amount of time with the MCC for the same reason. In addition, the several PL83-566 awards received take a substantial amount of Coalition, District Conservationist and Harrisburg NRCS time to meet federal guidelines. Yet the benefits far outweigh these inconveniences. Lastly, it was mainly through the efforts of these entities that the PL83-566 watershed plan was completed, a somewhat lengthy process that resulted in an invaluable document. From the District to the Harrisburg level, a heartfelt thank you is extended.

The personnel in the Harrisburg office of the OSM have assisted the Coalition in several important ways. When the appropriate criteria are met, the Coalition can count on OSM doing its best to come up with matching monies for many of the projects. By visiting the watershed on occasion, the agency understands MCC's needs and has the expertise to offer technical advice. OSM's involvement and commitment to the Mill Creek watershed and the MCC over the past two decades is gratefully acknowledged.

The PA Game Commission and Fish & Boat Commission have been supportive from the very beginning. With much of the lower watershed in Game Lands, the PGC has an interest in the quality of water which courses through its property. The first passive treatment system constructed on Mill Creek is unique in that a portion is on both private land and Game Lands 74. The PGC allows Coalition members to have gate access to roads which provide an easy and convenient means to get to segments of Mill Creek for water sampling and electrofishing purposes. The PFBC is aware of the improved water quality observed over the years. Due to these improvements, it established an additional trout stocking location (originally only one) a number of years ago and has electrofishing monitoring points throughout the watershed. The Coalition thanks those many personnel at the local, regional and state levels within these two agencies which provide their continual support and encouragement.

The PA National Guard played a very critical and important role in the earliest days of the Coalition. Through the participation of Company B, 876th Engineer Battalion, located in Punxsutawney, the unit donated its men and machinery for most of the construction at the first four AMD sites the Coalition addressed. Long weekends and local encampments the first several years allowed for low construction costs and a big return in regard to marked improvements in water quality. Such a spurt of activity and successes caught the attention of everyone and raised some realistic hopes that indeed the water quality of the Mill Creek Watershed could be markedly improved. Thanks and gratitude go to the many members of the battalion, as well as

the leadership and commitment from the upper levels of the Guard for nearly instantaneously helping the Coalition become noticed locally and at the state agency levels.

There are some quasi-agency groups who have assisted the Coalition by providing small grants and technical support to meet the needs of the Coalition. Applications tend to be brief and acceptance/rejection is known in several days or short weeks. These groups include TU-TAG, WPCAMR, Foundation for Pennsylvania Watersheds, the Western Pennsylvania Conservancy and others. They provide a unique niche of assistance not generally offered by state and federal agencies. Thank you!

In no small way, Clarion University has also played an important role in the successes of the MCC. Support has come from the administrative and departmental levels. Several AMD associated conferences have been held on campus including the one in 1990 that was instrumental in the formation of the MCC. The Biology and AGES (Anthropology, Geography & Earth Science) Departments are acknowledged for providing students, faculty, and office and lab facilities. Faculty in AGES have directly participated by providing GIS and mapping expertise for students and Coalition members. The Biology Department provided lab space for water chemistry analyses, files, space for work study students, field equipment, etc. Nearly a half dozen active and retired faculty have expertise in areas such as fisheries, aquatic insects and water chemistry. Some from the Biology Department and other departments have participated in the MCC in leadership positions. Clarion University's Printing & Graphics Express Services (PAGES) Department has provided excellent printing, duplicating, and graphics services to the MCC for many years. The MCC recognizes Clarion University for its invaluable support.

A number of the MCC member groups have not been acknowledged yet, but have played an integral role in the formation and function of the Coalition over the past two decades. These include the Alliance for Wetlands and Wildlife, Clarion County Federation of Sportsmen, Jefferson County Federation of Sportsmen, Iron Furnace Chapter of Trout Unlimited, League of Women Voters of Clarion County, Mill Creek Chapter of the National Wild Turkey Federation, Northwest Pennsylvania's Great Outdoors Tourist Promotion Agency and the Seneca Rocks Audubon Society. Their interest, leadership and monetary assistance have been important as well as the diversity of expertise and experiences they bring to the MCC, all of which are invaluable and much appreciated.

Obviously, the Mill Creek Watershed has a strong base of stakeholders within the Coalition itself, but also among the outdoor visitors and residents of Clarion and Jefferson Counties. Stakeholder numbers have increased in the area, thanks to newspaper accounts, field trips open to the public as well as those provided through school and university activities. This broad level of interest and support by individuals, groups and businesses throughout the bi-county area and beyond are encouraging and deeply appreciated and acknowledged by the MCC.

Foreword

In the mid 1980s, two recent graduates of Clarion University's Biology Department (one M.S., the other a B.S. degree) were employed by EADS at the company's Strattanville office. From time to time, one or the other would visit the department and share their job experiences. One of the items that was frequently brought up was their work on the design and construction of passive treatment systems for addressing AMD affected waters resulting from past coal mining operations. It appeared that new technological advancements to treat AMD waters through passive treatment methodologies were showing great promise. It was not too long before a few Biology faculty joined them to visit several small newly constructed passive treatment systems in the area. Suitably impressed, several faculty and students soon found themselves involved in a few weekend projects planting cattails and spreading hay mulch on a couple of simple AMD sites located nearby, getting their collective feet wet, so to speak.

The two young men as well as interested faculty continued the next several years to gain additional experience and knowledge via field work and attending AMD focused professional conferences. Soon the two left EADS to form an environmental consulting company (Damariscotta) which specialized in the design and construction of passive treatment systems.

By the fall of 1990, several faculty along with Damariscotta, local conservation groups and agencies believed there was sufficient interest in the value of passive treatment systems to potentially restore AMD affected streams. A conference was held in early October on the Clarion University campus. It was attended by various state, federal agencies and other interested parties to ascertain if there was indeed sufficient knowledge, interest and potential funding possibilities to justify the formation of a coalition of academic, agency and local non-governmental organizations (NGOs) to tackle a nearby AMD affected stream. The strong consensus of the attendees at the end of the meeting was to move forward with the formation of a coalition to focus on stream restoration of the Mill Creek Watershed. Before the end of the year, the Mill Creek Coalition of Clarion and Jefferson Counties was formed. What has happened since that momentous occasion is the purpose of this report.

Mill Creek Coalition Overview

Abstract

The Mill Creek Coalition of Clarion and Jefferson Counties has actively worked to improve the water quality and coldwater fishery of the 60 square mile Mill Creek Watershed for two decades. Since its inception, about 40 projects (several with multiple sites) have occurred that in some way have resulted in a positive change to the watershed. These include the construction of passive treatment systems (24 sites), the continuation of active treatment systems originally constructed by a defunct mining company with its present operation supported through a DEP-negotiated trust (6 sites), DEP (BAMR) treatment of more recent mine sites (3 sites), re-mining (4 sites), the re-contouring, adding of alkalinity to disturbed overburden and revegetation (1 site), incorporating heavy applications of lime to the surface of previously mined sites (2 sites), and plugging of abandoned gas wells (2 sites). Roughly \$12.0 million has been invested in the Mill Creek Watershed to this point in time, excluding about \$100,000/year by the aforementioned trust to maintain active chemical treatment on the six sites formerly treated by a coal company. It is likely that nearly several thousand gpm of AMD water have been substantially improved through these efforts.

The PA Fish & Boat Commission has committed to two (originally one) trout stocking locations on Mill Creek, both on PA Game Lands 74, which takes in approximately the lower one-half of the watershed. The Commission has approximately doubled the trout stocking for the past ten years. The largest tributary (Little Mill Creek), while remaining partially degraded, has several tolerant fish species, crayfish, and aquatic insects, which have re-colonized most of its nine mile length. Brook trout were documented in Little Mill for the first time in June, 2011, as well as in two of its tributaries.

The present objectives are to maintain and upgrade the passive treatment sites when necessary and acquire construction funding for several more AMD sites on Little Mill where designs are completed. More attention is presently focused on the Jones/Douglass subwatershed, about one-half the size of Little Mill Creek and seriously affected by AMD. The last six miles of Mill Creek will continue to be devoid of a fishery until this tributary's AMD problems are satisfactorily addressed.

Acquiring continued funding is critical. The enthusiasm and support of Coalition members as well as partnering NGOs, state and federal agencies are appreciated and necessary for continued success. The Coalition looks forward to increasing its leadership base as it pursues its future goals as stated in its 2011-2015 five-year plan.

A 20-Year (1990-2010) Review of the Accomplishments of the Mill Creek Coalition of Clarion and Jefferson Counties, with a Five-Year Plan for 2011-2015

Introduction

The Mill Creek Coalition of Clarion and Jefferson Counties (MCC) has been in existence since the fall of 1990, with its first AMD treatment system (Howe Bridge Site) constructed in late 1991. Presently, the Coalition is at a crossroads with an aging leadership, more of a focus on Jones/Douglass Run, maintaining or improving the effectiveness of the present 20+ passive treatment systems, moving forward on the design and construction of future systems, continuing the monitoring of the fisheries and aquatic insects in the entire watershed, dealing with a phasing out of Growing Greener funds, and planning for a likely shift of funding to BAMR due to the reauthorization of SMCRA in late 2006.

Following is an overview of the Coalition's background along with the important events and accomplishments which have transpired over the two decades of the Coalition's existence. Next, a five year plan (2011-2015) is provided, that if enacted, will result in the potential establishment of a quality and sustainable coldwater fishery throughout more of the watershed.

Background

The MCC came into existence in 1990 after a fall conference held at Clarion University focused on the restoration of the 60 square-mile Mill Creek from the effects of AMD. Streams in both Clarion and western Jefferson Counties are heavily impacted by AMD (Figure 1) resulting in sufficient interest to initiate a watershed restoration project.

The magnitude of the impact in this area from coal mining is immense and no doubt helped fuel the attempt to address the problems primarily associated with past mining practices. In fact, about 567 stream miles in Clarion County and 179 miles in Jefferson County are affected. Also, on a square mile basis, Clarion County has the greatest proportion of AMD affected streams in the Commonwealth, with about one mile of stream length to nearly every square mile in the county. Jefferson County is about at the top of the quartile in AMD-affected streams. In regard to the acres of mined area compared to the total acres of a county, Clarion County is 4th and Jefferson County 7th out of 37 counties in which mining has occurred.

Streams and Fisheries Impacted by Acid Mine Drainage in Pennsylvania
 (Based on EPA Fisheries Survey – 1995)

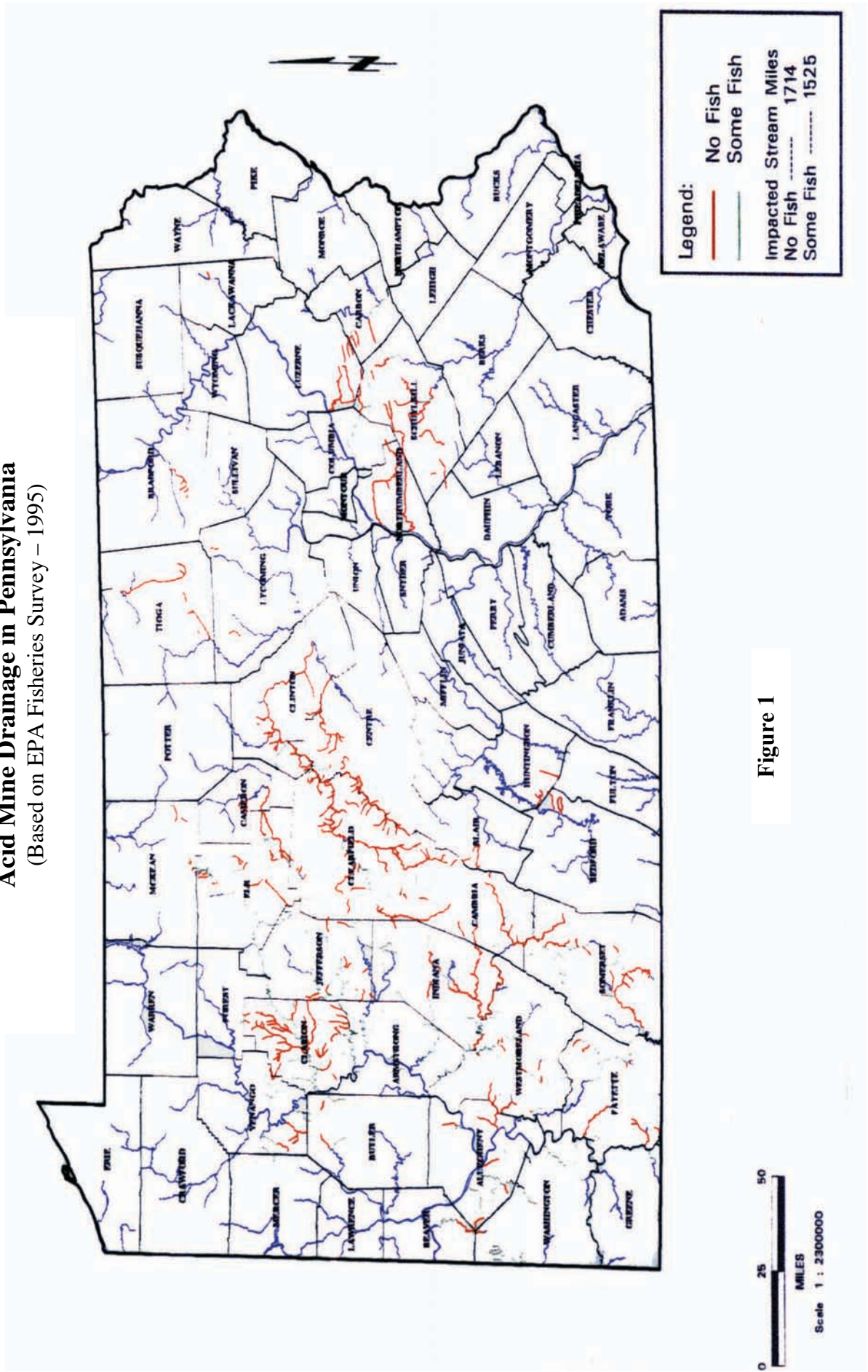


Figure 1

The conference focused on Mill Creek for a number of reasons:

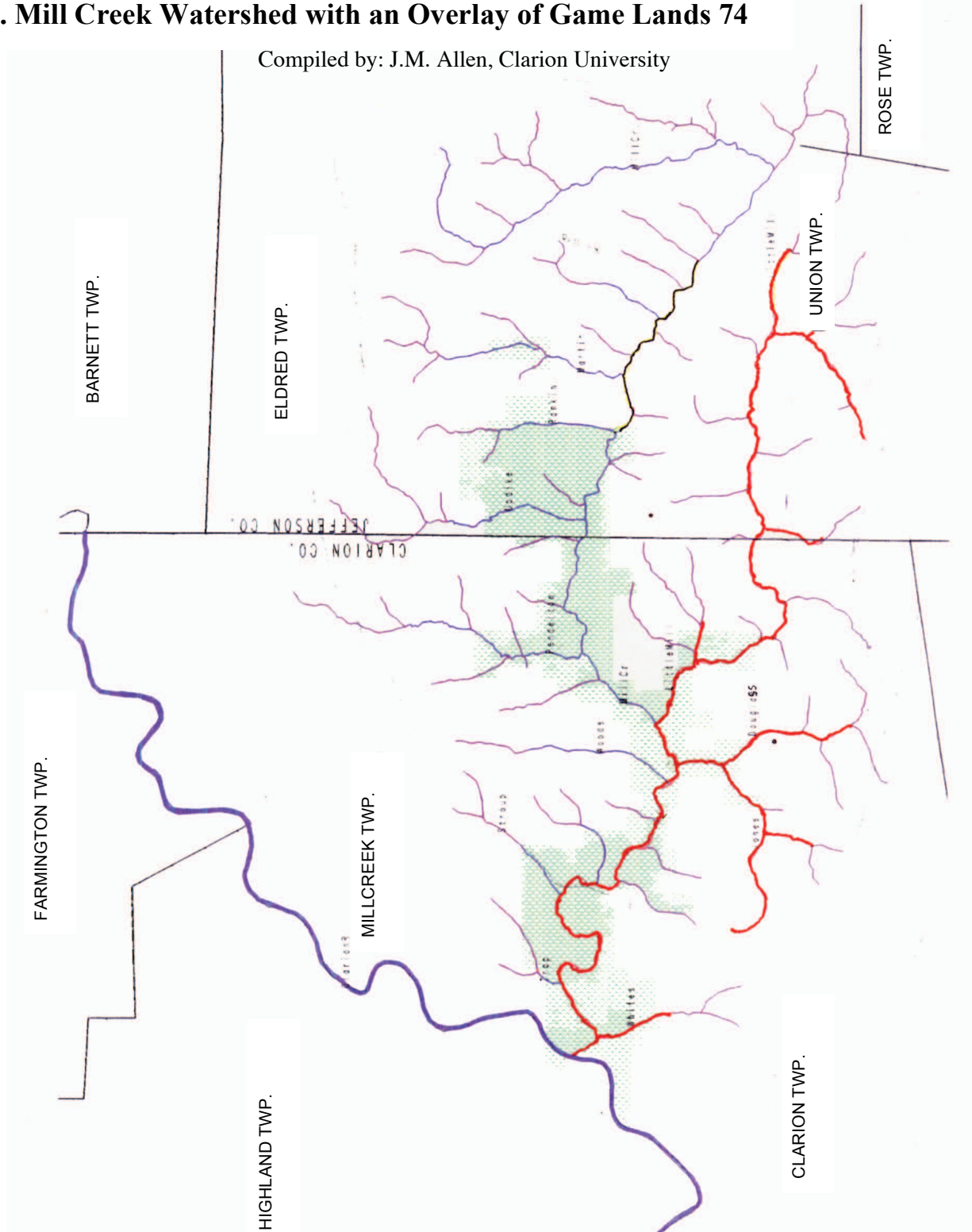
- Passive treatment systems at that time were becoming functional realities, and the discharges on the watershed were thought to be treatable volumes and chemistries by agency and watershed restoration consultants.
- Two pre-coalition studies on the watershed, one by the Army Corps of Engineers and the other by DEP (EADS contract) provided important guidance documents on AMD discharges and their locations.
- The Knox District Mining Office (DMO) believed that future mining in the watershed would be negligible because of the sulfur content of the coal and overburden chemistry.
- The encouragement, helpfulness, overall support and proximity of the Knox DMO was an important factor in the formation of the MCC.
- Some of the tributaries and the upper 9-10 miles of the relatively unpolluted main stem, constituting about 50 percent of the watershed, have a native brook trout fishery. A significant tributary to Mill Creek, Pendleton/McCanna Run, is a designated Wilderness Trout Waters.
- The main stem of Mill Creek from its mouth at the Clarion River and upstream through all of Clarion County and nearly two miles of Jefferson County is in State Game Lands 74 along with the lower portions of Little Mill and Jones/Douglass (Figure 2). Therefore, this stretch is open to the public and any improvements in the watershed would be enjoyed by everyone.
- Several environmental organizations (Trout Unlimited, Audubon, County Federation of Sportsmen) draw their membership from individuals in both counties and willingly constitute part of the active membership of the MCC.
- The interest for stream restoration was strong enough that bi-county support from political offices (commissioners), natural resource agencies (conservation districts, NRCS offices and RC&D units (PennSoil, Headwaters) provide an influential and talented group to guide and participate in the MCC.
- The watershed is entirely within the Pennsylvania Congressional District 5, and in two State House of Representative Districts (63 and 66) and within two State Senate Districts (21 and 25).

Important Events

The Mill Creek Watershed, at about 60 square miles, covers four townships in its bi-county drainage (Figure 2). It appears in the “State’s High Priority List of Degraded Watersheds” published in 1997, being part of watershed 17B, a tributary of the Clarion River. Out of a total of about 109 miles of streams in the Mill Creek Watershed, 61 are AMD affected.

A NRCS PL83-566 Watershed Agreement was approved in 1999. It provided the locations for all the AMD sites within the watershed with representative flows and water chemistry for each as well as an estimated treatment cost in 1999 dollars for each site.

Figure 2. Mill Creek Watershed with an Overlay of Game Lands 74



To follow the mandate of federal section 303(d) of the Clean Water Act, which requires Pennsylvania to establish water quality standards, five TMDLs have been completed in the watershed by DEP's Knox District Mining Office (DMO) and approved by the EPA: Whites Run, Douglass/Jones Run, Parks Run, Little Mill Creek, and most recently, Mill Creek. The latter was published in the Pennsylvania Bulletin in fall of 2008, and approved by EPA in 2009.

In 1996, a 51.7-mile length of the Clarion River received federal Wild and Scenic River designation down to the Piney Dam pool. Mill Creek is the first AMD-affected watershed below the designated segment and with other AMD streams below Mill Creek, result in the degradation of the Clarion River as it flows toward the Allegheny River.

Clarion and Jefferson Counties are part of "PA Wilds," a special designated multi-county area noted for its many natural resource attractions. Established in 2004, funding opportunities are available to promote and develop outdoor recreational opportunities.

The MCC from its inception did not wish to receive or administer grant monies because of limitations of time and the expertise of its officers. Fortunately, with NRCS as a Coalition member as well as two conservation districts (Clarion and Jefferson) and two RC&D trusts (Penn Soil and Headwaters), arrangements were made very early in the Coalition's formative months to have the Headwaters Charitable Trust agree to serve as the administrator and co-writer of most grants. Headwaters has experience with AMD issues, has the administrative personnel, and most of the Mill Creek AMD sites fall within its jurisdictional boundaries.

Accomplishments

Up to the present, the Coalition and its state, federal, non-governmental organizations and other partners have plugged two abandoned gas wells, treated approximately two dozen AMD sites via the construction of passive treatment systems, and, along with other accomplishments, slightly over 40 sites have been improved, resulting in less AMD flowing into the watershed (Figure 3). Formal water sampling monitoring stations are also shown. More specifics are noted in the Financial Support section.

Recognizing the need to improve and upgrade the performance of the Coalition's older passive treatment systems, EADS and Dietz-Gourley Consulting were funded to provide an assessment and recommendations for these systems. The study was completed in 2006. Based on the report, a Growing Greener grant was written in 2007 to address several of these sites. The grant was not funded. It was resubmitted in 2008 and not funded. The grant was resubmitted in 2009 and received funding from the 319 program to upgrade three sites in 2011, with another scheduled for 2012. Another Growing Greener grant proposal was submitted in 2010 for funding to upgrade another of the older sites (Beagle), but was not funded.

In 1996, the formation of a C&K trust fund initiated perpetual treatment on six significant AMD sites in the watershed. The Knox DMO oversees the day-to-day operations of a contracted entity responsible for treatment and maintenance activities.

Over the years, the Coalition has taken the responsibility of periodically collecting water samples from select points within each passive treatment system as well as upstream and downstream water samples, then conducting the appropriate water chemistry analyses at Clarion University's water testing laboratory located within the Biology Department. These monitoring data are important to understanding the performance of the systems. The Knox DMO and BAMR continue to collect water samples and some stream flow data, from which loadings can be calculated. Their samples are analyzed in the state laboratory in Harrisburg. All these data are critically important in monitoring changes in water quality over time as well as providing information to assist in future AMD treatment decisions.

The MCC is pleased that since its inception it has employed over three dozen topnotch undergraduate students from Clarion University, many of whom have pursued graduate studies. Nearly all of them have become employed in some field of aquatic ecology. In addition, five Masters Degree students have conducted their research projects on the watershed. Also, hundreds of elementary, middle and high school students have visited one or more stream segments and passive treatment sites. Several Clarion University biology courses utilize the watershed for lab exercises and independent studies. The MCC and faculty at Clarion University periodically sample segments of Mill Creek (AMD affected and non-AMD affected segments) for fish, using minnow trapping and electrofishing techniques in order to monitor population health and recolonization patterns. Aquatic invertebrates are occasionally monitored.

The Iron Furnace Chapter of Trout Unlimited has established a number of successful "Trout in the Classroom" programs in the high schools of Clarion and Jefferson Counties. Two, Clarion-Limestone and Brookville high schools, are located within the Mill Creek Watershed. At this time, Clarion-Limestone has yet to enter the program. However, once that happens, both schools will be encouraged to participate in Mill Creek Watershed activities.

The Clarion Conservation District acquired and administered funding to do extensive surface liming on two 90-acre sites located on previously strip-mined areas on the headwaters of Jones Run. Also, the District examined three locations on the lower Jones/Douglass watershed where AMD problems exist which may have resulted from past gas drilling activities. Exploratory drilling was conducted at possible well sites. The AMD problems were determined to not have originated at the surface due to past drilling activities.

To date, because of a half dozen treatment (active and passive) sites on the upper portion of Mill Creek itself, the stream has retained its native brook trout and other fish and invertebrates throughout the upper two-thirds (14-15 miles) of its length. The lower one third (six miles) of Mill Creek is mildly compromised by intensively AMD treated Little Mill Creek and profoundly affected by untreated Jones/Douglass Run. After the Coalition initiated its restoration work on the watershed, the PA Fish and Boat Commission established a second trout stocking point on Mill Creek at Howe Bridge. This site is approximately four miles upstream from the original stocking location at Old State Road Bridge near the mouth of Pendleton/McCanna Run. Excluding earlier data, for the five-year period 1990-1994, 17,400 brook trout were released during pre-season and post-season stockings. After the Commission's evaluation of Mill Creek waters in the Howe Bridge vicinity, stocking was also approved for that location in 1995. In the next five years, stocking increased to 31,500, an 80 percent increase, due in part to

improvements in water quality. Both stocking points are located on Game Lands 74, and easily accessible to trout fishing enthusiasts.

The approximately 9 mile long Little Mill Creek, where much of the attention and effort has been focused, has improved 100-fold in pH, from approximately 4.0 to 6.0. In 2007, crayfish were found throughout its total length, along with four species of fish, but with only one species of minnow (creek chub) having consistently healthy populations at each sampling site. In 2008, minnows had disappeared from a significant length of Little Mill Creek before rebounding, indicating that water chemistry and water quality stability need to be addressed in selected areas. For unknown reasons at this time, there appear to be infrequent events, which result in the pH to briefly drop, thus affecting fish recolonization. The construction of two adjacent passive treatment systems (Filson 7 sites) in the summer of 2008 was a positive step in alleviating these concerns.

Also benefiting Little Mill Creek, two AMD sites on the Corsica tributary to Little Mill Creek have completed designs for passive treatment systems, with construction initiated in late 2010. Funding from the NRCS PL83-566 program was approved for construction and completion in 2010-2011.

Overall, the positive improvement on Little Mill Creek has resulted in an approximately 10-fold increase in pH (previously mid 5s to presently low 6s) for Mill Creek after the former merges with Mill Creek. However, that improvement is soon negated by the water from Jones/Douglass one half mile downstream, where the pH is decreased to about 5.0 for the final six miles of Mill Creek. Nevertheless, there is enough of a positive change that crayfish, albeit in small numbers, have recolonized Mill Creek below Little Mill Creek to its confluence with the Clarion River.

Efforts are moving forward to start addressing AMD problems on Jones/Douglass. Based on support from TU-TAG, Hedin Environmental initiated a water quality assessment on the upper portion of the watershed in 2010, with completion in 2011 for the lower section.

The MCC benefited from a “Mill Creek Watershed Assessment of an Acid-Mine Drainage Abatement Project in Clarion (ed. note, also Jefferson) County: Final Report.” This project, funded in 1999, was made possible by a grant from the Center for Rural Pennsylvania, a legislative agency of the Pennsylvania General Assembly. Published in 2001, it included among a number of topics, an assessment of the passive treatment systems and their impact on stream water chemistry and invertebrate and fish communities up to 1999. Included is “A Users Guide for the Mill Creek Watershed Water Quality Database.”

In the spring of 2011, a M.S. thesis written by Clarion University student Amy Myers was completed. The thesis analyzed macroinvertebrate data collected in the Little Mill Creek Watershed from 1994 to 2007. A number of analyses showed that macrovertebrate assemblages improved in the watershed after the completion of a number of the treatment systems, especially during the mid-1990s. The data also indicated that there has been a decline in those assemblages with the gradual lowering of the treatment efficiency of the earlier treatment systems over time. As some of these systems are scheduled for improvement in 2011-2012, a new macroinvertebrate

study would be very useful to learn more about how macroinvertebrate assemblages vary with the success of passive treatment. A fall 2011 survey of the aquatic macroinvertebrates will be conducted at selected sites, primarily in Little Mill Creek, by the Watershed Conservation Program of the Western Pennsylvania Conservancy.

Little Mill Creek has benefited from four mining/re-mining projects from 2003-2005 by Ben Hal Mining Company, MSM Mining Company, TDK Coal Sales and Sky Haven Coal, Inc. While mining, previous coal high walls were eliminated, alkaline material was added to overburden and soil, surface water runoff efficiencies were improved, and pools of acidic water within the permitted areas were eliminated.

For those interested in AMD and stream restoration efforts, the Mill Creek Coalition has received more attention than probably any other watershed in the state, and perhaps the nation. The MCC is unique in its formation because the organization exists to principally address AMD problems in a watershed. There have been a number of tours to Mill Creek for in-state, out-of-state and foreign guests in order to view particular AMD treatment designs and functions. In 1995, the MCC and other organizations sponsored a regional conference on restoration and management at Clarion University entitled "Mine Drainage & Watersheds." Researchers, including MCC members, have presented papers and displays at state, national and international meetings. The same goes for peer-reviewed papers in professional publications. A number of undergraduates, graduate students and faculty at Clarion University and elsewhere have conducted their research at AMD sites and the waters of Mill Creek itself.

Recognizing the importance of communicating to the residents of Clarion and Jefferson Counties, MCC routinely invites local journalists to new treatment sites as well as providing news releases to four local newspapers. In addition, the MCC has a display at the annual spring National Wildlife Week/Sportsmen's Days three-day program at the Clarion Mall, an activity in which it has participated for the past 15 years.

The MCC has received a number of awards as recognition for its successes and sustained long-term efforts to establish a coldwater fishery throughout more of the watershed. Some of these awards include: Conservation Organization of the Year from the Pennsylvania Wildlife Federation (1993), the Watershed Protection Award from the Pennsylvania Association of Conservation Districts (1993), the Three Rivers Environmental Award (1998), and the Governor's Award for Watershed Stewardship (2002).

Financial Support

Since the formation of the MCC, nearly \$12 million has been invested in the Mill Creek Watershed as the Coalition pursued its efforts to restore a coldwater fishery throughout the watershed. The primary agencies and organizations which provided the funding are noted below, along with the amounts. However, keep in mind that there has been a huge amount of donated time and labor over the years. These efforts remain invaluable for the continued upgrading of the watershed. In addition, NRCS, DEP and county conservation district personnel have contributed many hours in the field and office.

The Headwaters Charitable Trust is utilized by the MCC for assisting in its grant applications and administrative functions for many of the passive treatment systems. Headwaters has administered DEP Growing Greener, WRAP, 104b and 319 funds, as well as support monies from TAG, WPCAMR, Foundation for Pennsylvania Watersheds, and WPC's Watershed Conservation Program. Financial support has also been received from EPA, OSM, NRCS, and several foundations/businesses. All in all, Headwaters has administered approximately \$2,000,000 up to 2008 in the following projects:

The project sites (Figure 3) are more or less in the order of their construction, starting in 1991, and includes Howe Bridge (two AMD sources), Schnepf (two AMD sources), Alder Bog, Filson 5 and 6, McKinley 1, McKinley 2, Morrow 1, Filson 4, Bog, Simpson 1, Daiva, Filson 1, Filson 2, Orcutt/Smail, and Filson 7 (two AMD sources).

The following paragraphs include funding administered by Headwaters since 2008 as well as funding and support from other sources:

In its first years, the Coalition received invaluable donated time and services from Damariscotta Consulting and Simpson Excavating. Similarly, the PA National Guard, Company B, 876th Engineer Battalion, stationed in Punxsutawney, donated their men and machinery for most of the construction at the first four AMD sites the Coalition addressed. These donations are estimated to be at least \$150,000 if they were contracted services and are included in the paragraph covering Headwaters accounts.

BAMR has invested in four sites (Figure 3), including the Shofestall alkaline addition backfill site and the Strattanville, Hanlon and Kotchey sites, totaling \$3,517,728. This number does not include development, design, inspection and monitoring of the sites.

The Knox DMO has provided in excess of \$110,000 from in lieu of civil penalty monies and other sources. The staff has participated in numerous field trips to the watershed, independently as well as by request from the MCC. The Knox office conducted all the TMDLs on the watershed. The office is supportive of MCC's efforts with staff attending Coalition meetings when requested.

The Knox DMO and BAMR have provided water sampling services throughout the watershed while monitoring AMD sites, stream sites, and BAMR treatment sites. Over the nearly two decades of the MCC's existence, hundreds of water samples have been analyzed. Presently priced at over \$50/sample via the Harrisburg lab, just 2,000 samples would equal about \$100,000. Clarion University provided a lab for water sampling at MCC's approximately two dozen passive treatment sites. Over the years, many hundreds of samples have been analyzed at approximately one-half the cost to DEP and conducted primarily by undergraduates under faculty supervision, a value of at least \$50,000.

As noted, Clarion University provided a water chemistry lab and other physical support for the participating faculty. In addition, university funding provided work-study and graduate student funding over the past two decades. Together, over forty undergraduate and graduate

students have been employed by the MCC providing approximately \$60,000 in field and lab services.

The Bureau of Oil and Gas (DEP) invested \$150,218 and its own personnel to investigate four potential abandoned gas well sites on the watershed and successfully identified and plugged two. After initial drilling, the remaining two sites were determined not to be abandoned wells.

The Clarion Conservation District received a Growing Greener grant of \$40,000 to investigate some potential abandoned gas well sites on the Jones/Douglass watershed. No gas well drill holes were found.

Four re-mining activities in the watershed occurred during the period of 2000-2005. Their estimated value of the reclamation work was calculated by DEP. The MSM Mining Company was listed at \$93,000, Ben Hal at \$5,595, TDK at \$185,000 and Sky Haven at \$784,686, for a total of \$1,068,281.

DEP's Knox DMO oversees the active chemical treatment of six AMD treatment sites previously the responsibility of C&K Coal prior to its bankruptcy. These sites are Hughey, Kunselman, Schnepf Road (two sites), Vosberg, and Wishart (Figure 3). Funded through a trust account and serviced by a private contractor since July 2006, approximately \$100,000/year is expended for treatment site operation and maintenance. The C&K sites have existed prior to MCC's formation, with C&K constructing and servicing the systems. Since the time C&K was involved in these sites, maintaining and treating them just during the two decades the MCC has existed, it is reasonable to assume that \$2,000,000 or more have been expended. This includes one treatment system on Schnepf Road, which was upgraded with the addition of an ALD in the past decade for approximately \$70,000. All were (and still are) designed primarily for treatment with caustic soda or other alkaline chemicals. The cumulative treatment costs have far surpassed the original construction costs.

The NRCS's PL 83-566 program has provided \$400,000 in matching funds and \$800,000 in services. These monies aided in the construction of the REM (Orcutt-Smail) passive treatment site as well as various design and construction oversight services at that site and elsewhere. Most recently (2010), a grant was awarded for the construction of two AMD treatment sites (Glenn 17, Glenn 19) on an unnamed tributary known by the MCC as the Corsica tributary of Little Mill Creek. The two sites will be completed in 2011 at a cost of approximately \$585,000.

A number of small grants and contributions have come from other sources. Two of the largest include Trout Unlimited, a Coalition member, which has provided \$35,000 in support of various projects funded by money received from local, state and national levels. The McLean Contributionship has provided \$45,000 in support. S&T Bank donated \$10,000. Headwaters administered the above funding. Clarion University, Trout Unlimited-Iron Furnace Chapter and the Clarion County Federation of Sportsmen have covered copying and mailing costs for the monthly minutes.

A grant of \$44,500 was awarded in 1999 by the Center for Rural Pennsylvania, a legislative agency of the Pennsylvania General Assembly. See "Accomplishments" for a further description.

Through the Clarion Conservation District, the Alliance for Wetlands and Wildlife, NRCS, and the PA Game Commission, a Growing Greener grant in the amount of \$108,000 was funded to support a pilot land-liming project on Jones Run. The initial phase treated 90 acres of private land at 20 tons/acre of agricultural lime on the western headwaters which had been strip-mined, leveled and planted primarily in tolerant species of trees, but sparsely vegetated at the time of this project in 2001. The project expanded onto a 90 acre portion of Game Lands 74, again at 20 tons/acre, on another headwaters portion of Jones Run. The Alliance for Wetlands and Wildlife purchased a lime spreader for the Game Commission, with the Commission doing the spreading.

In 2009, the REM Site received an \$82,000 grant from DEP as it transitions from MCC responsibilities to DEP. The grant covers continued site flushing, water sampling, maintenance, lab analyses, travel, etc., with most of the expenditures dedicated to contractual services for design of an upgrade/replacement system. Administered by the Headwaters Charitable Trust, the grant ends November 2011. A long-term treatment plan, using a lime slurry system in conjunction with a modification of the present treatment ponds, was approved early in 2011. The cost is estimated roughly at \$150,000. Operation and maintenance expenses could range from \$30,000-\$40,000 per year; a more accurate estimate has yet to be determined.

In 2009 and 2010, two TU-TAG grants totaling \$10,500 were awarded to Hedin Environmental to provide a watershed assessment for Jones/Douglass, to be completed in 2011.

In 2010, DEP (319 Nonpoint Source Program) awarded \$65,041, with an OSM match of \$18,500, thus totaling \$83,541 to do an O&M upgrade of three sites (Bog, Filson 5/6, Morrow). Construction will occur in 2011. A DEP/OSM award of \$187,000 is dedicated to Filson 4 with construction completion in late 2012.

Up to this point, about 500 gpm have been treated on the main stem of Mill Creek via a combination of active and passive treatment systems. On the other hand, for the seriously affected Little Mill, over three times as many treatment systems (passive) have been constructed, two abandoned gas wells plugged, one significant lime addition and recontouring/diversion project completed (Shofestall/Zerbe) and four re-mining projects undertaken have all decreased the quantity of AMD affected water and improved surface water runoff. As a result, it is estimated that the quality of approximately 1,000 gpm of Little Mill water has been improved by some treatment design. These estimated gpm values for Mill and Little Mill are going to be less during summer low flows and more during spring high flows. The flow of Little Mill ranges from roughly 1000-4000 gpm in late summer and fall to about 6,000-9,000 gpm, primarily in the spring. All in all, the remarkable improvement to Little Mill water quality is a function of the concerted long-term team efforts to address AMD in this watershed.

In summary, adding the costs, which are enumerated above, amount to approximately \$12,000,000. This does not take into account the nearly \$100,000/year treatment of the six trust supported C&K Coal sites established in 1996. Nor does it take into account the huge amount of volunteer and agency personnel time and expense.

The Five-Year Plan

There are a number of important strategic priorities on which the Coalition will focus its efforts for the next five years:

- The Coalition will continue to vigorously pursue funding to improve and upgrade the older passive treatment systems on the watershed. Several systems constructed by BAMR need to be reviewed and perhaps improved and upgraded during the same time period. Nearly all the systems are within the Little Mill Creek drainage and critical to the water quality of Mill Creek. With fish documented in 2007 for the first time throughout Little Mill Creek, the Coalition is concerned that shrinking levels of Growing Greener and other types of state and federal agency funding may make it difficult to maintain present systems and impede further progress in the watershed. The lack of funding to maintain the improvement in water quality that has been accomplished thus far is a challenge. To date, it represents the most serious funding shortage during its 20 years of commitment to the Mill Creek Watershed with DEP's 319 program currently being the only effective funding source at the moment.
- DEP in 2008 accepted responsibility for the REM (Smail-Orcutt) Site. The MCC and DEP are working together to ensure that both short and long term treatment goals are met. A treatment design was approved in 2011, with a construction date not yet established.
- Funding through the PL83-655 program will provide for the construction of two passive treatment systems on the Corsica Tributary, which flows into the lower half of Little Mill Creek. Construction will be completed in 2011. After their completion, only a few remaining AMD sites amenable to passive treatment remain on Little Mill Creek.
- The Jones/Douglass tributary will receive substantial attention during the next five years and likely beyond. It is the second largest tributary to the Mill Creek Watershed. It is about five miles in length, and includes approximately 11% of the watershed area (compared to 25% for Little Mill Creek). Based on low flow conditions in the fall, Jones/Douglass contributes approximately 15% of the flow into Mill Creek, but is responsible for about 50% of the acidity, iron and manganese and 85% of the aluminum to Mill Creek. Numerous AMD discharges are on the Jones/Douglass tributary, some of which due to location, are difficult to treat via a passive treatment system. While the Douglass fork has AMD problems, they are slight compared to the much larger contribution provided by Jones Run. The important AMD sites need to be field investigated, a sampling regimen established, flow and loading rated determined, and a source of funding identified to cover sampling expenses. A "TAG" grant was awarded in 2009 and again in 2010 to Hedin Environmental to field visit the watershed, take water samples, examine past data on the watershed, then ultimately provide treatment

recommendations. A final comprehensive report will be provided in late 2011. A design and construction phase will follow, which will likely go beyond 2015.

- Because of Mill Creek's general lack of alkalinity and the presence of acidity, discussions have ensued between the Coalition, BAMR and selected environmental consultants about the potential construction of several lime dosing/slurry plants on the Mill Creek Watershed. For lime dosing, it is desirable to have reasonably fast current conditions, multiple riffles, a significant elevation drop and accessibility: several locations on Little Mill Creek and Jones/ Douglass do exist. Lime slurry plants, because of faster oxidation reactions, can be associated with passive treatment systems or direct input to a stream. Initial cost, yearly operation costs and applicability of dosing/slurry systems within the watershed all need to be critically ascertained.
- The Coalition intends to continue its cooperative relationship with the PA Fish and Boat Commission, including the identification of other stocking possibilities as water quality continues to improve in the watershed, thus providing additional fishing opportunities for the public.
- The MCC intends to continue participating with DEP and others in water sampling throughout the watershed. It will also continue to monitor crayfish/fish presence and diversity through minnow trapping and electrofishing methodologies. With assistance from Clarion University faculty and students and others, the stream invertebrates will also be occasionally sampled.
- Lastly, the commitment of financial and personnel resources over the past two decades by MCC and such a diverse group of NGOs, state, and federal agencies is truly impressive. To maintain this level of success and to guarantee a sustainable level of improvement and maintenance, the MCC will actively pursue having the Mill Creek Watershed become a Qualified Hydrological Unit within BAMR's Acid Mine Drainage Set-Aside Program. In addition, it would be advantageous to complete DEP's 319 Watershed Implementation Plan.
- The MCC looks forward to maintaining its academic/research/educational relationship with Clarion University and the surrounding community.
- The Coalition will continue having its members contributing to the WPCAMR, state and federal AMD related meetings and conferences, and providing press releases to the newspapers servicing this area.