The WEST BRANCH SUSQUEHANNA RECOVERY BENCHMARK Project

A Technical Report by

TROUT UNLIMITED

And Contributing Authors

pennsylvania DEPARTMENT OF ENVIRONMENTAL PROTECTION

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Trout Unlimited's West Branch Susquehanna Restoration Initiative and the Need for a Benchmark of Recovery

In 1998, Trout Unlimited (TU), an organization committed to the conservation, protection, and restoration of North America's coldwater fisheries, recognized the significance of abandoned mine drainage (AMD) problems in the Kettle Creek Watershed in Clinton County, Pennsylvania as a component of its nationally renowned Home Rivers Initiative. Since then, TU has taken the role as the lead catalyst, working in close partnership with the local Kettle Creek Watershed Association to address severe AMD problems that plague the lower Kettle Creek watershed. Since 1998 TU and its partners have conducted numerous assessments and developed restoration plans, completed construction of multiple reclamation and remediation projects, and are currently in the planning and construction phases for two more treatment and land reclamation projects.

While remaining actively involved with AMD cleanup in the Kettle Creek watershed, TU took its AMD remediation work to the next level and established the West Branch Susquehanna Restoration Initiative in 2004, which is aimed at the restoration of coldwater streams and the ultimate recovery of the West Branch Susquehanna River. As the lead non-profit organization for this initiative, TU is working with numerous local, state, and federal government and non-government organizations on a coordinated, strategic, and cost-effective AMD cleanup approach for the entire river basin. TU is also providing organizational support to the West Branch Susquehanna Restoration Coalition, a group that represents the collective efforts of watershed groups, TU chapters, county conservation districts, businesses, and others that are working to address AMD problems throughout the West Branch Susquehanna River watershed.

As a result of all the individual and collaborative efforts over the past couple decades to restore the West Branch Susquehanna River watershed from the effects of AMD, numerous AMD remediation projects have been implemented throughout the watershed to improve water quality and biological conditions. However, despite the vast amount of resources spent by government agencies, non-government organizations, the private industry, and philanthropy, there had never been a concerted effort to quantify the resulting improvements on a watershed-scale. Recognizing this need, TU developed the West Branch Susquehanna Recovery Benchmark Project.

TU led this collaborative Project in 2009 in partnership with the DEP, PFBC, SRBC, and members of the WBSRC. The goals of this ambitious evaluation were to provide documentation of water quality conditions on a watershed-scale, substantiate anecdotal fishery improvements in the river, and provide baseline documentation of benthic macroinvertebrate populations and habitat conditions in AMD impacted tributaries. To accomplish these goals, TU and its partners targeted 90 sites throughout the watershed and collected water quality and benthic macroinvertebrate samples, measured stream flows, conducted habitat surveys, and assessed fish populations over a five-month period.

Copies of this report may be obtained from:

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Photo: L. Kester

Abbreviations

AMD	abandoned mine drainage
BAMR	Bureau of Abandoned Mine Reclamation
BMP	best management practice
DEP	Department of Environmental Protection
EPA	Environmental Protection Agencey
EPT	Ephemeroptera, Plecoptera, Trichoptera
GIS	geographic information system
GPM	gallons per minute
IBI	Index of Biological Integrity
ICE	Instream Comprehensive Evaluation
PFBC	Pennsylvania Fish & Boat Commission
SMCRA	Surface Mining Control & Reclamation Act
SRBC	Susquehanna River Basin Commission
TU	Trout Unlimited
UNT	unnamed tributary
USGS	United States Geological Survey
WBSRC	West Branch Susquehanna Restoration Coalition

Note: All references to metal concentrations in the report refer to total metal concentrations.

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Acknowledgements

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Introduction

AMD, the number one source of pollution to Pennsylvania's waterways (DEP 2010) is the consequence of the historical unregulated coal mining that occurred before the establishment of the federal SMCRA of 1977. Mine drainage is formed when pyrite, a naturally occurring mineral often found in tandem with coal, reacts with oxygen and water to produce iron hydroxide and sulfuric acid. The acidic water associated with most mine drainage may also leach metals such as aluminum and manganese from the surrounding bedrock into the water. These toxic metals can negatively influence the growth rate, development, behavior, and metabolic processes of fishes. Additionally, mine drainage can cause a reduction in the abundance and diversity of benthic macroinvertebrate populations and the metal precipitates can armor the stream substrate, thereby reducing habitat and diminishing the food supply for other aquatic organisms. All but the most pollution tolerant fish and macroinvertebrate species are usually eliminated from AMD-impaired streams.

Unfortunately, just over 20% (approximately 1,200 miles) of Pennsylvania's AMD pollution plagues streams within the West Branch Susquehanna watershed (Figure 1), hindering the realization of the region's full ecological and economic potential. The costs required to remediate the watershed from AMD are at first overwhelming. The most recent estimates range between $110 and $453 million in capital costs and up to $16 million in annual operation and maintenance costs (Downstream Strategies 2008).

However, when the long-term economic benefits that can be realized from a restored watershed are taken into consideration, the cost to remediate AMD becomes more palatable. For instance, in 2006 it was estimated that the West Branch Susquehanna watershed lost approximately $22.3

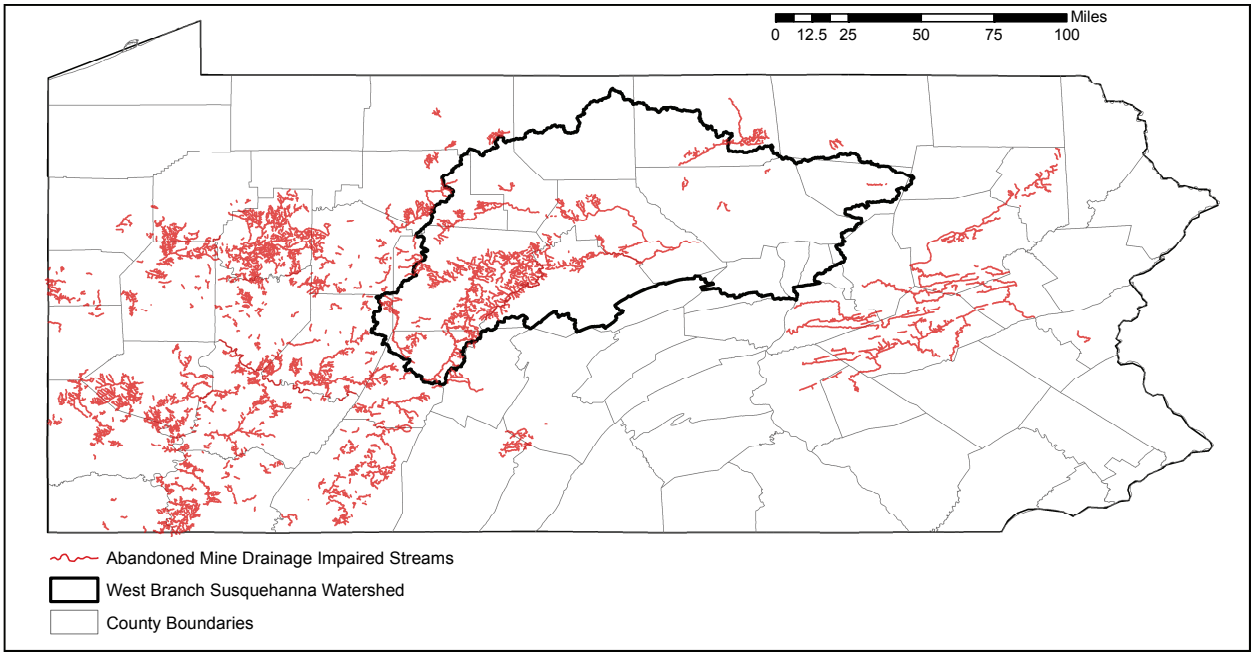

***Figure 1**—Abandoned mine drainage impaired streams in Pennsylvania.*

million in annual sport fishing revenue dollars due to the AMD that renders more than a thousand stream miles fishless (Downstream Strategies 2008). Furthermore, it was estimated that owners of single family residences in Clearfield County, the most heavily AMD impacted county in the watershed, have lost approximately $4 million in property values as a result of AMD pollution (Downstream Strategies 2008).

In 2003, Governor Rendell launched the PA Wilds Initiative to promote the growth of tourism and related businesses in north-central Pennsylvania based on the significant amount of outdoor experiences that are available on public land within the area. Since water quality impairment from AMD is a major limiting factor to the tourism and development opportunities, as well as the economic potential of the region, cleanup of the West Branch Susquehanna's AMD became a priority for the Commonwealth.

To that end, more than $70 million in Growing Greener grants have been awarded for AMD projects in the watershed. These funds, combined with funds from sources such as the Office of Surface Mining's Watershed Cooperative Agreement Program, EPA's 319 Nonpoint Source Grant Program, the National Fish and Wildlife Foundation, the Foundation for Pennsylvania Watersheds, and other philanthropic organizations, have resulted in many abandoned mine treatment systems and a multitude of reclamation projects by watershed groups, county conservation districts, and other groups including TU. In addition, as of 2010 the Commonwealth had completed 210 remining projects and reclaimed 5,100 acres of abandoned mine lands in the watershed. Furthermore, it has been determined that the Commonwealth has spent $11 million in the watershed to correct problems caused by AMD for drinking water supplies.

However, despite the millions of dollars spent to restore the West Branch Susquehanna watershed and the number of groups vested in the region's recovery, there had never been a concerted effort to measure the improvements on a watershed-scale. TU recognized that such documentation was necessary to sustain the tremendous amount of effort already realized and to also provide a "return on investment" for the funding agencies and the countless entities contributing to the recovery of the watershed. As a result, TU developed the West Branch Susquehanna Recovery Benchmark Project (hereinafter referred to as the "Project") for the purpose of documenting improvements in water quality and biological conditions, as well as to establish a benchmark of current conditions so that future remediation efforts may be evaluated.

Photo: R. Dunlap

Cooks Run, Clinton County.

Photo: A. Wolfe

Local business in Clinton County.

Photo: R. Dunlap

White Oak AMD discharge near Madera, Clearfield County.