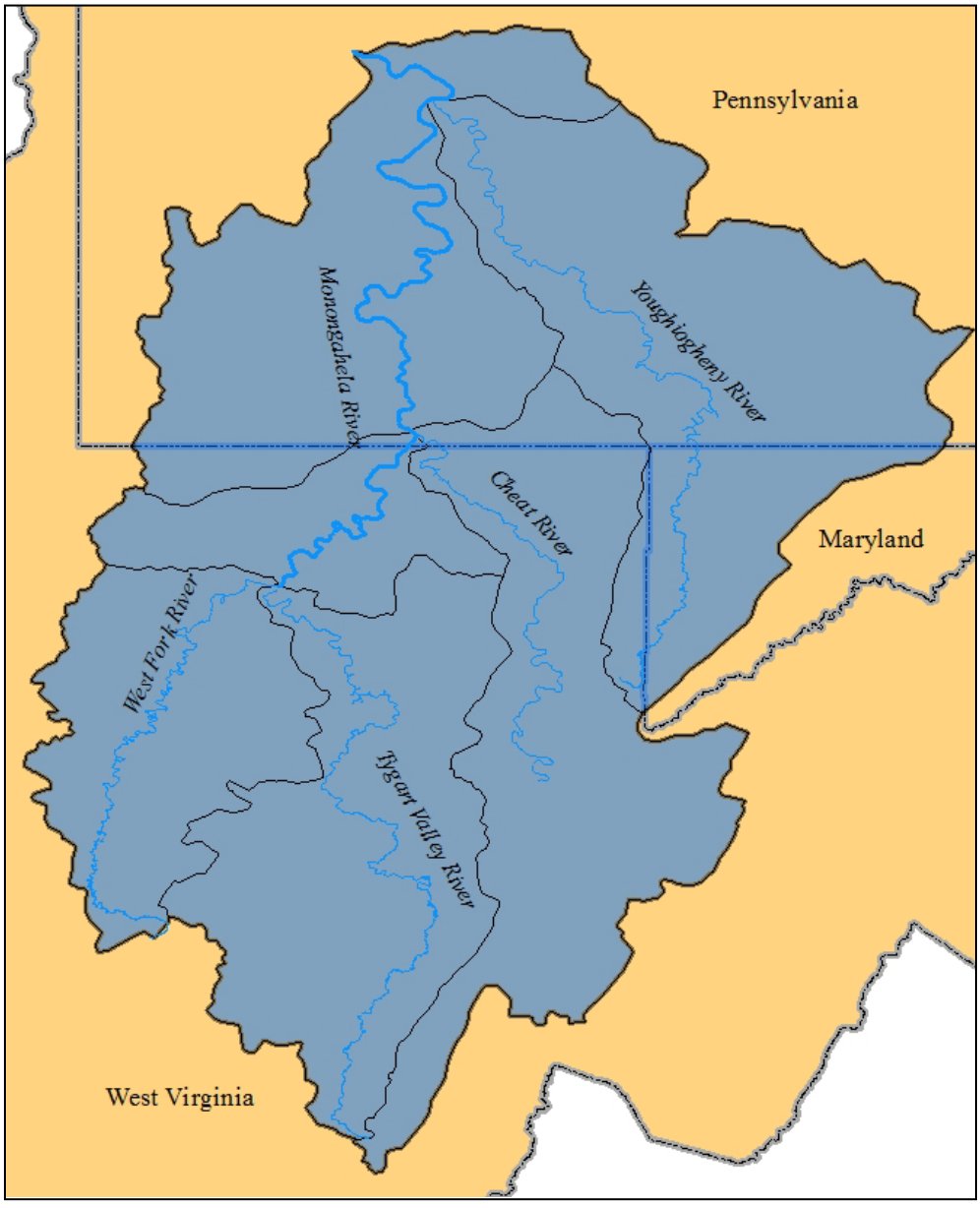
US Army Corps
of Engineers®
Pittsburgh District

Monongahela River Watershed
Initial Watershed Assessment
September 2011
(Revised February 2012)



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Executive Summary

The following report is an Initial Watershed Assessment (IWA) of the Monongahela River watershed in Northern West Virginia, Southwestern Pennsylvania and a small portion of Western Maryland. This IWA was prepared under the authority of Section 729 of the Water Resources Development Act of 1986 as amended which authorizes the U.S. Army Corps of Engineers to undertake watershed planning. Watershed planning is an approach for managing water resources within watershed boundaries and addresses problems in a holistic manner that reflects the interdependency of water uses, competing demands and the desires of a wide range of stakeholders. The purpose of watershed planning is to undertake the planning process in a broad, integrated systems approach instead of solely focusing on single purpose projects. The result of the watershed planning process is development of a Watershed Plan that identifies general strategies or plans for solving problems on a watershed scale.

The Monongahela River IWA is a reconnaissance level report that identifies current existing conditions within the watershed, details the major water resource problems of the watershed and discusses the potential scope and objective of a future cost-shared Final Watershed Assessment. Throughout the watershed planning process, numerous problems were identified in the watershed; however, water quality and quantity issues came to the forefront as key problems impacting water resources in the watershed. Acid mine drainage, traditional gas drilling, industrial and municipal pollution, land use, and deep well gas development are currently some of the principal water quality concerns in the watershed. It was also identified that the lack of comprehensive management of the water resources such as that done by the Susquehanna River Basin Commission, is of concern. The quantity of water withdrawn from streams is largely unregulated and is beginning to show negative consequences. This was illustrated by a low-flow event, related to excessive withdrawals, in the watershed in 2008. In addition, some water quality parameters, like total dissolved solids, require watershed based regulation rather than "end-of-pipe" monitoring due to their dependence on flow volume and inability to degrade downstream. An additional water resource area of concern throughout the watershed is flood risk management and the inability of local communities to implement flood risk management projects.

It was the conclusion of the IWA that a Watershed Assessment Management Plan (a Project Management Plan) be drafted that will define further the scope and objective for the Final Watershed Assessment. Greene County, Pennsylvania was identified as a potential non-Federal sponsor interested in cost sharing a Final Watershed Assessment. If the Watershed Assessment Management Plan and associated cost-sharing agreement are successfully negotiated, it is recommended that the U.S. Army Corps of Engineers, Pittsburgh District and Greene County participate in a cost-shared Final Watershed Assessment of the Monongahela River watershed and develop a Watershed Plan that will help alleviate water resource problems in the Monongahela River basin in a holistic manner.

1 Study Authority

1.1 Authority

This Initial Watershed Assessment (IWA) of the Monongahela River watershed is authorized by Section 729 of the Water Resources Development Act (WRDA) of 1986 as amended.

> "(a) The Secretary, in coordination with the Secretary of the Interior and in consultation with appropriate Federal, State, and local agencies, is authorized to study the water resources needs of river basins and regions of the United States"…
> "(b) In carrying out the studies authorized under subsection (a) of this section, the Secretaries shall consult with State, interstate, and local governmental entities."

Section 729 of WRDA of 1986 has since been amended by Section 202 of WRDA 2000 to provide the Secretary discretionary authority to assess the water resources needs of river basins and watersheds of the United States, including needs relating to ecosystem protection and restoration; flood damage reduction; navigation and ports; watershed protection; water supply; and drought preparedness. It also establishes cost sharing provisions and defines cooperation and consultation requirements. The most recent amendment of Section 729 of WRDA of 1986 is contained in Section 2010 of WRDA 2007. This section includes priority river basins and modifies the non-Federal cost sharing for assessments. The full authorization language for Section 729 of WRDA of 1986 and related amendments is located in Appendix A.

1.2 Related Guidance

The primary source of guidance for conducting US Army Corps of Engineers (Corps) watershed assessments is Engineer Circular (EC) 1105-2-411, Watershed Plans. The purpose of EC 1105-2-411 is to provide guidance for conducting watershed planning. The Engineering Circular is shown in Appendix B. In the past, the Corps has focused on problem solving and decision making for specific sites and projects. The Corps has since recognized the need to undertake planning in a broader, integrated systems approach instead of focusing on single purpose projects.

Specifically, watershed planning is an approach for managing water resources within particular watersheds and addressing problems in a holistic manner that reflects the interdependency of water uses, competing demands and the desires of a wide range of stakeholders in addressing watershed problems and opportunities. The planning process should identify and characterize systems of interest to the current and future needs of the watershed. Public involvement is essential to the success of watershed planning.

1.3 Process

There are two document phases leading to the development of a watershed plan. The first phase which is fully Federally funded (up to $100,000) is the development of an Initial Watershed

Assessment documented herein and similar to the traditional reconnaissance level planning phase. The second phase, which is cost-shared with a non-Federal sponsor, is the development of a Final Watershed Assessment that is similar to the feasibility level planning phase. The second phase of watershed planning can only be undertaken if a non-Federal sponsor is identified who is willing to enter into a cost-share agreement.

The Initial Watershed Assessment will be used to do the following tasks assuming a cost-share sponsor is identified:

- Identify a non-Federal cost-sharing partner for the second phase of watershed planning which will include a Final Watershed Assessment;
- Obtain a non-binding letter-of-intent from the non-Federal sponsor;
- Define the scope and objective of the Final Watershed Assessment;
- Prepare a Watershed Assessment Management Plan (similar to a Project Management Plan that is developed for a traditional feasibility study);
- Negotiate a cost-share agreement with the identified non-Federal partner; and
- Execute a legally binding cost-share agreement.

The basic watershed planning process is similar to a traditional planning study but is done in a broad systems approach and analyzes water resource problems on a larger, watershed scale. The watershed planning process resulting in a Watershed Plan will generally follow the civil works planning process. The following elements will be discussed throughout the Initial Watershed Assessment (IWA) phase. These will be fully developed in the Final Watershed Assessment based on stakeholder and non-Federal sponsor interest.

- Define the study area by identifying an appropriate watershed (IWA);
- Identify problems and opportunities within the watershed through stakeholder engagement (IWA);
- Inventory and forecast conditions based on the stakeholder needs identified within the watershed (IWA and Final Watershed Assessment);
- Evaluate and compare alternative approaches to address the identified needs within the watershed (Final Watershed Assessment); and
- Select a strategy or broad plan based on the shared vision of the stakeholders and partners that can be implemented to address significant identifiable watershed problems (Final Watershed Assessment).

1.4 Funding

This IWA is funded through the Ohio River Basin Comprehensive Reconnaissance Study (ORBCS) which is authorized through the U.S. Senate Committee on Public Works Study Resolution, dated 16 May 1955 as displayed below:

> "Resolved by the Committee on Public Works of the United States Senate, that the Board of Engineers for Rivers and Harbors created under Section 3 of the River and Harbor Act, approved June 13, 1902, be, and is hereby requested to review the reports on the Ohio River published in House Document No. 306,

> Seventy-fourth Congress, First Session, House Committee on Flood Control Document No. 1, Seventy-fifth Congress, First Session and related reports, with a view to determine whether any modifications in the present comprehensive plan for flood control and other purposes in the Ohio River Basin is advisable at this time."

The Monongahela River Basin is one of many priority watersheds identified in the ORBCS for initiation of an IWA. The IWA phase is 100 percent Federally funded. Federal funds, in the amount of $100,000 have been appropriated for this IWA phase.

2 Study Purpose

2.1 Purpose

The primary purpose of this IWA is to identify problems, needs and opportunities within the Monongahela River watershed through stakeholder outreach. Heavy reliance will be placed on existing reports and data for all or portions of the watershed available from the Corps and outside sources. This IWA will serve as the basis for a comprehensive Final Watershed Assessment and development of a Watershed Assessment Management Plan which will provide strategic guidance to watershed restoration from a systems-wide perspective. Completion of the IWA will allow for identification of a non-Federal sponsor; definition of the scope and objective of the Final Watershed Assessment; negotiation and execution of a legally-binding cost-share agreement; and preparation of a Watershed Assessment Management Plan (WAMP).

2.2 Problems and Opportunities in the Watershed

Consistent with Corps Guidance, this Initial Watershed Assessment should make a preliminary identification of problems and opportunities in the Monongahela River watershed study area. In the context of this study, a "problem" is defined as a generally existing undesirable condition. An "opportunity" relates to a future action that can be undertaken to solve a problem. In addition to reviewing existing reports, stakeholder outreach was performed in order to develop a preliminary set of problems. In the context of this report, stakeholder input was gained by compiling information obtained from a non-profit organization in the watershed, a previous Corps study, and a stakeholder outreach meeting hosted by the Corps. A common theme appears when comparing the input obtained through the stakeholder outreach process. Among the problems listed below, water quality and quantity issues are the major concerns and can be attributable to historical and new resource extraction. In general, a water resource management strategy that protects water quality while allowing for economic development was identified as the desired goal of the Watershed Assessment Management Plan (WAMP). The below list are the main problems identified in the watershed. Section 6, Outreach and Stakeholder Concerns, contains more detailed information on the problems and opportunities identified by each source, in the Monongahela River watershed.

Problems:

- Acid mine drainage
- Sufficiency of public water supply
- Hydraulic fracturing wastewater disposal

- Cumulative impacts associated with increasing basin-wide unregulated surface and groundwater withdrawals (water budget) on water quality and quantity (water supply, aquatic life)
- Interstate water quality regulation/ control (differences in state regulations / permitting/ enforcement)
- Lack of comprehensive water resource regulation (such as the Susquehanna River Basin Commission)
- Increasing total dissolved solid (TDS) loads
- Fish passage through the navigation system
- Navigation system stratification during low flow periods and associated low dissolved oxygen concentrations and reduced metal problems
- Aging river infrastructure
- Flood risk management

3 Location of Watershed/Congressional Districts

3.1 Location of Watershed

The study area for this effort is defined as the Monongahela River watershed located in the north central portion of West Virginia, the western tip of Maryland, and most of southwestern Pennsylvania. This area is highly industrialized and includes the coal fields of West Virginia and Western Pennsylvania. Main population centers include the cities of Pittsburgh, Pennsylvania and Morgantown, West Virginia. The Monongahela River forms from the confluence of the Tygart and West Fork Rivers, both in northern West Virginia. The river then travels 128 miles north to its confluence with the Allegheny River to form the Ohio River at the "Point" in Pittsburgh, Pennsylvania. The Cheat and Youghiogheny Rivers are tributaries of significance in the Monongahela River basin. Headwater streams are likely to be characterized by abundant aquatic insects on stream bottoms with small fishes. The larger order streams and rivers are slow-moving and muddy, with canopy trees covering only shorelines and inhabited by larger fish and mud dwelling organisms. The Monongahela River watershed also includes 85 miles designated as a National Wild and Scenic River and a portion of the Cheat located within the Monongahela National Forest.

3.2 Hydrologic Unit Codes

A watershed is defined as an area of land that drains all surface water and rainfall to a common outlet. The term "watershed" is sometimes used interchangeably with "drainage basin" and a larger watershed may contain many smaller watersheds. The United States Geological Survey (USGS) is the Federal agency responsible for monitoring the quantity and quality of waters throughout the nation. The USGS has organized watersheds into a hydrologic system that divides and subdivides the United States into successively smaller watersheds. These levels of subdivision, used for organization of hydrologic data, are called "hydrologic units."

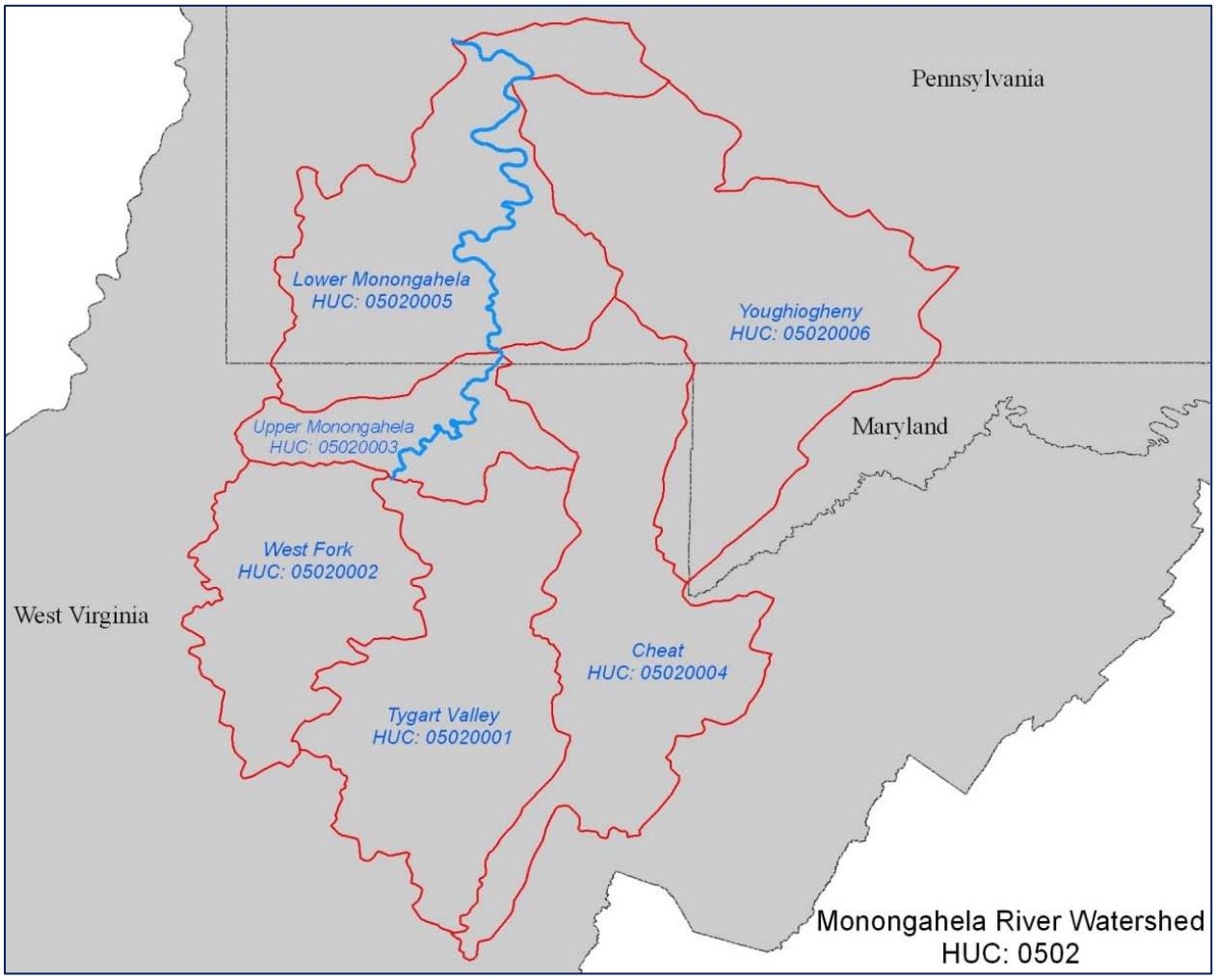

Figure 1. HUC 8 sub-basins in the Monongahela River Watershed.

Hydrologic unit codes (HUC) describe the relation of the hydrologic units to each other to represent the way smaller watersheds drain areas that together form larger watersheds. According to the HUC organization, regions are the largest watersheds and are further divided by sub-regions which are then divided into accounting units. The smallest division HUC is a cataloging unit code which is an eight-digit number that identifies each of the watersheds into which the country has been divided for the purpose of water-resources planning and data management.

The Monongahela River watershed is a HUC 4 cataloging unit which is the defined study area for this IWA. The Monongahela River watershed is identified by the hydrologic unit four digit code '0502'. The first two digits (HUC 2) identify the water-resources region (Ohio River) and the first four digits (HUC 4) identify the sub-region (Monongahela River). The Monongahela River watershed contains six HUC 8 sub-basins, as seen in the above figure. These include the Tygart Valley, West Fork, Upper Monongahela, Cheat, Lower Monongahela, and the Youghiogheny.

3.3 Congressional Districts

The Monongahela River watershed is located within portions of three states and nine congressional districts in southwestern Pennsylvania, western Maryland, and north-central West Virginia. Table 1 lists the congressional district by state. Figure 2 shows the congressional district boundaries within the Monongahela River watershed.

Table 1. Congressional Representatives in the Monongahela River Watershed.

Pennsylvania	West Virginia	Maryland
Jason Altmire (D-PA) 4th	David McKinley (R-WV) 1st	Roscoe G. Bartlett (R-MD) 6th
Bill Shuster (R-PA) 9th	Shelley Moore Capito (R-WV) 2nd	
Mark Critz (D-PA) 12th	Nick Rahall (D-WV) 3rd	
Mike Doyle (D-PA) 14th		
Tim Murphy (R-PA) 18th		

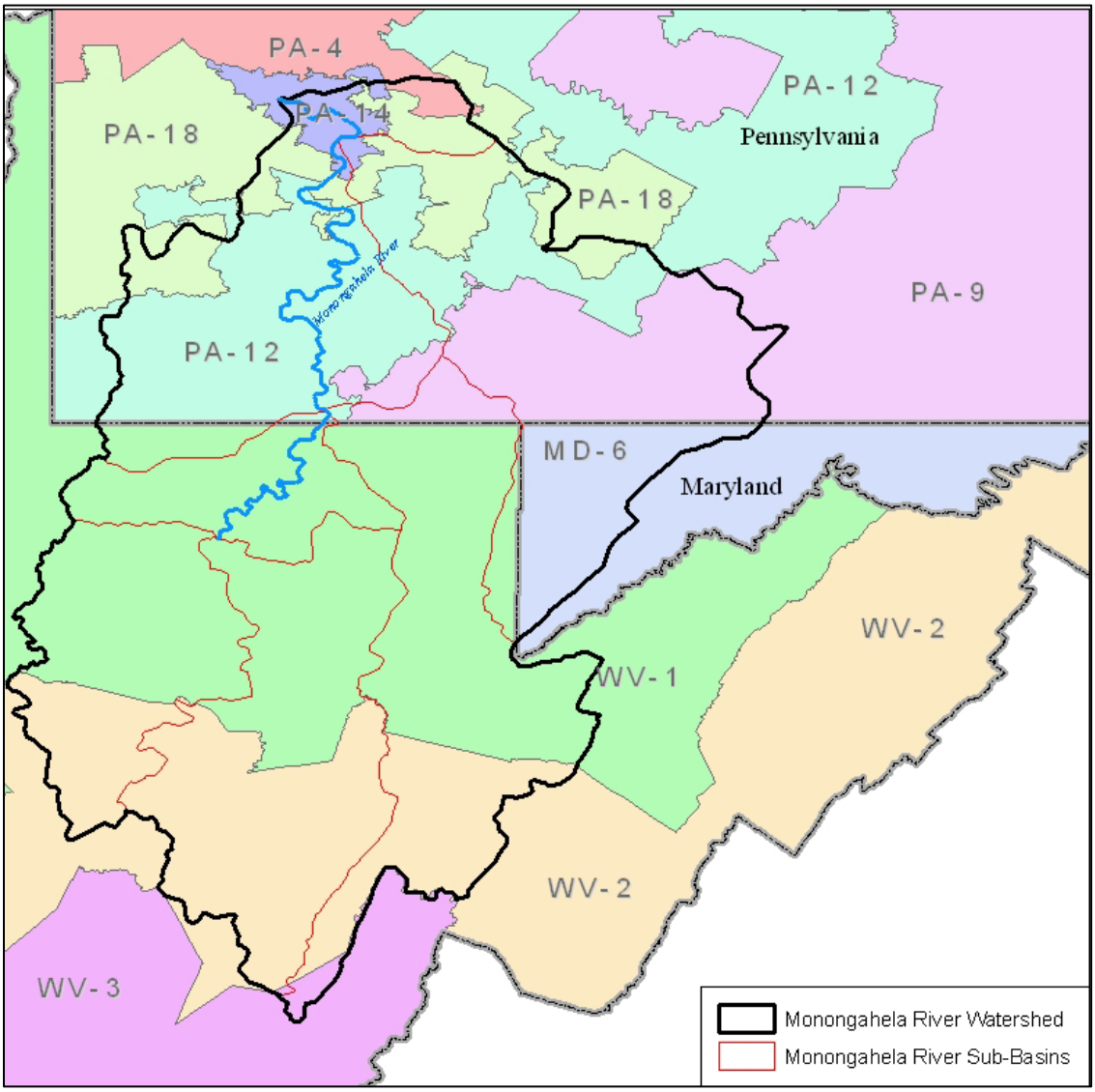

Figure 2. Map of the Congressional District Boundaries.

4 Existing Reports, Projects and Actions

A multitude of studies, reports and projects have been undertaken by the Corps and other non-Corps entities within the Monongahela watershed. Some that are pertinent to this watershed planning effort are detailed below and discussed throughout the following IWA.

4.1 Existing Reports

4.1.1 Monongahela River Navigation Projects Annual Water Quality Report 1976

The Corps published a Water Quality Report for the Monongahela River Navigation Projects in February 1976. The purpose of this report was to evaluate the effect of mainstem navigation dams on the water quality of the Monongahela River. This report contains a detailed discussion of the physical, chemical, and biological parameters that were observed during surveys conducted along Monongahela River. The results of this study indicated that the navigation structures on the Monongahela River have a highly significant influence on several important physical-chemical and biological parameters. The most dramatic effect of the mainstem projects were observed on dissolved oxygen concentrations. The distribution patterns of acidity, alkalinity, water temperature, non-filterable solids, turbidity, and iron were also noticeably affected by the navigation structures on the river. The navigation system and headwater reservoirs have a direct impact on the downstream regulated reaches, impacting water quality, fish passage, sediment transport and floodplain health and function. The operation of the headwater reservoirs alter natural stream flows by removing peaks and troughs from the hydrograph but allow for low flow augmentation increases of base flows and improvement of water quality by diluting pollution loads.

The navigation dams create a series of pools or small lakes, which can stratify chemically and physically during the summer season, impacting water quality (elevated dissolved metals and nutrient concentrations, reduced dissolved oxygen levels, and warmer water temperatures). However, when water passes through navigation dams, water is mixed, stratification is broken; and the tailwaters are aerated, generally to 100 percent dissolved oxygen saturation downstream of most dams.

4.1.2 Monongahela River Navigation System Reconnaissance Study

Completed in 1981, the overall objective of the Monongahela River Navigation System Study was to develop a report for Congress presenting an inventory of the navigation and related water resource problems and needs within the confines of the Monongahela River Navigation System. A range of feasible alternative actions that could be implemented to provide for the identified needs, an assessment of the impacts of each alternative action, and a recommendation of a specific plan were also included. The determination was made that the Monongahela River Navigation System is a viable entity providing a needed service to the region. It was also concluded that a number of problems exist within the system, primarily relating to the structural condition of several facilities and potential deficiencies in capacity. This study identified a number of problem areas within the system that warranted detailed investigation. The most significant problems were identified on the middle river at original Locks and Dams 7 and 8. These problems were remedied through construction of Grays Landing and Point Marion Locks

and Dams as described in Section 4.1.4 below. The lower river was also identified as a problem area and is currently being rehabilitated through the Lower Monongahela River Navigation Project as described in Section 4.1.5 below.

4.1.3 Monongahela River Basin Flood Investigation

The Monongahela River Basin flood investigation was undertaken by the Corps to identify major damage centers within the Monongahela River Basin and to investigate potential solutions to the problems such as local protection projects and/or reservoir plans. Completed in August 1990, the study recommended a flood control study along the Cheat River Basin and several individual studies for local protection projects. In addition to the 1990 Basin study, a Reconnaissance Study of the Basin was completed in 1996 and several local flood protection projects were found to be feasible. To date, none of the flood protection projects have been constructed by the Corps.

4.1.4 Locks and Dams 7 and 8 Monongahela River Feasibility Study

The Locks and Dams 7 and 8 Feasibility Study investigated navigation modifications to these two facilities in the Upper Monongahela River. Completed in April 1984, the study recommended a new lock and fixed crest dam near Grays Landing to replace Lock and Dam 7, named Grays Landing Lock and Dam, and a new larger lock to replace the existing at Lock and Dam 8, renamed Point Marion. The report included a separate Environmental Impact Statement and twelve appendices. The report was prepared as an interim effort under an authorizing resolution adopted by the Committee on Public Works and Transportation of the United States House of Representatives in 1976.

4.1.5 Lower Monongahela River Navigation System Feasibility Study

Completed in December 1991, the Lower Monongahela River Navigation System Feasibility Study was undertaken to evaluate the lower portion of the Monongahela River Navigation System consisting of Locks and Dams 2, 3 and 4. The report described the general problems caused by their age and the small size of the locks at the projects and how the problems could be remedied. An Environmental Impact Statement and ten appendices were included with the main report. The report was prepared as an interim effort under an authorizing resolution adopted by the Committee on Public Works and Transportation of the United States House of Representatives in 1976. The Lower Monongahela Project is currently under construction.

4.1.6 Monongahela River –West Virginia Comprehensive Study

The Monongahela River West Virginia Comprehensive Study was authorized by the 1994 Energy and Water Appropriations Act, passed on October 28, 1993 (PL 103-126). The study was authorized to develop a broad plan of action for flood control, urban waterfront enhancement, water supply, recreation, fish and wildlife enhancement, preservation and interpretation of archaeological, historical, and cultural resources, and other purposes along the urban riverfront areas in West Virginia. Volume I of the study consists of waterfront development conceptual plans for eight sites that focus on recreation; Volume II is an inventory of potential development sites; and Volume III contains the results of side-scan sonar mapping of the river. The resultant Master Plan Proposal outlined development recommendations and

strategies, funding sources, and special planning concerns. While the establishment of a regional development authority did not come about, the master plan has been utilized by non-profit organizations and planning bodies in the area.

4.1.7 Ohio River Basin Comprehensive Reconnaissance Study

The Ohio River Basin Comprehensive Reconnaissance Study (ORBCS) is based upon the U.S. Senate Committee on Public Works Study Resolution, dated 16 May 1955, and is a Corps planning effort at the reconnaissance study level. The study was initially funded by Congress in 2008 and received additional funds in 2009. As a reconnaissance study, the funding was 100% Federal without any non-Federal funding match. Prior to the ORBCS the last time that the Corps studied the Ohio River Basin was in 1968. Many aspects of American life and people's needs and expectations of the existing system of dams, reservoirs and levees and floodwalls have changed since that time. This study was meant to assess what those new needs are and to forge a pathway forward for making the system reliable and relevant to the region and the nation for the future. This study process did not result directly in construction of any new projects or rehabilitation of existing projects. This study's purpose was to capture the existing conditions of the basin, the many issues that plague the basin, and opportunities for improvement of the water resources that service the region and the nation. Each sub-basin was analyzed to determine issues specific to that region (see Section 6 for specific information). From this analysis, the Monongahela watershed was identified as a candidate for the completion of an Initial Watershed Assessment under the authority of Section 729 of WRDA 1986.

4.1.8 Pittsburgh District Water Quality Monitoring Network

The Corps maintains a system of real-time, continuously recording water quality monitors within the Monongahela River watershed, in partnership with the Pennsylvania and West Virginia Departments of Environmental Protection. The parameters monitored include dissolved oxygen, conductivity, pH, and water temperature, and at some locations, turbidity, barometric pressure and total dissolved gas. This system supports the Corps', congressionally authorized water quality mission that requires the operation of reservoir projects for optimum water quality benefits to restore, maintain, and improve ambient chemical, physical, and biological integrity of the surface waters of the upper Ohio River drainage basin. The monitoring network is maintained for the Corps by the U.S. Geological Survey and data are available online.

The Corps also conducts annual grab water quality surveys on the Monongahela River mainstem and major tributaries, as well as limnological surveys on reservoirs. Between 1973 and 2010, about 30 cursory surveys were conducted, which included sampling more than 45 stations along the length of the Monongahela River, including vertical and horizontal transect and vertical profile sampling. In addition, more than 30 limnological surveys were conducted at each of the headwater reservoirs, the Tygart, Youghiogheny, and Stonewall Jackson reservoirs, and their watersheds. Samples were routinely analyzed for more than 80 physical, chemical, and biological water quality parameters.

4.1.9 Monongahela River Water Quality Study

The West Virginia Water Research Institute (WVWRI) is undertaking a comprehensive water quality monitoring and reporting project for the Monongahela River. Bi-weekly samples are collected and lab-analyzed. The resultant data have been presented in a useful manner via their website utilizing a Geographic Information System database to organize and present the assembled water quality data. The project is being funded by the WVWRI and by grants from the U.S. Geological Survey, Longview Power and supporting organizations such as the West Virginia Division of Natural Resources, Allegheny Power, the Corps, Pennsylvania Fish & Boat Commission and others.

4.1.10 Integrated Water Quality Monitoring and Assessment Reports

Integrated Water Quality Monitoring and Assessment Reports are the new reporting method used by the U.S. Environmental Protection Agency (EPA) which combines the 303(d) impaired stream listing and 305(b) overall assessment of a state's waters. Pennsylvania, Maryland, and West Virginia have all produced a Draft Integrated Water Quality Monitoring and Assessment Report in 2010. This is a relatively new method of reporting which has been used since the 2004 reporting cycle.

4.1.11 River Alert Information Network

The River Alert Information Network (RAIN) is a regional Source Water Protection program that will implement a continuous on-line river monitoring system to better ensure the protection of public health and drinking water across Southwestern Pennsylvania for the estimated 1.7 million residents that rely on the Allegheny, Monongahela, Youghiogheny, and Ohio Rivers as their source of drinking water. RAIN was initiated through a voluntary collaboration of thirty-three water systems, Pennsylvania Department of Environmental Protection, California University of Pennsylvania, and Riverside Center for Innovation who recognized the importance of protecting the tributaries of the Ohio River.

4.2 Existing Projects

4.2.1 Reservoirs/Lakes

In the United States, the Corps maintains 609 dams, with thousands of other lakes and reservoirs operated and maintained by various Federal, State, and local entities. These projects are constructed for various reasons including: flood control, navigation, hydroelectric power, irrigation, water supply, and recreation. Three of the reservoirs in the Monongahela River watershed were constructed by the Corps and are located along major tributaries. Tygart River Lake, located on the Tygart River, Stonewall Jackson Lake, located on the West Fork River, and Youghiogheny River Lake, located on the Youghiogheny River, help to regulate water level fluctuation along the length of the Monongahela River. Deep Creek Lake and Cheat Lake were constructed in the 1920's by private entities to generate hydroelectric power. Not all dams in the project area are covered in this IWA; however the major reservoir and lake projects will be discussed briefly in the following sections. Figure 3 shows the five major reservoir projects located within the Monongahela River watershed.

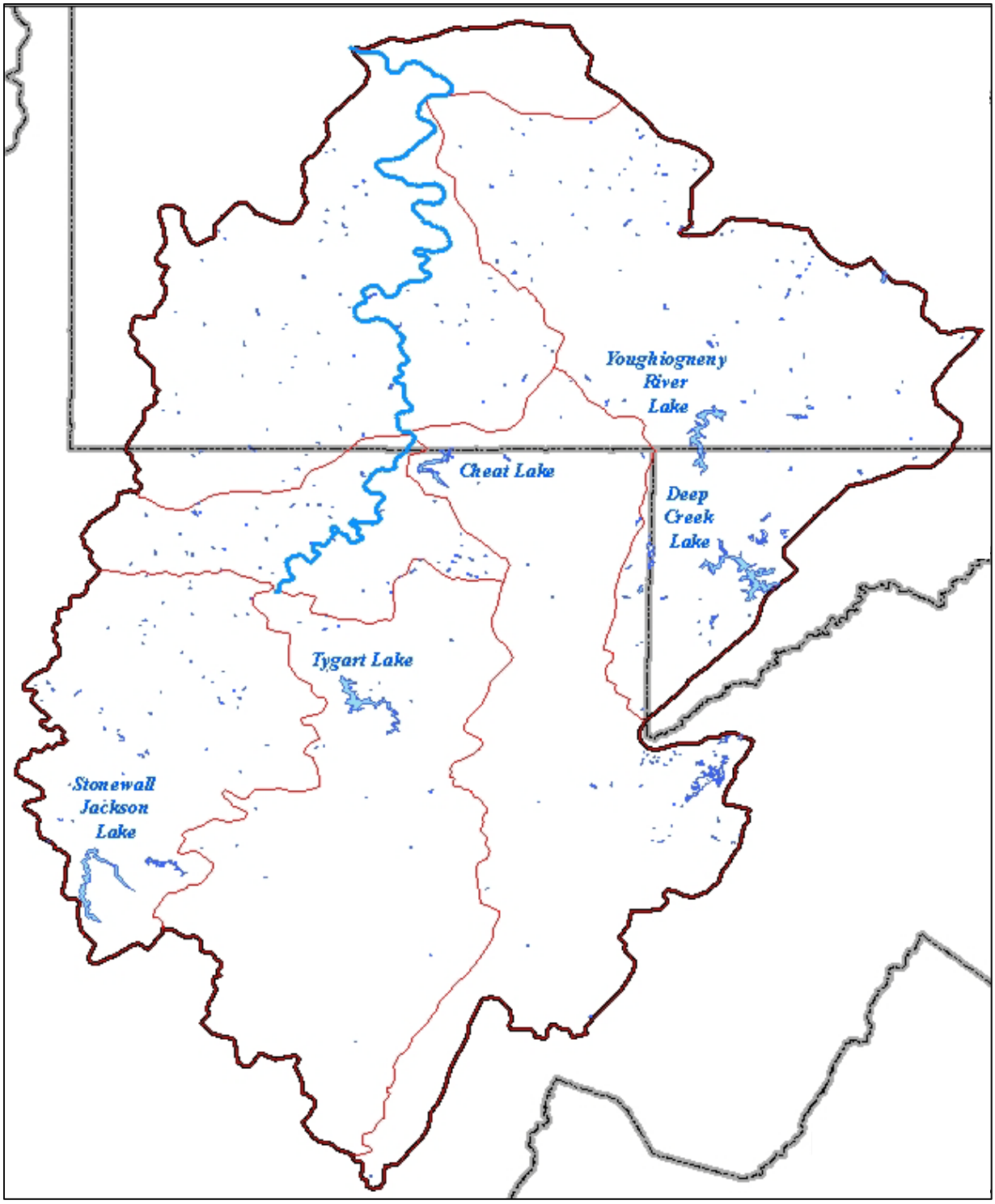

Figure 3. Major Reservoirs and Lakes.

Authorized by the Rivers and Harbors Act of 1935, Tygart Dam was the first of 16 flood control projects in the Pittsburgh District. The project provides flood protection for the Tygart River Valley as well as for the Monongahela and upper Ohio Rivers. Tygart has the capability to store the equivalent run-off of 4.56 inches of precipitation from its 1,184 square mile drainage area. The dam is a concrete gravity type structure that stretches 1,921 feet across the Tygart River just

south of the City of Grafton, West Virginia. In addition to flood control, the Tygart project was also authorized for navigation, water supply, recreation, water quality, fish and wildlife, and low flow augmentation purposes. During the summer and fall low-water season, Tygart releases additional water downstream to meet navigation flow requirements on the Monongahela River for commercial navigation. The increased flow also improves water quality and quantity for domestic and industrial use, recreation, aesthetics and aquatic life.

The most significant water quality aspects of the Tygart project are related to low flow augmentation of the Monongahela River mainstem. A minimum flow of 340 cubic feet per second (cfs) is guaranteed at Opekiska Lock and Dam from storage in Tygart River Lake. Because of the hydrology and low quality of the Monongahela River this 340 cfs from Tygart River Lake is an important factor in water quality considerations. Historically on the Monongahela River mainstem there have been problems with gross acid mine drainage, domestic, thermal and industrial pollution. The Monongahela River can be characterized as a low yielding stream at base flow. It is not uncommon for uncontrolled tributary flow to be negligible relative to augmentation from Tygart River Lake as far downstream as the mouth of the Cheat River, 62 miles downstream of Tygart Dam. During the frequent and sometimes prolonged low flow periods that occur on the Monongahela River, pollutants are concentrated and their effects are exaggerated. The 340 cfs guaranteed flow from Tygart River Lake storage at these times provides generally high quality dilution water. The degree of influence of augmented flow from Tygart River Lake is diminished below the mouths of major tributaries such as the Cheat and Youghiogheny Rivers. However, water quality benefits from Tygart River Lake low flow augmentation are probably still measurable and significant as far downstream as the mouth of the Monongahela River at Pittsburgh, Pennsylvania.

Stonewall Jackson Lake was authorized by the Flood Control Act of 1966, and maintains the capability to store the equivalent run-off of 7.1 inches of precipitation from its 101.8 square mile drainage area. The 620 foot long concrete gravity dam is located on the West Fork River in Lewis County, West Virginia, about 3 miles south of Weston. The authorized purposes of the project include flood control, low flow augmentation, water quality, water supply, fish and wildlife, and recreation. The Stonewall project provides at least 80 cfs for downstream flow at Opekiska. Stonewall and Tygart releases combine to provide a minimum of 420 cfs at Opekiska on the Monongahela River. The project, completed in 1990, is the most recent addition to the Pittsburgh District's 16 flood control projects. The volume of water quality storage in Stonewall Jackson Lake and the operational flow schedule were designed and authorized to improve the water quality of the 73.9 mile reach of the West Fork River downstream of Stonewall Jackson Dam, with additional benefits along the upper Monongahela River. West Fork River water quality has historically been stressed by a multitude of problems, including metal pollution and mineralization related to AMD; metal pollution from the tailings of old zinc smelting operations; sewage pollution and related dissolved oxygen sags downstream of urban centers, oil and brine pollution from oil and gas well fields; thermal pollution; algae blooms in the Monongahela River backwater reach of the West Fork River and the pools of low head, water supply dams on the river; etc. However, water quality improved with the construction and operation of the dam for low flow augmentation, and trends towards improvement continued until 2009, when specific conductivity levels doubled and concentrations of metals and some salts began to increase (strontium, specific conductivity, chloride, bromide, etc.).

Youghiogheny River Lake provides flood protection for the Youghiogheny and lower Monongahela River valleys as well as for the upper Ohio River as authorized by the Flood Control Act of 1938. The 1,610 foot long, rolled-earth fill/impervious core dam has the capability to store the equivalent run-off of 11 inches of precipitation from its 434 square mile drainage area. The project's authorized purposes include low flow augmentation, fish and wildlife, flood control, water supply, and recreation. This project regulates the famous whitewater downstream of the dam at Ohiopyle State Park in Pennsylvania. Currently, Youghiogheny Hydroelectric Authority holds a license issued by the Federal Energy Regulatory Commission to operate a hydroelectric plant below the dam. D/R Hydro Company is the firm that has operated and maintained the plant since 1989. The plant has the capacity to generate up to 12 Megawatts of electricity per hour. This project is located between Confluence, Pennsylvania to the north and Friendsville, Maryland to the south.

Youghiogheny River Lake can be characterized as a clear, oligotrophic and relatively cool impoundment that is well aerated to considerable depths throughout the year. In general, the water quality of Youghiogheny River Lake is more than adequate for the realization of project purposes. Formerly, Youghiogheny River Lake was moderately degraded by acid mine drainage. In recent years there has been significant mine drainage abatement in the basin controlled by Youghiogheny Dam and the influence of acid mine drainage on the reservoir is presently negligible. The reservoir currently supports an important two-story reservoir fishery and a popular cold-water tailrace fishery. Low-flow augmentation downstream of Youghiogheny Dam mitigates the affects of acid mine drainage and domestic and industrial wastes in the Youghiogheny, lower Monongahela, and upper Ohio Rivers. Low-flow augmentation from Youghiogheny River Lake has a significant impact on the water quality of the lower 15.6 mile reach of the Monongahela River mainstem, mitigating mine drainage, and thermal and domestic pollution in (Lock and Dam No. 2 Pool and the Monongahela Arm of Emsworth Pool).

Originally named Lake Lynn, Cheat Lake was formed in 1925 by damming the Cheat River near Point Marion, Pennsylvania. The project was constructed to serve the needs of the 52-megawatt Lake Lynn Power Station. Allegheny Energy Supply now owns and operates this project as a peaking plant.

Deep Creek Lake, a hydroelectric project constructed on Deep Creek in 1925 by the Youghiogheny Hydroelectric Company, is located just north of Oakland, Maryland. This project was issued a license for operation by the Federal Energy Regulatory Commission in 1968. Since late 1991, Deep Creek Lake has operated with a State of Maryland surface water appropriations permit, as it was released from Federal jurisdiction by Federal Energy Regulatory Commission.

In accordance with the Water Supply Act of 1958, water may be withdrawn from Corps reservoirs for multiple purposes, Corps reservoirs may be authorized for construction with Municipal and Industrial (M&I) water supply as a project purpose and storage within an operating reservoir may be reallocated to facilitate withdrawals for M&I water supply purposes. The Water Supply Act allows for reallocation of storage without Congressional approval provided that other project purposes are not adversely affected. Non-Federal cost sharing for any improvements to a project needed to facilitate water withdrawal is 100% for M&I purposes and 35% for agricultural irrigation.

4.2.2 Navigation Projects

The locks and dams on the Monongahela River make up one of the nation's oldest continuously operating navigation systems. Its success is largely due to the high volume of coal traffic that has long been characteristic of the system. The first system to be placed in operation on the Monongahela River was a commercial venture by a group of businessmen. The system of four locks and dams maintained a 5-foot navigation depth between Pittsburgh and Brownsville, Pennsylvania. Two more projects were added to the system, extending the navigation pool to Greensboro, Pennsylvania. The Corps became involved after the Civil War, extending navigation to Morgantown, West Virginia. In 1897, under pressure from the coal industry, the Federal government acquired the Pennsylvania portion of the system, to provide toll-free service for the entire length of the system. Under Federal control, older structures were renovated, and the system was again extended to Fairmont, West Virginia. By 1926, the system of 15 manually-operated locks and dams increased the navigation depth to 7-feet along the entire 128-mile length. Since then, the number of structures has been reduced to nine, the navigation depth and lock sizes have increased, and operations have been mechanized. Currently, a system of nine navigation facilities operates along the entire Monongahela River providing a minimum depth of nine feet to make the river navigable over a 147-foot drop in river elevation from just above Fairmont, West Virginia to the Point at Pittsburgh. The following section gives some details on the current navigation infrastructure in the Monongahela River watershed. The locations of the navigation projects within the Monongahela River watershed are shown in Figure 4.

Photo 1. Monongahela River at Elizabeth, Pennsylvania, 1936.

Photo 2. Braddock Dam

Braddock Locks and Dam is a gated dam, located at river mile 11.2 at the City of Braddock. This type of dam is constructed to permit increased control over the water level in the navigation pool upriver of the dam. Machinery mounted on tall concrete piers moves large chains which lift gates that

are hinged into the body of the piers. As the gates are raised or lowered to control the amount of water flowing under them, the upstream pool is maintained at a relatively constant level for an authorized depth of at least 9 feet throughout its length. It currently maintains a pool for 12.6 miles upstream to Locks and Dam 3 at Elizabeth. The Lower Monongahela River Navigation System Project replaced the nearly 100 year-old fixed-crest dam at Braddock Locks and Dam with a gated dam. The Braddock Dam portion of the Project incorporated significant new and innovative business practices with respect to design, construction, procurement and contract management that have received notable interest and endorsement not only with the Federal government, but the engineering community as well. The Braddock Dam has been recognized in many engineering periodicals including Civil Engineering magazine. Engineering News-Record named it one of the top 25 newsmakers of the year in 2002. In 2003 the Engineers' Society of Western Pennsylvania honored Braddock Dam as its Project of the Year. In 2004 the project was a finalist for the American Society of Civil Engineers' Outstanding Civil Engineering Achievement Award. In 2005 it received the Civil Engineering Achievement Award from the Pittsburgh Section of the American Society of Civil Engineers. And finally, the History Channel's Modern Marvels highlighted the Braddock Dam construction in its one hour documentary on the history of the Corps.

The Lower Monongahela Project will also remove Locks and Dam 3 in Elizabeth, Pennsylvania. Removal of Locks and Dam 3 will create a single pool between Braddock and Elizabeth, and cause the river to rise 5 feet. Locks and Dam 3 consists of two lock chambers and a 670 foot fixed crest dam. This type of dam is basically a concrete weir or wall across the river which keeps the river channel upriver of the project deep enough for navigation, about 9 feet or more. Water flowing over this type of dam cannot be controlled. Locks and Dam 3 is located at river mile 23.8 at the city of Elizabeth, Pennsylvania. Locks and Dam 3 currently maintains a pool for 23.8 miles above the mouth of the Monongahela at Pittsburgh, just above Elizabeth.

Photo 3. Locks and Dam 3 at Elizabeth, PA.

Photo 4. Lock and Dam 4 at Charleroi, Pennsylvania.

The final portion of the Lower Monongahela Project includes the construction of two new larger locks at Locks and Dam 4 in Charleroi. From Elizabeth to Charleroi, the river will drop 3.2 feet. Charleroi Locks and Dam (Locks and Dam 4) currently consist of two lock chambers and a gated dam. The main lock chamber is 720 feet by 56 feet, the auxiliary chamber is 360 feet by 56 feet, and the dam is 535 feet in length. It maintains a pool for 19.7 miles upstream to Maxwell Lock and Dam just south of Brownsville, Pennsylvania.

Maxwell Locks and Dam has two lock chambers, both are 720 feet by 84 feet, and a gated dam. It maintains a pool for 20.8 miles upstream to Grays Landing Lock and Dam near Grays Landing, Pennsylvania. Construction of Maxwell Locks and Dam began in 1960 and was completed in 1965. The construction of this facility resulted in the removal of old Lock and Dam 6 at Rice's Landing, Pennsylvania.

Photo 5. Maxwell Locks and Dam.

Grays Landing Lock and Dam is located at river mile 82 near the community of Grays Landing, Pennsylvania. It consists of one 720 foot by 84 foot lock chamber and a fixed crest dam. Grays Landing Lock and Dam replaced Lock and Dam 7, which was located three miles upriver from the new project. Construction of the project began in 1988. The lock was completed in March 1993 and the dam in June 1995. Lock 7 was constructed between 1923 and 1926 and replaced the original timber and stone structure built just upstream of Grays Landing, Pennsylvania, in the late 1800s.

The original Point Marion Lock and Dam, previously known as Lock and Dam 8, was built between 1923 and 1926. In 1959, the dam was changed from a fixed crest to a gated type. The Water Resources Development Act of 1986 authorized replacement of the existing lock chamber with a larger lock chamber (720 feet by 84 feet) on the landward side of the existing chamber. Using an innovative, award-winning design in constructing the chamber, the new lock was dedicated in September 1994. Point Marion maintains a pool for 11.2 miles upstream to Morgantown Lock and Dam.

Morgantown Lock and Dam consists of a single 600 foot by 84 foot lock chamber and a 410-foot long gated dam. The dam has a lift of 17 feet and forms a pool approximately six miles long. Average annual traffic from the past five years is approximately 763,800 tons of commodities per year. Construction of Morgantown Lock and Dam began in 1948 and was completed in 1950 (operation began July 1950) at a total cost of $8.8 million. The structure brought about the removal of the original Lock 10 and Lock 11 which had been built by the government in 1897 and 1903.

Photo 6. Morgantown Lock and Dam.

Hildebrand Lock and Dam was constructed in the period from 1950 to 1960 (operation began June 1959) at a total cost of $12.5 million. The navigation facility was opened in March of 1960. Hildebrand Lock and Dam consists of a single 84 foot by 600 foot lock chamber and a 530 foot long gated dam with a total lift of 21 feet. Average annual traffic from the past five years is approximately 256,720 tons of commodities per year. Construction of Hildebrand lock and dam eliminated the older Locks 12 and 13 which had been in service since 1903.

Photo 7. Hildebrand Lock and Dam.

Opekiska Lock and Dam consists of an 84 foot by 600 foot lock chamber and a 366 foot long gated dam with a lift of 22 feet. Average annual traffic from the past five years is approximately 257,440 tons of commodities per year. The facility forms a pool of approximately 13 miles of the Monongahela River plus a few miles of narrow channel on the Tygart and West Fork Rivers for a total surface area of 800 acres. Completing the modernization of the West Virginia portion of the Monongahela River was realized with the completion of the Opekiska lock and dam project in 1967 at a total construction cost of $26 million. Construction was completed on the structure in 1967 but the locks at Opekiska have been operational since August 1964. Locks 14 and 15, the last of the 60-year-old locks and dams, were removed after completion. The below figure shows a profile of the navigation projects in the watershed.

Photo 8. Opekiska Lock and Dam.

4.2.1 Local Flood Protection Projects

In addition to its reservoirs, the Pittsburgh District has constructed 42 local flood protection projects (LFPP). These projects are designed to provide protection for heavily developed residential, business and industrial areas with a history of flood problems. Such projects typically consist of one or more of the following elements; stream bank protection, dredging, flood walls, drop structures, debris basins and levees. Six of these local flood protection projects are located in the Monongahela River watershed. One of these projects, in Elkins, West Virginia, is unique in that the Corps maintains responsibility for its operation and maintenance. Authorized by Section 4 of the Flood Control Act of 1938, the City of Elkins, West Virginia cooperated with a LFPP on the Tygart River. This project consisted of a cut-off canal, and an impervious rolled-earth diversion dike and protection dike. The project was completed in January 1949 and is currently maintained by the Pittsburgh District.

Completed in September 1969, the City of Buckhannon, Upshur County, West Virginia, cooperated with the Pittsburgh District to complete a project that involved the widening, deepening, and realigning of 24,170 feet of the Buckhannon River. The City of Buckhannon accepted the project for operation and maintenance shortly after its completion.

The LFPP constructed in Friendsville, Maryland consisted of excavating the channel of Bear Creek for a length of approximately 2,000 feet, providing protection at the bridges, and clearing the natural channel from the downstream end of the channel improvement. This project was authorized by Section 205 of the Flood Control Act of 1948, as amended, and was turned over to the local interests post construction.

The Washington County Commissioners participated in a LFPP with the Pittsburgh District in Granville, Pennsylvania. On Pike Run and its tributary, Gorby Run, about 34,500 cubic yards of mine dump was removed, 210 feet of rock faced dike was placed, and 4,600 feet of dumped rock bank protection was installed. The Washington County Commissioners has operated and maintained this project since 1952.

On Ten Mile Creek, the Supervisors of West Bethlehem Township cooperated with the Pittsburgh District to complete a LFPP in August 1979. This LFPP consisted of widening, deepening, realigning, and stabilizing the channel for 7,761 feet; providing a low flow channel; improving the mouth of Daniels Run; providing rock surfaced access ramps and gutters; minor utility adjustments; and environmental improvements such as planting trees and shrubs, constructing a park area and bituminous walkway.

The Turtle Creek District Flood Control Authority, created by the boroughs of East Pittsburgh, Turtle Creek, and Wilmerding, cooperated on a LFPP with the Pittsburgh District in the late 1960's. This project consisted of five phases and consisted mainly of channel excavation; concrete and stone lining; cantilever and bar anchored steel sheet pile walls; concrete cantilever and gravity walls; alterations to the Westinghouse Electric Corporation backwater flood gate and sill; raising of railroad tracks and bridge; a new railroad bridge; protection of various bridge substructures; five concrete drop structures on Thompson Run; six debris basins on Turtle Creek and its tributaries; the removal of buildings and stone walls; and the alterations of numerous utility lines and structures. This project was turned over to the local interests in 1972.

Photo 9. Turtle Creek LFPP.

In addition to structural methods of local flood protection, non-structural flood warning systems within the Cheat and Tygart River basins in West Virginia are innovative early-warning systems designed to save lives and protect property by providing advance warning of flood crests.

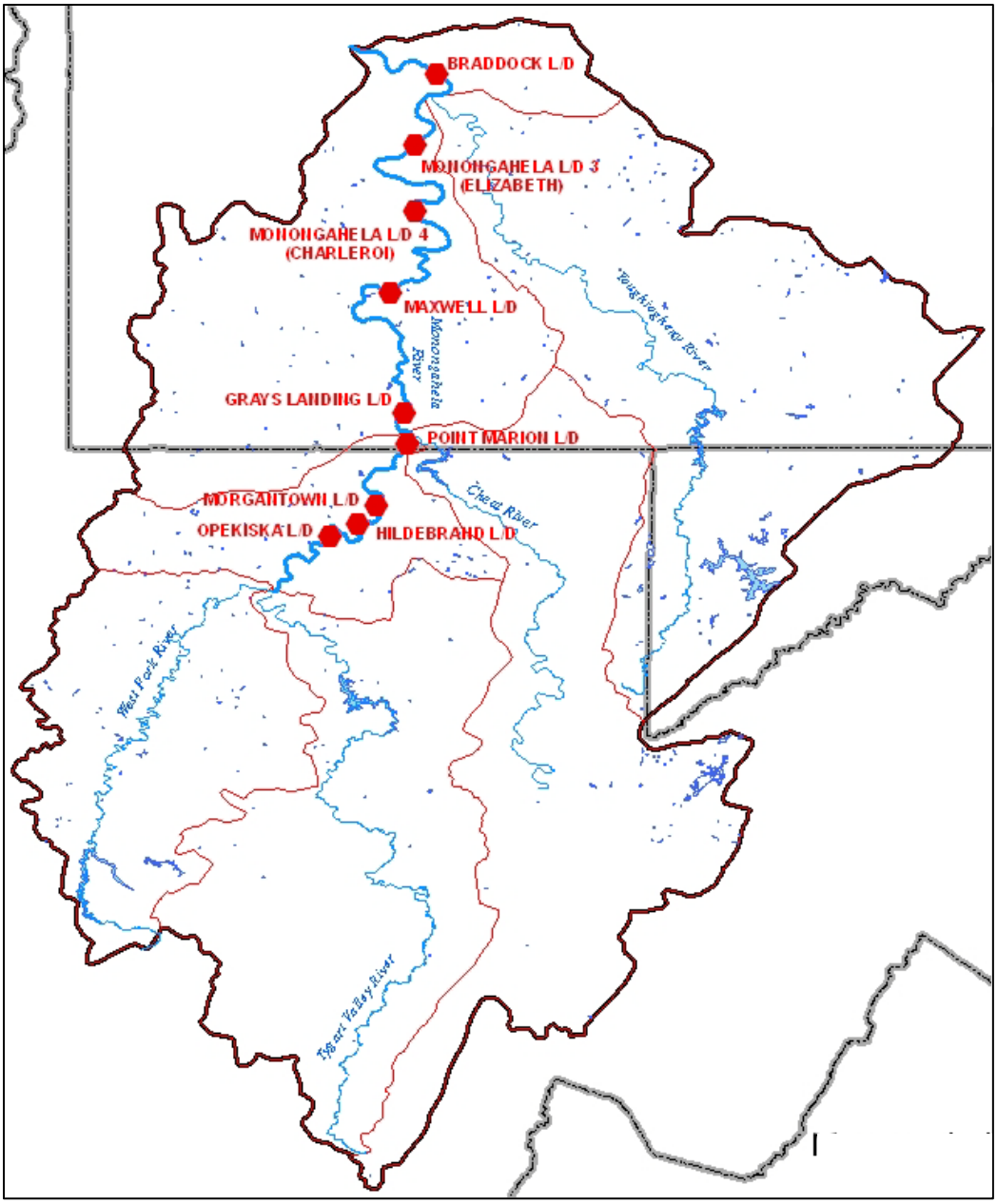

Figure 4. Navigation Project Locations in the Watershed.

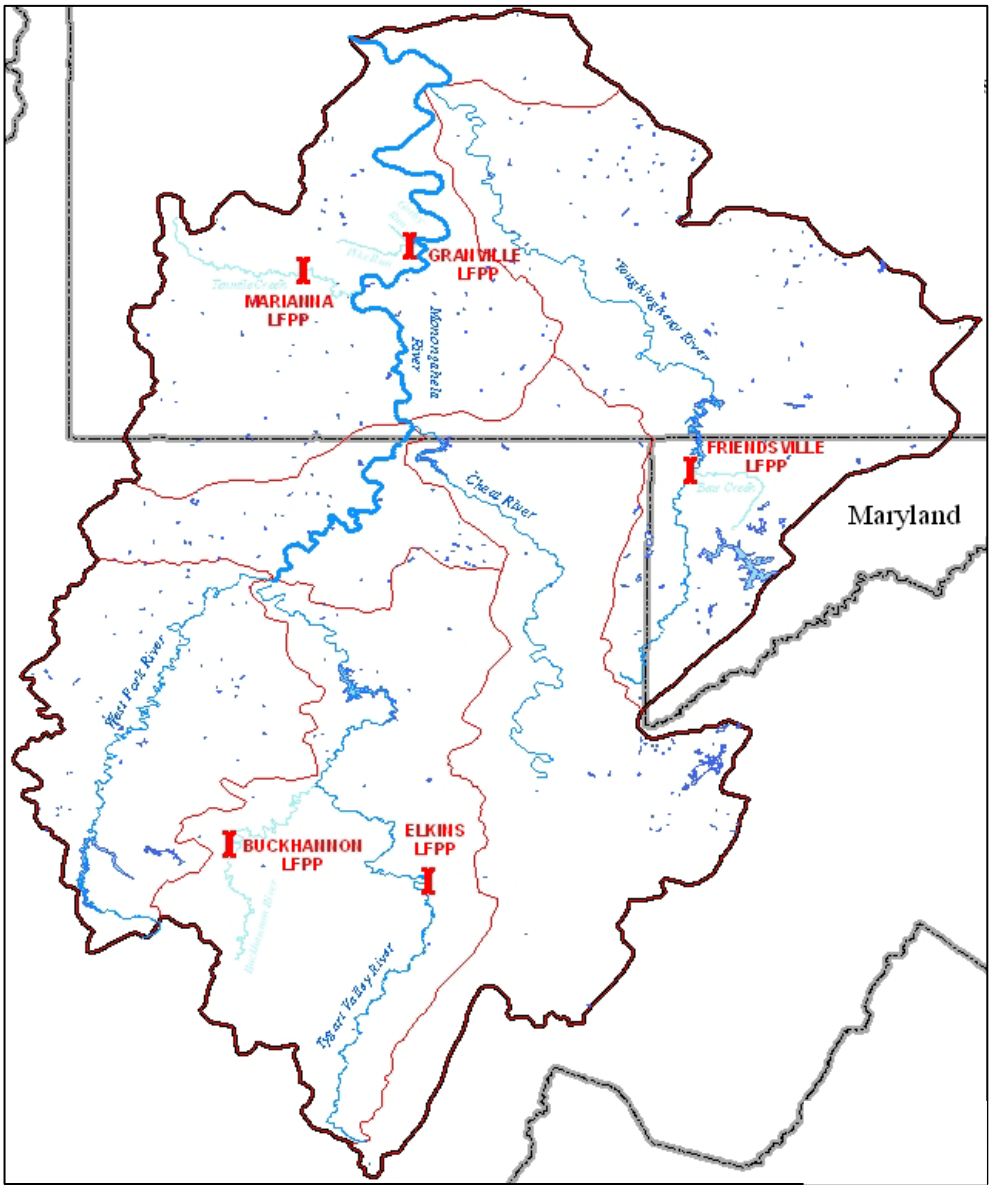

Figure 5. Local Flood Protection Projects in the Study Area.

4.3 Existing Actions

There are a multitude of existing actions within the Monongahela basin which cannot all be detailed within this IWA. However, two current actions that are important to mention for the sake of future watershed planning are the update to the Stonewall Jackson Water Control Manual and Nature Conservancy actions. Stonewall Jackson, as mentioned previously is one of the Corps reservoir facilities within the basin. This facility has an impact on the water resource management within the watershed and therefore the update to the Water Control Manual may tie closely with the efforts of watershed planning in the Monongahela Basin.

Additionally, the Nature Conservancy chapters both within Pennsylvania and West Virginia are working on watershed assessments/flow modeling activities throughout portions of the Monongahela River basin. Their efforts at watershed planning may be combined with Corps efforts in the future in the idea of coordination and collaboration with limited resources which is the core of watershed planning.

5 Existing Conditions

5.1 General Watershed Conditions

The Monongahela River watershed has a total area of 7,340 square miles and lies mostly within the Appalachian Plateau physiographic province, with a minor portion of the Cheat in the Valley and Ridge province. This equates to a total drainage area of 4,736,000 acres. The Monongahela River forms at the junction of the Tygart Valley and West Fork rivers near Fairmont, West Virginia. The Cheat River joins the mainstem just south of the Pennsylvania border, above Point Marion, Pennsylvania, followed by the Youghiogheny River which joins near Mckeesport, Pennsylvania. The confluence of the Monongahela and the Allegheny Rivers in Pittsburgh forms the Ohio River. The Monongahela River is part of a large riverine system that flows through a highly dissected plateau with deep eroded stream valleys. Wetlands and forested floodplains bordering the stream are seasonally flooded. The land use is limited by rough terrain and nutrient-poor soil. Bituminous coal is mined extensively throughout the study area and as a result, acid mine drainage commonly affects streams throughout the watershed. Effluents from industrial sources as well as runoff and sewage discharges from urban areas are also commonly expressed concerns.

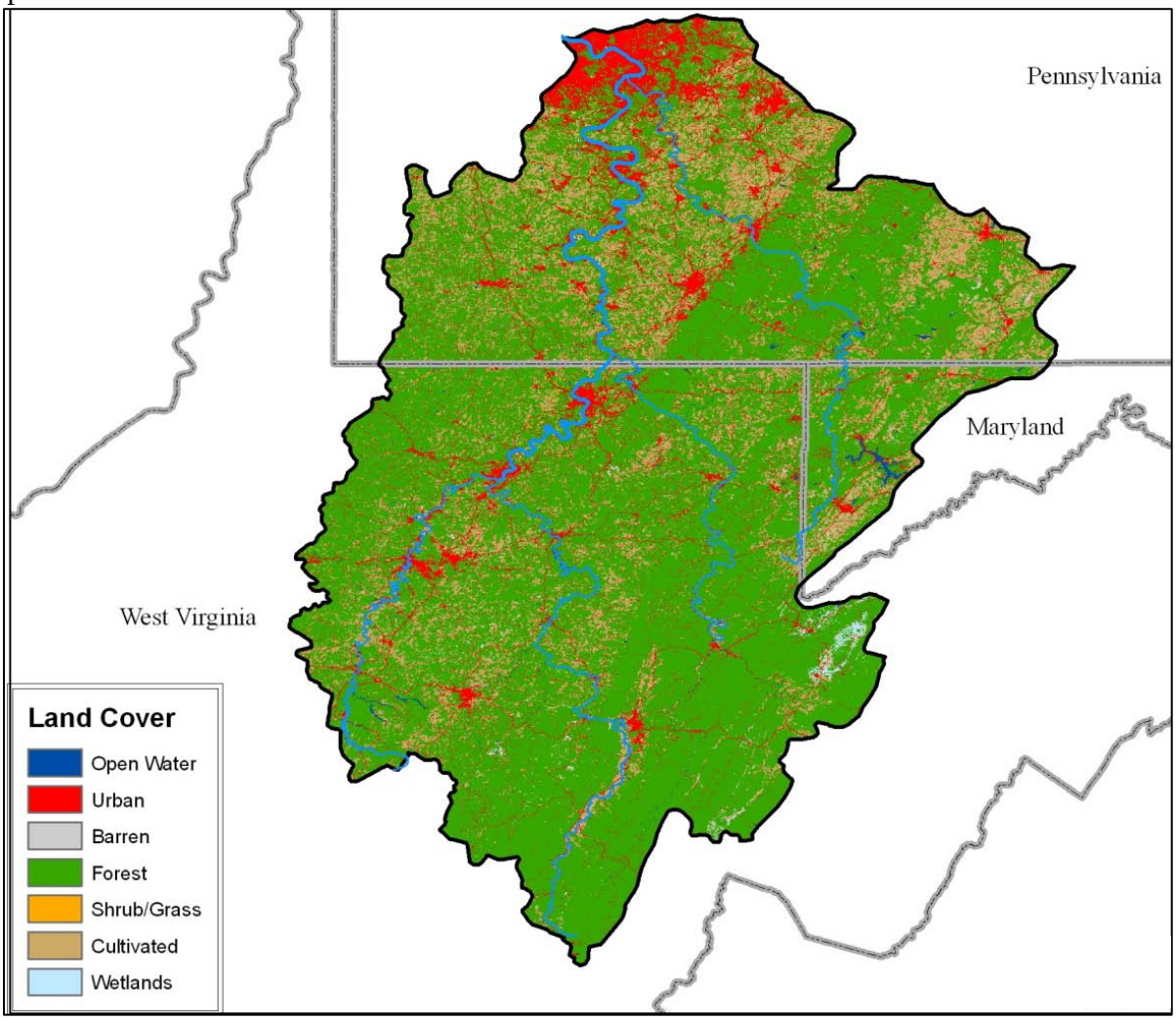

Figure 6. Land-use in the Study Area.

The above figure shows the distribution of land-use throughout the watershed. The largest contributor to urban areas in the watershed is the City of Pittsburgh to the north and its surrounding communities. In West Virginia, urbanized areas include Morgantown, Fairmont and Clarksburg.

5.2 Climate

The Monongahela River watershed exhibits a humid continental climate. The humid continental climate (Köppen *Dfa* or *Dfb)* is a climate found over large areas of land in the temperate regions of the mid-latitudes. The humid continental climate is marked by variable weather patterns and a large seasonal temperature variation due to its position between polar and tropical air masses. As shown in the below figure, the average annual temperatures are lowest in the more mountainous areas in the south and east of the watershed. Dominant airflow patterns are from the west for most of the year. In the summer, however, low pressure cyclonic systems often dominate with southerly winds and heavy precipitation.

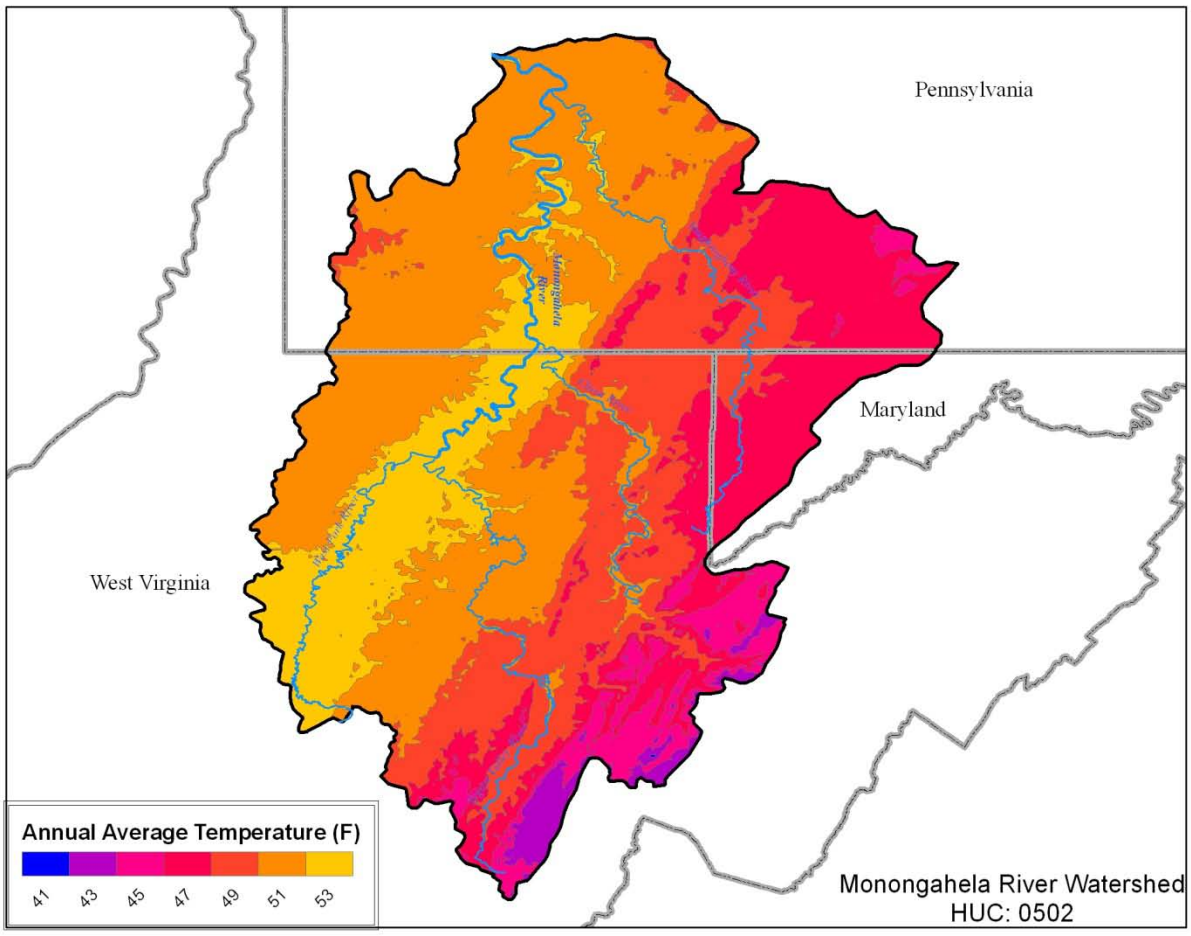

Figure 7. Average Annual Temperatures.

From June through November, northeasterly moving hurricanes and tropical disturbances occasionally produce heavy rains and strong winds. Precipitation is rather evenly distributed throughout the year, with an annual average of approximately 41 inches in the watershed. February is typically the driest month with an average of about 2.6 inches in the basin. Highest

monthly precipitations occur in July and August. Figure 8 shows the average annual precipitation in the Monongahela River watershed.

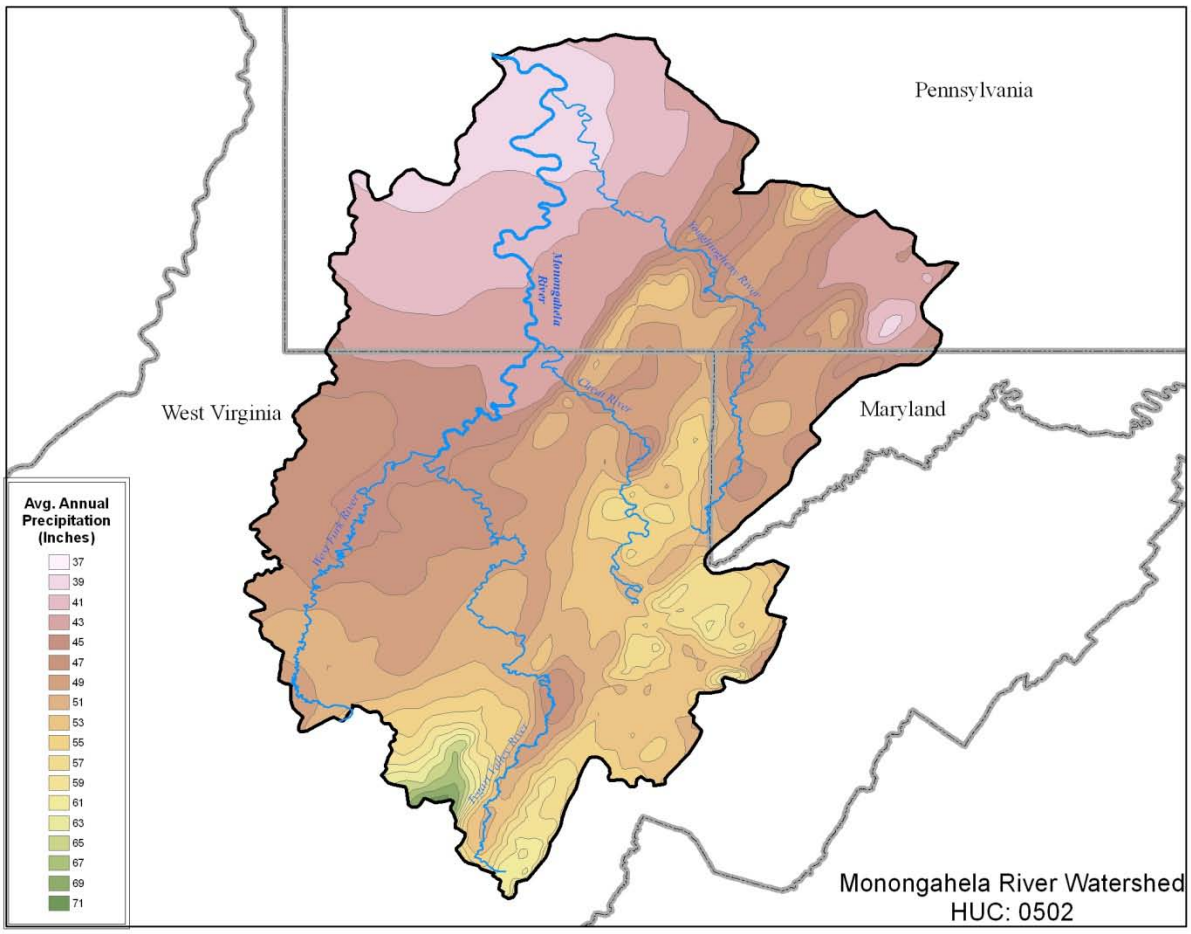

Figure 8. Average Precipitation.

5.3 Physiography and Geology

The Monongahela River watershed lies within the Allegheny/Pittsburgh Plateau section of the Appalachian Plateau physiographic province. The topography of much of the Monongahela River watershed is rough, and many areas are sloped at varying degrees of steepness. This area is a highly dissected plateau with deeply eroded stream valleys. The study area is underlain by sedimentary rocks (sandstone, shale, coal, and limestone) of Devonian, Mississippian, Pennsylvanian, and Permian age. These rocks are commonly fractured and folded but are also flat-lying. Bituminous coal is present in the Mississippian, Pennsylvanian, and Permian strata. Six coal seams underlie most of the study area and include the Sewickley, Pittsburgh, Upper Freeport, Upper Kittanning, Lower Kittanning, and Upper Mercer. The Pittsburgh seam has been mined most extensively for more than 200 years, with most commercially important beds occurring in the Monongahela series.

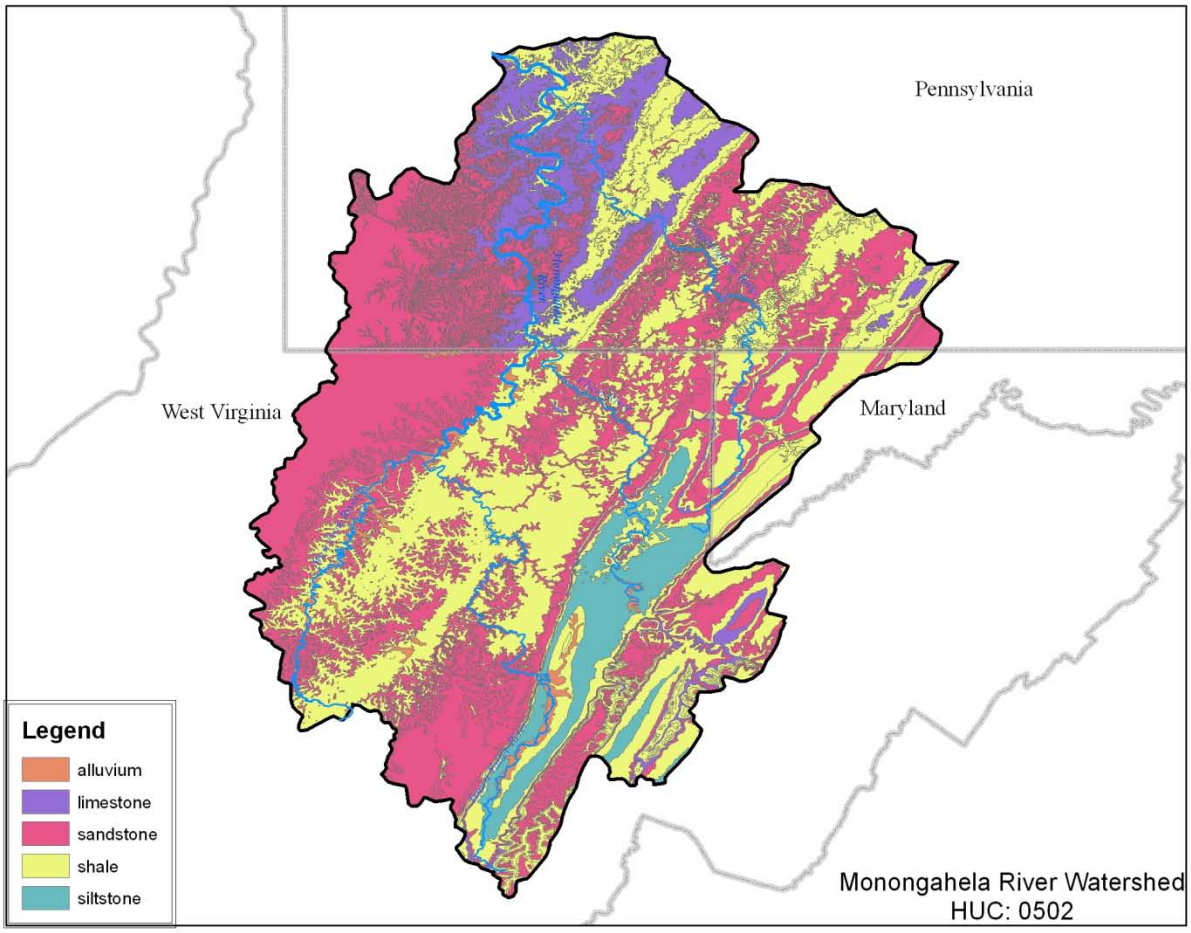

Figure 9. Dominant Geologic Parent Material in the Watershed.

The process of erosion usually slows down the soil development to the point that most organic soils in the region are classed as immature (lacking a well-stratified organic profile), with the distinguishing characteristics more or less determined by the nature of the underlying parent materials. Soils in areas of steep slope are commonly shallow, weakly developed, poorly drained and have low fertility and high erosion potential. Soils on gentler slopes and soils over unconsolidated sediments are commonly deep, well-drained, and fertile. Two general soil associations occur within and adjacent to the Monongahela River valley in West Virginia. The Monongahela-Zoar-Allegheny association includes moderately to well-drained acid soils occurring on terraces. These soils occur along the river from the head of the river to Prickett Creek and from Hildebrand to Van Voorhis. The remainder of the soils within the Monongahela River valley in West Virginia belongs to the Westmoreland-Culleoka-Clarksburg association. These are well drained and moderately well drained lime-influenced soils that occur on uplands and foot slopes.

The soil profiles in Greene and Washington Counties in Pennsylvania are nearly identical along the river. In both counties, Donnont-Culleoka is the dominant soil association countywide and is prevalent in the Monongahela River basin. It exists uninterrupted along the river from the West Virginia border to the Washington/Allegheny County line. This association commonly displays hills with many benches and ridges. Less sloped areas are suited for farming with limitations

that include a relatively high water table and moderate bedrock depth. In the streambeds of Ten Mile Run and Pigeon Creek in Washington County, the Donnont-Culleoka-Newark association is common. The less sloping areas of the association are suitable for farming which was common on level ground in the flood plain. Slope, erosion, occasional flooding, and a seasonal high water table, are the major limitations for most uses. The bedrock depth can be an additional limitation with uses not associated with farming. Along Dunkard Creek in Greene County, the Glenford-Donnont-Library association is present. This soil association consists of terraces, hills, ridges and benches with slopes up to 20 percent. The common use in the corridor for this association is residential and open space.

Along the river, the Guernsey-Westmoreland-Clarksburg soil is located in every municipality of Fayette County, Pennsylvania. It consists of soils influenced by limestone and underlain by the Pittsburgh coal seam. The landscape consists of rounded hilltops and a series of benches located along the slopes. The soils of this association readily accept fertilizer and have good surface drainage, making them among the best soils for farming in county. Commercial, industrial, and residential development, although present in some areas, is limited due to the soil's permeability and the fine textured subsoil.

The Philo-Monongahela-Atkins association is located along the river in North Belle Vernon Borough, Rostraver Township, and the City of Monessen. This soils association is commonly located along the larger streams of the county and it contains a hardened layer of soil (fragipan) near the water table. The association can be productive for farm and pastureland, but it is not used commercially in this the capacity within the study corridor. The primary uses consisted of industrial, commercial, and residential, all which are limited by frequent flooding and a seasonal high water table.

In Allegheny County, the Urban Land-Philo-Rainsboro association is found consistently along both sides of the Monongahela River. The Urban Land soil consists of land so altered by earth moving or so obscured by buildings or structures that the original soil type cannot be identified. It is commonly found on somewhat level land adjacent to the Monongahela River where past development has been intense for industrial, residential, and commercial uses. Like other urban soils, it has been so altered by development that the original soil types could not be identified. Most of the association in Clairton and Duquesne has a gentle slope which accommodates the intense urban development. The Gilpin-Upshur-Atkins association is located just outside the Urban Land-Philo-Rainsboro association along length of the river. This association is located on the steep hillsides of river valley. In some areas, seepage springs are common due to recent landslides.

5.4 Hydrology and Water Quality

5.4.1 Hydraulic Conditions

The hydraulic conditions of the Monongahela River have been substantially modified over the past two centuries. The river typically displayed a pool and riffle morphology prior to the construction of the navigation structures and the meander pattern of the river was relatively gentle. At many locations the river was shallow enough to be waded at normal flows. The navigation dams have significantly altered the hydraulic characteristics in the Monongahela

River watershed, particularly under low flow conditions. The effect has been to create almost constant river stages within each pool, accompanied by slight increases in river width and large increases in depth. The channel thalweg depths range anywhere from 15 feet immediately below the dams up to 35 feet immediately above the dams, but always maintains at least 9 feet for navigation purposes.

Unregulated stream discharges in the Monongahela River watershed show a very wide seasonal variation. The highest flows generally occur from December through April, although it is possible for major floods to occur at any time of the year. The basin can be characterized as low-yielding at base flow with the ground water contributions to stream flow being particularly low in the western portion of the basin. The discharge of unregulated streams is often negligible in the late summer and early fall and low flows can be expected primarily during this period.

At the headwaters of the watershed, the Tygart and Buckhannon Rivers, which exhibit very similar flow characteristics, converge to produce a river with a mean annual discharge about four times greater. The West Fork River's mean annual discharge increases downstream from Stonewall Jackson Lake as tributaries continue to contribute flow. This is the same situation presented by the Cheat River. The Youghiogheny contributes a similar level of flow to the Monongahela River as the Cheat, Tygart and West Fork Rivers, at its confluence. The table below shows discharge data for the main branches within the Monongahela River watershed. Tygart Lake is operated to provide a minimum 340 cfs flow in the Upper Monongahela River, with Stonewall providing an additional 80 cfs for a total minimum flow of 420 cfs. The Youghiogheny River Lake maintains a minimum flow of 500 cfs at Connellsville.

Sub-basin	Location	Mean Annual Discharge (ft^3/sec)	Highest Daily Mean (ft^3/sec)	Lowest Daily Mean (ft^3/sec)
Tygart Valley	Tygart River near Elkins, WV	525	16,000	0.1
Tygart Valley	Buckhannon River near Hall, WV	603	14,500	0.2
Tygart Valley	Tygart River near Grafton, WV	2,369	18,800	0
West Fork	West Fork River near Butcherville, WV	310	13,400	4.3
West Fork	West Fork River near Clarksburg,WV	592	16,900	0
Upper Monongahela	Buffalo Creek near Barrackville, WV	169	5,710	0
Cheat	Shaver Fork near Parsons, WV	449	9,370	8.8
Cheat	Cheat River near Pisgah, WV	2,988	80,300	13
Youghiogheny	Youghiogheny River below Confluence, PA	2,016	34,600	121
Youghiogheny	Youghiogheny River near Suttersville, PA	3,080	79,000	57
Data from USGS, Pennsylvania and West Virginia water resources data reports.				

Table 2. Mean discharge characteristics throughout the Monongahela River Watershed

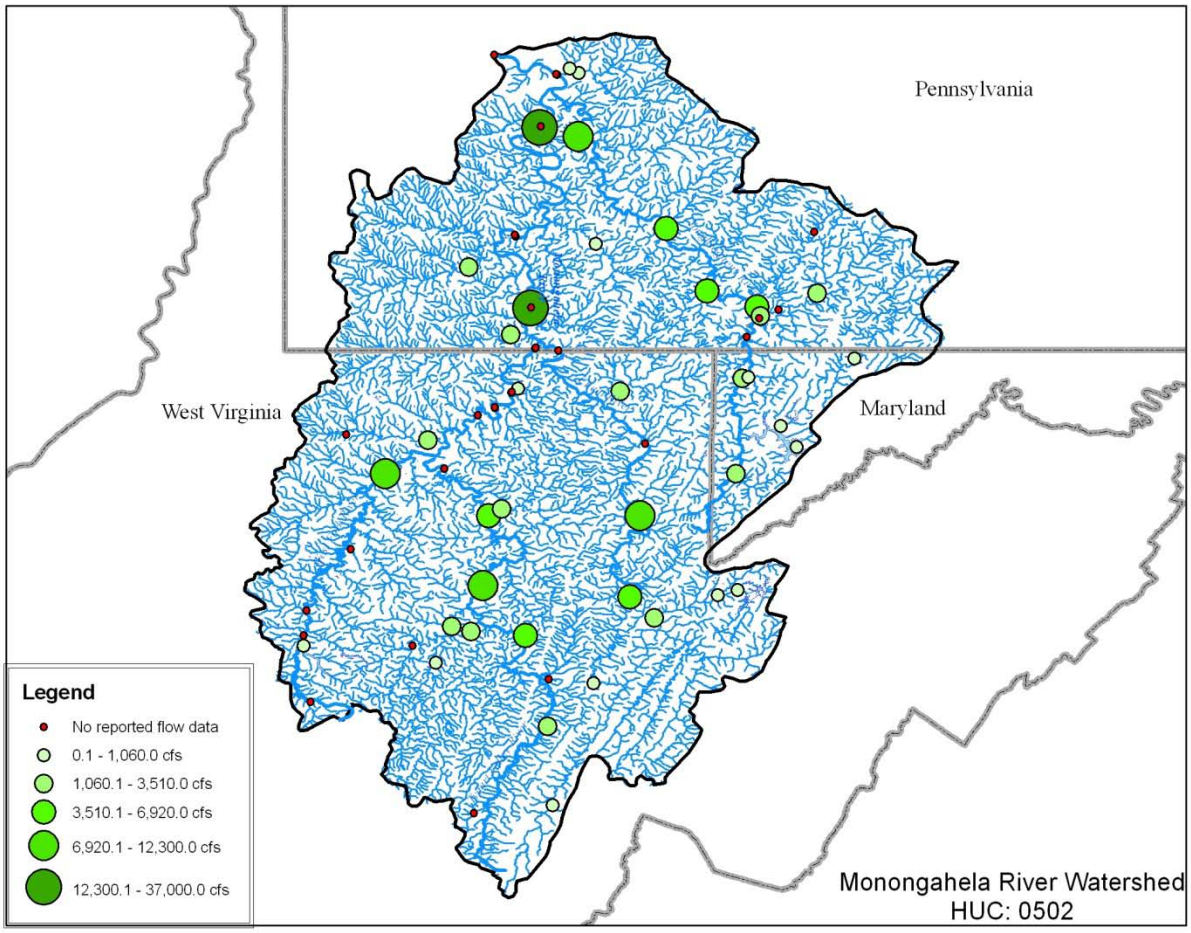

Figure 10. Stream Flow Volume Throughout the Watershed.

5.4.2 Water Quality

Water quality in the Monongahela River watershed has long been a concern. Most of the water quality problems on the Monongahela River mainstem are low-flow related. Consequently, flow augmentation from the Corps reservoir projects is an important factor on the entire length of the river. Within the context of navigable rivers, the Monongahela could be characterized as a complex headwater system, so tributary influences are very significant to the mainstem water quality problems. Current trends indicate improved water quality on the Monongahela River over the past 40 years, attributable to low flow augmentation, AMD treatment projects, and natural attenuation of AMD pollution. The Cheat River inflow and the operation of Lake Lynn hydroelectric plant is an important controlling factor in the water quality and biology of the middle reach of the Monongahela; as is the Youghiogheny inflow and the operation of Youghiogheny River Lake in the lower Monongahela River.

In general, water quality problems can be caused from point or non-point sources. Point sources are those which are attributable to an exact location that emits directly into the water. An example of a point-source is a pipe discharging untreated sewage into a stream. Non-point sources are not easily identified as they are not directly discharged into the waterbody. An example of a non-point source is the addition of phosphorus to a stream resulting from the

phosphorus in fertilizer being attached to a soil particle on an agricultural field before being washed into a stream.

Water quality in the Monongahela River watershed is affected by both point and non-point sources of water pollution. Most non-point sources are a result of past coal mining activities. Primary sources contributing to metals and pH impairments include an array of nonpoint or diffuse sources as well as discrete point sources/permitted discharges. Loading processes for nonpoint sources or land-based activities are typically rainfall-driven and thus relate to surface runoff and subsurface discharge to a stream. Permitted discharges may or may not be dependent on rainfall. Other non-point sources include runoff from trash dumps and highway construction, sediments, and sewage. Figure 11 shows the streams listed as impaired in the 2010 state water quality reports by general classification.

The Pittsburgh District, Water Management Branch regularly conducts field surveys and operates a real-time monitoring network to assess existing water quality conditions at our reservoirs and navigation locks and dams and tracks water quality trends. The Pittsburgh District has identified the main water quality problems within the Monongahela River watershed through their monitoring network. Acid mine drainage, traditional gas drilling, industrial and municipal pollution, landuse, and Marcellus Shale gas development are currently the principal concerns in the watershed. The parameters of concern include elevated temperatures, reduced dissolved oxygen, elevated iron and sulfate ions, and high levels of turbidity and dissolved solids. All of these parameters are affected by the flow levels of the river. Also, contaminated substrates have been identified with polychlorinated biphenyls (PCBs), chlordane, and aromatic volatile organic compounds being of greatest concern.

Photo 10. Stream Impaired by Acid Mine Drainage (www.raccooncreek.org).

The Monongahela River watershed was considered to be one of the region's most intensely polluted by acid mine drainage in the United States until about 1970. Acid mine drainage (AMD) is foremost among the water quality problems historically associated with the Monongahela River. The majority of this pollution originates from either deep-mine openings or surface-mine seeps at abandoned mine sites. Acid mine drainage is characterized by low pH values and high levels of iron, manganese, aluminum, and sulfate ions which can produce a distinct orange or yellow color, as seen in the above photo. The color of AMD is dependent on the pH and if the metals are dissolved or precipitating.

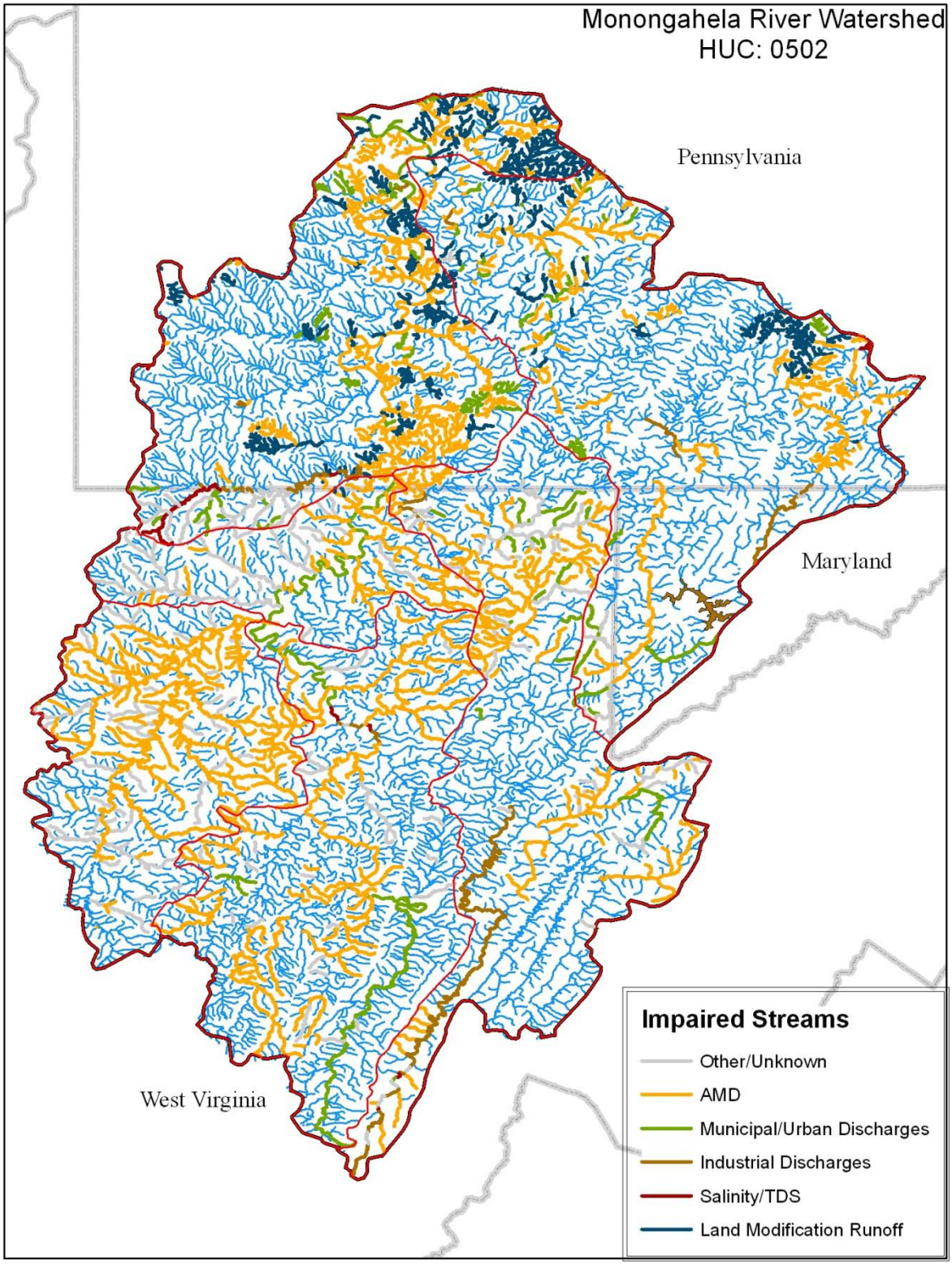

Figure 11. Streams Listed as Impaired in 2010 State Water Quality Reports.

Municipal and industrial pollution is a large factor in the watershed, considering its long history of industrial activity and the associated population. This type of pollution includes pathogens, various organic contaminants (detergents, petroleum hydrocarbons, volatile organic compounds, and emerging contaminants) from urban runoff and inadequate wastewater treatment, inorganic contaminants (acidity and heavy metals), and thermal pollution.

Many waters contain elevated levels of fecal coliform bacteria within the watershed, an indicator of inadequately treated sewage. The West Virginia DEP states that contributors to the problem include leaking or overflowing sewage collection systems, illegal homeowner sewage discharges by straight pipes or failing septic systems, and runoff from urban or residential areas and agricultural lands. Combined sewer overflows (CSO) are one of the largest contributors to fecal coliform contamination and are typically designed to collect rainwater runoff, domestic sewage, and industrial wastewater all in the same pipe. Most of the time, combined sewer systems transport all of their wastewater to a sewage treatment plant. However, during periods of heavy rainfall or melting snow the volume of wastewater going into the pipes can exceed the capacity and excess wastewater empties directly into nearby streams, rivers, or other water bodies. Improperly treated wastewater can transmit disease, contain organic matter that can cause odor and nuisance problems, and hold nutrients that may cause eutrophication of receiving water bodies. Fecal coliform impairments have been identified along the entire length of the Monongahela River, the entire length of the Tygart Valley River, and the West Fork River (mouth to Stonewall Jackson Lake).

Photo 11. Combined Sewer Overflow.

Organic contaminants are not as wide spread throughout the watershed, but can be very difficult to deal with. The two organic compound most prevalent in the Monongahela River watershed are Polychlorinated Biphenyls (PCBs) and Chlordane. Both were banned by the U.S. Environmental Protection Agency (1979 and 1988 respectively) due to their persistence in the environment and human health concerns. Most of the Lower Monongahela River, the West Fork River from its mouth to Stonewall Jackson Lake, Cheat Lake, and Tygart Lake have fish consumption advisories due in-part to elevated fish tissue concentrations of PCBs. The Lower Monongahela River also has a fish consumption advisory due to Chlordane contamination. The Monongahela River watershed is significantly affected by inorganic pollutants, but most of this contamination results from AMD. There is, however, a small portion of the Youghiogheny River that currently has a fish consumption advisory placed on it based on mercury contamination. Because fish and shellfish have a natural tendency to concentrate mercury in their bodies, often in the form of methylmercury, a highly toxic organic compound of mercury, consumption advisories are issued to reduce human exposure to such compounds.

Thermal pollution is the rise or fall of water temperature induced by human activity. In the Monongahela River watershed, this is most often attributable to the use of water as a coolant for power plants and industrial manufacturers. Increased water temperatures tend to decrease oxygen levels which affect ecosystem composition, such as invasion by new species. Urban runoff may also elevate temperature in surface waters. The five coal-fired power plants that operate along the mainstem of the Monongahela River use a significant amount of water from the river for cooling, and subsequently return that water back to the river at temperatures up to 20°F above ambient. Also, the industrial activities near Pittsburgh, utilize water from the Monongahela River for cooling purposes.

The Marcellus Shale play, a vast deposit of black sedimentary rock containing natural gas, lies 4,000–8,500 feet beneath southern New York, northern and western Pennsylvania, the eastern half of Ohio, and through West Virginia. Development of this deep formation has grown rapidly since 2008, and several water quality issues have arisen from the process of extracting natural gas using hydraulic fracturing. Millions of gallons of "fracking" fluid (mostly freshwater containing sand and proprietary mixtures of surfactants, biocides, and other additives) injected into the shale to fracture and stimulate extraction of natural gas eventually return to the surface as wastewater. This wastewater—many times saltier than seawater (technically described as being much higher in *total dissolved solids*, i.e., TDS)—characteristically contains large amounts of sodium chloride and other salts, smaller amounts of oxidized metals (e.g., iron, manganese, barium, arsenic), benzene and other carcinogens, and radioactive elements (e.g., radium). Uncontrolled release of fracking wastewater containing such potentially toxic substances has raised much concern regarding the safety of drinking water and other environmental pollution.

In 2005, the U.S. Congress exempted hydraulic fracturing from coverage under the Safe Drinking Water Act. Therefore, the regulation of this type of natural gas drilling and its associated fluids falls to the states. The states, however, lack the manpower necessary to adequately perform this duty. This wastewater has been highly controversial due to the proprietary nature of the chemical additives used, the high content of TDS, and the lack of regulation. The ratio of constituents in the wastewater would provide a signature that could be used to indentify its source in the event of contamination. Currently, municipal wastewater treatment plants are not able to handle many constituents of the wastewater. Approximately coinciding with the beginning of Marcellus Shale development in the Monongahela River watershed, data gathered by the Corps have shown increased levels of TDS in the watershed. Increasing TDS loads and water withdrawals interfere with and reduce the benefits of authorized Corps reservoir project purposes, including water quality, fish and wildlife purposes, and water supply. Increasingly, water is being withdrawn from non-degraded reservoir inflows that are naturally low in TDS. This could result in the loss of dilution possibly interfering with reservoir operation schedules. The Pittsburgh District Water Management Branch has determined that the TDS assimilative-capacity of the Monongahela River has been reached. Also, the Corps-operated reservoirs in the Monongahela River watershed have little or no capacity to release enough water to meet the Pennsylvania TDS drinking water criteria during low flow periods.

As a result of the numerous water quality impacts across the U.S., the EPA has developed total maximum daily loads (TMDLs), which are a calculation of the maximum amount of a pollutant that a waterbody can receive and still safely meet the water quality standards set by states. In

order to satisfy the requirements of both sections 305(b) and 303(d) of the Clean Water Act, the Pennsylvania Department of Environmental Protection (PADEP) and the West Virginia Department of Environmental Protection (WVDEP) have ongoing programs to assess the quality of waters in both states and identify streams and other bodies of water that are not attaining designated and existing uses as "impaired." Their 2010 Integrated Reports were developed using information from stream and lake surveys and other sources, including DEP's Statewide Surface Water Assessment Program, the Non-point Source Program, and when available existing and readily available data submitted by external groups and agencies. Specific information regarding the TMDLs developed in the Monongahela River watershed can be obtained electronically from the U.S. Environmental Protection Agency, the Pennsylvania Department of Environmental Protection, and the West Virginia Department of Environmental Protection.

Lack of comprehensive management of the water resources within the Monongahela River watershed, such as that done by the Susquehanna River Basin Commission, is of great concern throughout the basin. The quantity of water withdrawn from streams is largely unregulated and is beginning to show negative consequences. This was illustrated by a low-flow event, related to excessive withdrawals, in the watershed in 2008. This event resulted in unacceptable increases of several contaminants, including at least one known carcinogen, at all potable water supply intakes along the Monongahela River in Pennsylvania. In addition, some water quality parameters, like total dissolved solids, require watershed based regulation rather than "end-of-pipe" monitoring due to their dependence on flow volume and inability to degrade downstream. Wastewater disposal issues have also come to light in recent years due to the massive quantity now in need of disposal. An increasing number of non-traditional natural gas wells are conveying their waste to wastewater treatment facilities that are then discharging effluent with unacceptable concentrations of benzene, 2-butoxyethanol, barium, strontium, and other contaminants. This has caused increased regulatory pressure on regulators such as the states of West Virginia and Pennsylvania which could be lessened through development of a comprehensive water resource management plan.

Dunkard Creek, a stream located in the Monongahela watershed, approximately 36 miles in length plus tributaries, was completely decimated of aquatic life in the form of gill-breathing creatures, i.e., fish, freshwater shellfish (mussels), aquatic salamanders (mudpuppies), and other animals in August and September 2009, effectively destroying the ecosystem. The fish kill was determined to be the consequence of the presence of a microscopic "golden algae" that had never previously been detected in the mid-atlantic states, and which bloomed, emitting a toxin, due to a combination of hot weather, low water levels, and excessive amounts of TDS and brine (salty waters). Two years after the destruction and devastating fish kill, native fish from tributaries are slowly repopulating Dunkard Creek, capable of spawning and reproducing, with prospects of eventually constituting a healthy fishery under the careful stewardship of citizens, industry, and government agencies responsible for natural resources. It is important that events such as that occurred at Dunkard Creek are avoided in the future. Comprehensive management of water resources would assist in ensuring that damaging water quality events are minimized in the future.

5.5 Natural Resources

5.5.1 Terrestrial

5.5.1.1 Vegetation and Wildlife

At least 250 species of birds, 47 species of mammals, and 51 species of amphibians and reptiles are present within the Monongahela River watershed, which lies in what is currently classified as the Appalachian mixed mesophytic forest. The number of species and suitable habitats increases with distance from Pittsburgh. There are currently four endangered and three threatened species within the watershed. These species are listed in Table 2. Vegetation throughout the watershed consists of forested areas dominated by oak, beech and hemlock trees. Upland areas are characterized by white oak-hickory forests while lowland areas include willow, beech, and maple hardwood trees. Native vegetation is still predominant in areas of limited accessibility or rugged topographic relief that do not provide sites suitable for human development. Narrow bands of vegetation persist along the water's edge, even in the heavily developed industrial areas along the rivers.

Common Name	Scientific Name	Status	Distribution
Bat, Indiana	*Myotis sodalis*	E	Hibernacula: Fayette and Somerset Counties, PA, Pocahontas, Preston, Randolph, and Tucker Counties, WV. Maternity sites: Greene County, PA, Tucker County, WV. The Indiana bat may use abandoned mine portals (confirmed in the New River Gorge National River, Fayette County) or occupy summer habitat throughout WV and PA.
Cougar, eastern	*Felis concolor cougar*	E	May occur throughout WV. However, this species may be extinct or extirpated and there have been no documented, verified occurrences in WV in over 100 years
Bat, Virginia big-eared	*Corynorhinus (=Plecotus) townsendii virgini*	E	Known summer or winter caves located in Randolph and Tucker Counties, WV. May also occur in mine portals and caves throughout WV, particularly in Preston County. Critical habitat: Cave Hollow/Arbogast Cave, Tucker County.
Cheat Mountain salamander	*Plethodon nettingi*	T	Pocahontas, Randolph, and Tucker counties.
Snail, flat-spired three-toothed land	*Triodopsis platysayoides*	T	Monongalia and Preston counties, including both sides of Cheat River Gorge.
Running buffalo clover	*Trifolium stoloniferum*	E	Known in Barbour, Pocahontas, Randolph, and Tucker Counties, WV. May potentially also occur in Monongalia and Preston Counties, WV.
Virginia spiraea	*Spiraea virginiana*	T	May potentially occur in Upshur County.
Data from U.S. Fish and Wildlife Service, Northeastern Regional Office website: http://www.fws.gov/northeast/endangered/endangered_species_listing.html			

Table 3. Endangered and Threatened Species Present in the Monongahela River Watershed.

The vegetation in the watershed has been affected by both industrialization and urbanization. Habitat fragmentation is a growing issue in the eastern U.S. due to the continued expansion of

development. The Pennsylvania Department of Conservation and Natural Resources, Bureau of Forestry states that fragmentation contributes to isolated populations of species and communities, and changes in habitat conditions. Some of the major contributors to this fragmentation are mining activities and the growing natural gas industry centered in the watershed. Natural gas exploration and extraction permanently or temporarily converts the existing natural habitats in forests into a mix of well pad sites, freshwater impoundments, roads, pipelines, and gas storage areas. This land use conversion leads to loss of sheltering vegetation, introduction of invasive exotic species, and the disruption of plant seed production. Most of these sites are considered temporary disturbances by state agencies lasting from two to fifteen years. The area can eventually revert to its original habitat or a new habitat types once a well has been removed.

5.5.1.2 Mineral Resources

The principal mineral resources within the Monongahela River watershed are mineral fuels, including coal, oil, and natural gas. The most extensive mineral resource in the watershed is bituminous coal. These reserves are estimated to be about 23 billion tons and are contained mostly in the Allegheny and Monongahela Groups. Most of the present production comes from a small number of relatively thick coal seams which include the Pittsburgh, Sewickley, Lower Kittanning, Upper Freeport, Waynesburg, and the Brookville-Clarion Coal beds. Large amounts of coal are both produced and consumed in the area. The steel industry in the Pittsburgh area developed because of the availability of metallurgical coking coal found in the Monongahela River watershed. In the early days of steel production, coal was the single most important raw material in the steel-making process. Coal is also used by local companies for the generation of electricity. The area contains large reserves of coal. Five percent of the nation's demonstrated reserves of coal are in the Monongahela River Basin. The coal is generally high in heat content and moderate in sulfur content and is used for both electric generation and coke production. In 1995, Pennsylvania was the fourth largest coal producer in the United States at 69 million tons, behind Wyoming, West Virginia, and Kentucky.

Oil and gas wells are also common throughout the watershed. Most of the traditional production of oil and gas is derived from sandstone reservoirs of Mississippian and Devonian Age. The oil and gas fields follow the folded rocks throughout the central and western Monongahela River watershed. Natural gas is most commonly produced with oil production being very small and generally located only in the western portion of the basin. The main emphasis in energy production currently is the extraction of natural gas from the rich Marcellus Shale deposit. This deposit is accessed by utilizing a process known as hydraulic fracturing. In this form of natural gas production, the well is drilled vertically down and is then turned horizontally upon entering the Marcellus Shale. Millions of gallons of fracturing fluid (a proprietary mixture of water, sand, and various chemicals) are then injected into the well at high pressure in order to fracture the shale formation and allow the natural gas within to flow up the well. The development of the Marcellus Shale has been on the rise since about 2008. In Pennsylvania alone, there are 10 drilling companies operating that have drilled more than 960 wells, with over a thousand more permitted.

5.5.2 Aquatic

The biological communities living in streams in the watershed are exposed to many stressors, including toxic contaminants, sedimentation, nutrient enrichment, and acid precipitation. The

aquatic life communities in the headwater sections of many waters continue to be impacted by low pH acidic water quality. The impairment is most prevalent in areas with soils of low buffering capacity and most often caused by acid precipitation and less often (but more severely) by acid mine drainage.

5.5.2.1 Fisheries

The streams of the Monongahela River watershed present a diversity of habitats. Mountainous areas are generally dominated by streams that are very low in nutrients and remain cold all year. These streams support trout and a few other coldwater fish species but commonly include diverse aquatic-invertebrate populations. Streams along the western side of the watershed are generally warm-water systems with a much greater diversity of fish species. The Monongahela River basin presently supports a relatively "modest" fish fauna, which is somewhat indistinct from that of other adjacent basins. According to the USGS, the watershed contains 89 native taxa, 13 introduced species, and 2 euryhaline species. Two species have been extirpated in recent history. There are no endemic species. Specifically, the fauna includes 32 species of Cyprinidae, 12 Catostomidae, 9 Ictaluridae, 1 Cottidae, 11 Centrarchidae, and 15 Percidae.

All of Pennsylvania and West Virginia, not just in the Monongahela watershed, remains under a blanket advisory that recommends limiting consumption of any recreationally-caught fish to one meal per week. This advisory is designed to protect against eating large amounts of fish from waters that have not been tested, or for certain species that have not been tested or fish that may contain other unidentified contaminants. One meal is considered to be one-half pound of fish for a 150-pound person. All of the advisories within the Monongahela are common throughout the United States.

Waterbody	Segment	Species	Recommended Consumption	Contaminant
Dunkard Creek	Confluence of Toms Run to confluence of Roberts Run	Largemouth Bass	2 meals/month	Mercury
Dunkard Creek	SR 2021 bridge to mouth	Smallmouth Bass	2 meals/month	Mercury
Monongahela River	Entire river except Maxwell pool	Carp	1 meal/month	PCB
Monongahela River	Confluence to Braddock L/D	Channel catfish, White bass, Sauger, Walleye	1 meal/month	PCB
Youghiogheny River Lake	Entire lake	Smallmouth bass, Walleye	2 meals/month	Mercury
Youghiogheny River	Youghiogheny Lake Dam to confluence of Lick Run	Smallmouth bass	2 meals/month	Mercury
Deep Creek Lake	Entire lake	Small and largemouth bass	3 meals/month	Mercury
Deep Creek Lake	Entire lake	Yellow Perch	4 meals/month	Mercury

Table 4. 2011 Fish Consumption Advisories in the Monongahela River Watershed.

Although the physical habitat has not changed substantially, the Monongahela River fishery has steadily improved over the past few decades and has resulted in a considerable increase in the amount of sport fishing on the river. Several large fishing tournaments are now taking place in the watershed, increasing the economic impacts from this recreational use. Fishing access to the river has been made easier by a new boat launch and docking facility built on the Morgantown Pool by the West Virginia Division of Natural Resources. Competitors in fishing tournaments on the Monongahela River in both Pennsylvania and West Virginia use current information about the water quality to gain a competitive edge. These tournaments are important economic contributors and examples of the importance of a clean river for both state's natural resource based tourism economy. The recreational and economic benefits of a robust fishery in these waters are important to the region.

5.5.2.2 Groundwater

The best aquifers in the Monongahela River watershed come from sandstone reservoirs and can yield several hundred gallons per minute. Shale and siltstone aquifers in the region do not transmit enough water to be useful, generally yielding around ten gallons per minute. Wells drilled into sandstone bedrock can usually supply the needs of homes, farms, recreational facilities, and small communities. Near Pittsburgh Pennsylvania, the alluvium along the Monongahela River is also able to facilitate groundwater development. The outwash deposits that underlie the upper alluvial deposits sustain large groundwater yields by drawing on river water.

The quality of groundwater in the Monongahela River watershed is variable, but generally good. Bedrock aquifers generally exhibit high iron content and moderately hard water. In the eastern portion of the basin, the salinity is low, and increases to the west and northwest. The alluvial aquifers along the Monongahela River near Pittsburgh, Pennsylvania also have high iron content and are generally low in hardness and chloride. Large quantities of calcium, sulfate, and other chemicals can be found in areas where the alluvial aquifers are overlain by slag dumps. Acid mine drainage does not have much of an effect on the alluvial aquifers, that draw their water from the river, except in areas of heavy pumping. The carbonate content of the aquifer material is able to keep the pH close to neutral.

Available long-term records of groundwater levels indicate that the amount of groundwater in storage has changed very little throughout the watershed. Recharge and discharge are closely balanced and no net decline of groundwater levels has been observed, except in areas of heavy pumping from wells or mines has caused drawdown.

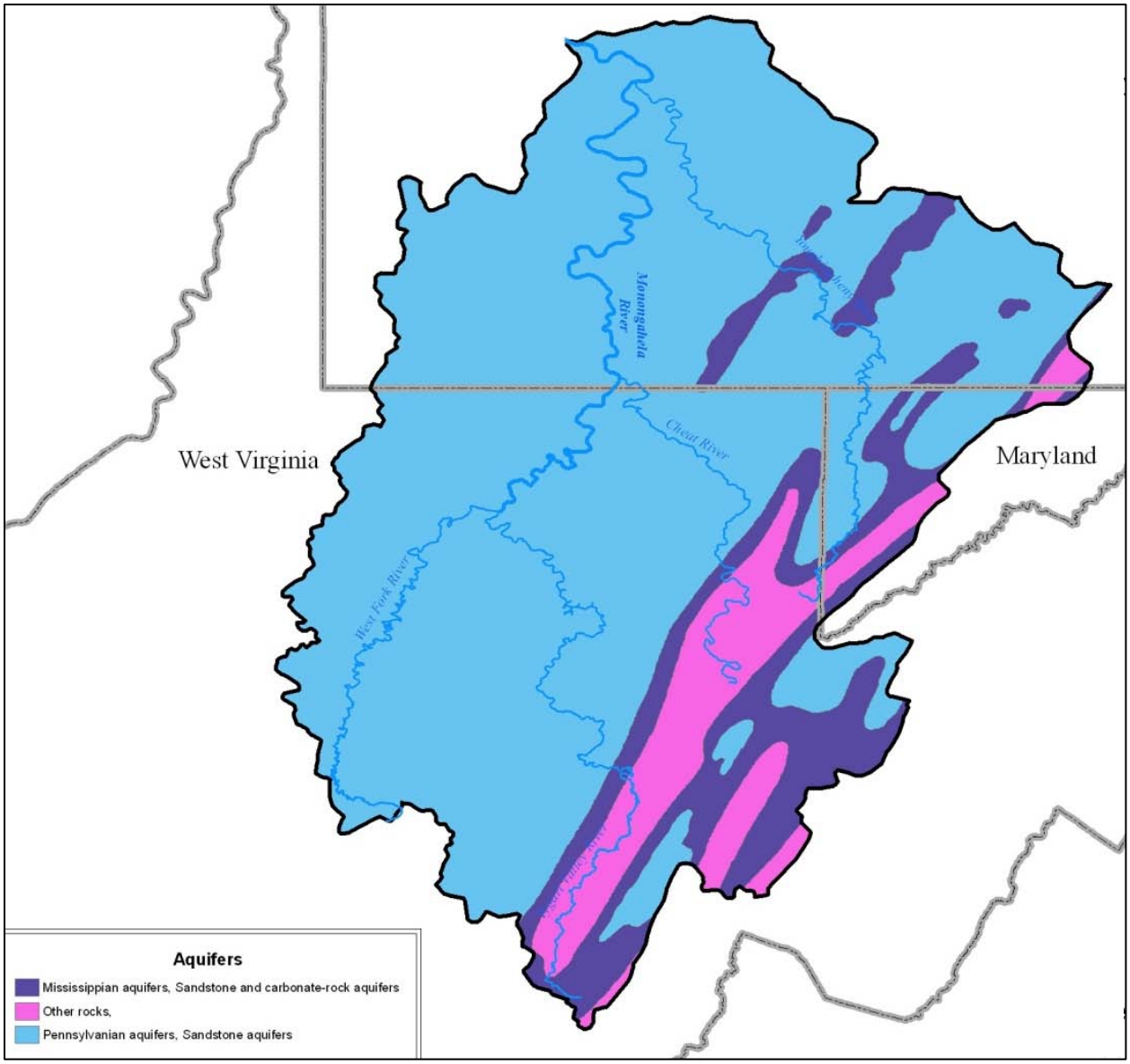

Figure 12. Aquifer Types throughout the Monongahela River Watershed.

5.5.2.3 Wetlands

Wetlands are among the most productive ecosystems in the world and have many valuable functions within a watershed, including their ability to create natural flood protection, act as a filtration system to improve water quality, and provide important habitat for essential plants and wildlife. Since they are such a valuable resource, they are protected and regulated under authorities granted by section 404(b)(1) of the Clean Water Act. The Corps executes the Regulatory program, with the main goal of limiting impacts to aquatic resources without inhibiting development. Any discharge of dredged or fill materials into "waters of the United States," including wetlands, is forbidden unless authorized by a permit issued by the Corps pursuant to section 404 guidelines. There are two main types of wetlands permits: general permits and individual permits. General permits change periodically and cover broad categories of activities. General permits are issued for fill activities that will result in minimal adverse effects to the environment. Individual permits are utilized for actions that are not covered by a

general permit, or that do not meet the conditions of a General Permit. In addition, individual permits typically require more analysis than do the general permits, and usually require much more time to prepare the application and to process the permit.

To have a functional wetland, hydric soils, hydrophytic vegetation, and a source of hydrology must be present, making the Monongahela River watershed historically a great spot for wetlands to exist. Because of its steep topography and decades of developmental flood plain growth, large expanses of wetlands are generally not found today in the Monongahela River watershed. Within the watershed, wetlands usually occur on the islands and embayments, and along the shoreline and tributary mouths. The majority of wetlands are in located in the southern portion of the watershed in West Virginia, although there is a significant concentration of emergent and submerged aquatic beds in Pool 3. Currently, there are around 37 square miles of wetland (Palustrine, Lacustrine, and Riverine) within the watershed and nearly 60 square miles of open water (large rivers and lakes).

The area covered by the Monongahela River watershed is industrialized, mostly as a result of its extensive aquatic resources which allow for easy river navigation. But because of this heavy industrialization and subsequent development both urban and rural, and other factors, including agriculture and logging, acres of wetlands are being lost. In addition to these losses, many other wetlands have suffered degradation of functions, although calculating the magnitude of the degradation is difficult.

5.6 Navigation, Floodplains, and Flooding

5.6.1 Navigation

As described in Section 4.2.2, the entire length of the Monongahela River is maintained for navigation. Currently, a system of nine navigation facilities operates along the Monongahela River to provide a minimum depth of nine feet to make the river navigable from just above Fairmont, West Virginia to the Point at Pittsburgh. Braddock lock and dam, Lock and Dam 3, Charleroi lock and dam, and Maxwell lock and dam account for the majority of traffic on the river. Overall commercial and recreational vessels and lockages through the Monongahela navigation system have decreased significantly in the past decade. In 2009, over 53 million tons of material was shipped through the Monongahela navigation system, which is down from about 73 million tons in 2000. Over 80 percent of commodities moved in 2009 consisted of coal, lignite, and coke. Manufactured equipment and machinery as well as waste material, including garbage, landfill waste, sewage sludge, and waste water, are the only materials that have increased in the last ten years.

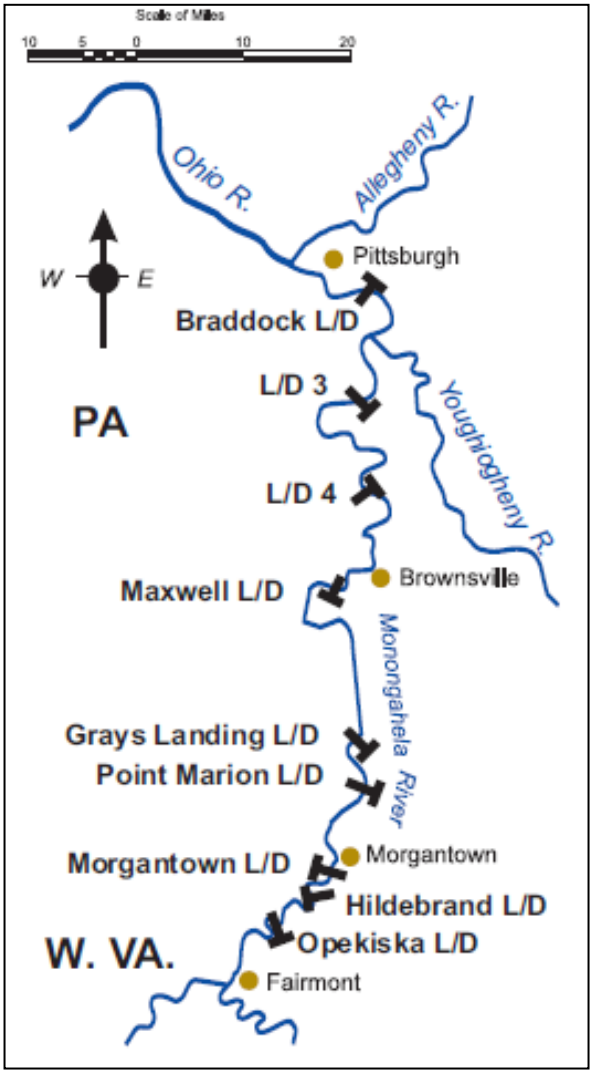

Figure 13. Monongahela River Navigation System.

5.6.2 Floodplains and Flooding

Floodplain development in some form has been ongoing in the basin since the early 1800's. Thousands of structures had been constructed in floodplains that since the advent of the National Flood Insurance Program in 1970 have been defined to be hazardous because of recurring and persistent out-of-bank flooding. Most of the counties and municipal areas within the basin participate in the NFIP. As such they are required to enact floodplain management ordinances that should limit most new development within the designated floodways of the jurisdiction and reduce damages to new construction in the flood fringe through elevation or wet or dry flood-proofing. The efficacy of the ordinances is dependent upon local jurisdiction enforcement of the ordinance requirements and limited variances. Existing structures that were grandfathered into the NFIP when enacted locally are only required to comply with the new ordinance requirements if the value of damages due to flooding or other events is more than 50 percent of the value of the structure. Despite high participation in the NFIP within the basin, relatively few jurisdictions are participants within the Community Rating System (CRS) under the NFIP.

Intense flood events in the more mountainous regions of the basin frequently result in debris-filled stream channels and loss of channel capacity due to high flow velocities and debris-filled floodways. The main flood season extends from December through April, but flood events may occur at any time. The elevations of high frequency flood events behind the gated dams are lower compared to fixed crest dams. However, the difference decreases as the floods' recurrence interval increases; the elevations of the 100-year flood being nearly indistinguishable upstream of either type of dam. Section 581 of WRDA 1996 authorizes the design and construction of 100-year flood control measures in portions of the Monongahela River basin. Many communities have expressed interest in pursuing floodwalls and levee construction under Section 581. However, the 100-year stipulation often makes flood control projects too cost prohibitive for smaller communities to take advantage of, leaving them flood prone.

Section 205 of the Flood Control Act of 1948 is another authority for the Corps to study and construct flood risk management projects. This authority is under the continuing authorities program, meaning that without specific congressional authorization, the Corps may study, adopt and construct flood risk management projects. For non-Federal entities to qualify for this type of project, they must agree to comply with the Federal flood insurance program and prepare a floodplain management plan after construction of the project.

5.7 Recreation and Scenic Resources

The Monongahela watershed provides numerous recreational opportunities. The Monongahela River itself runs for 128 miles from Morgantown north to Pittsburgh with many other tributaries along the way. There are countless parks within the Monongahela River Basin that provide the public with green space, picnic areas, docks, public boat launches, trails, campgrounds, ballfields, playgrounds, along with many educational activities and a rich history of the region. Along with traditional boating, canoeing and kayaking are other ways to appreciate the aquatic resources in the Monongahela River Basin and are growing in popularity as well. The Youghiogheny River is a tributary of the Monongahela River and it provides for some of the best whitewater rafting east of the Mississippi. It attracts thousands of adventure-seekers a year.

5.7.1 Fishing

The Monongahela River fishery has steadily improved over the past few decades resulting in a considerable increase in the amount of sport fishing on the river. Several large fishing tournaments are now taking place in the watershed, increasing the economic impacts from this recreational use. Fishing access to the river has been made easier by a new boat launch and docking facility built on the Morgantown Pool by the West Virginia Division of Natural Resources. Competitors in fishing tournaments on the Monongahela River in both Pennsylvania and West Virginia use current information about the water quality to gain a competitive edge. These tournaments are important economic contributors and examples of the importance of a clean river for both states' natural resource based tourism economy. The recreational and economic benefits of a robust fishery in these waters are great for the region.

5.7.2 Other

Pricketts Fort State Park is located in Fairmont, West Virginia and is located at the confluence of Pricketts Creek and the Monongahela River. It is listed on the National Register of Historic Places and not only is it a historical park, it is a recreational park as well, with bicycles rental, fishing, and picnicking options. Friendship Hill National Historic Site is also located within the Basin and provides an appreciation for local history.

Rails to Trails multi-purpose paths are also prominent along the banks of the Monongahela River and surrounding tributaries. They are relatively flat as they follow old, abandoned railroad grades that connect urban, suburban, and rural areas which makes it accessible to most citizens. The Monongahela River Trail Conservancy which runs along the Monongahela River, Decker's Creek and Caperton was even recognized as a National Recreational Trail.

Riverfront parks also provide areas for outdoor festivals during the warmer months. Palatine Park in Fairmont and Haze Ruby McQuain Park in Morgantown have annual festivals held along the banks of the Monongahela and are attended by many. More cities along the edges of the Monongahela River are planning improvements along the riverfront to attract local business and visitors.

The Monongahela National Forest (MNF) is a national forest located in the Allegheny Mountains of eastern West Virginia. It protects over 919,000 acres of Federally-owned land within a 1,700,000-acre proclamation boundary that includes much of the Potomac Highlands Region and portions of 10 counties. The MNF includes some major landform features such as the Allegheny Front and the western portion of the Ridge-and-valley Appalachians. Within the Forest are most of the highest mountain peaks in the state, including the highest, Spruce Knob (4,863 ft), also the highest point in the Alleghenies. Approximately 75 tree species are found in the Forest. Almost all of the trees are a second growth forest, grown back after the land was heavily forested around the turn of the 20th century. Species for which the Forest is important include red spruce (*Picea rubens*), balsam fir (*Abies balsamea*), and mountain ash (*Sorbus americana*). The MNF includes eight U.S. Wilderness Areas and several special-use areas, notably the Spruce Knob-Seneca Rocks National Recreation Area.

Despite all of the damaging impacts of industrialization in the watershed, eighty-five miles of river are designated as a National Wild and Scenic river and another major tributary, the Cheat River, is located within the Monongahela National Forest. With the Monongahela's extensive tributary system covering nearly 7400 square miles of drainage, it's important that it stay as healthy as possible not only for the main stem and tributaries, but for the wetlands that depend on it. As a valuable regulated national resource, wetlands must continue to be protected as the Monongahela region continues to develop and provide essential products and services to the entire nation.

6 Expected Future Condition

There are many ongoing activities throughout the watershed led by stakeholder agencies and organizations that aim at improving current conditions. However, all these ongoing efforts may

not be enough to sustain success as continued growth and resource extraction in the region is expected to put even more stress on the watershed. The watershed will continue to face water quantity and water quality challenges. Continued water impairments will likely result in suppression and reduction of aquatic and terrestrial biodiversity. In the absence of basin-wide planning, the current condition is likely to worsen in the future. With a comprehensive watershed management plan in place, however, the Monongahela River watershed can be managed in a sustainable manner.

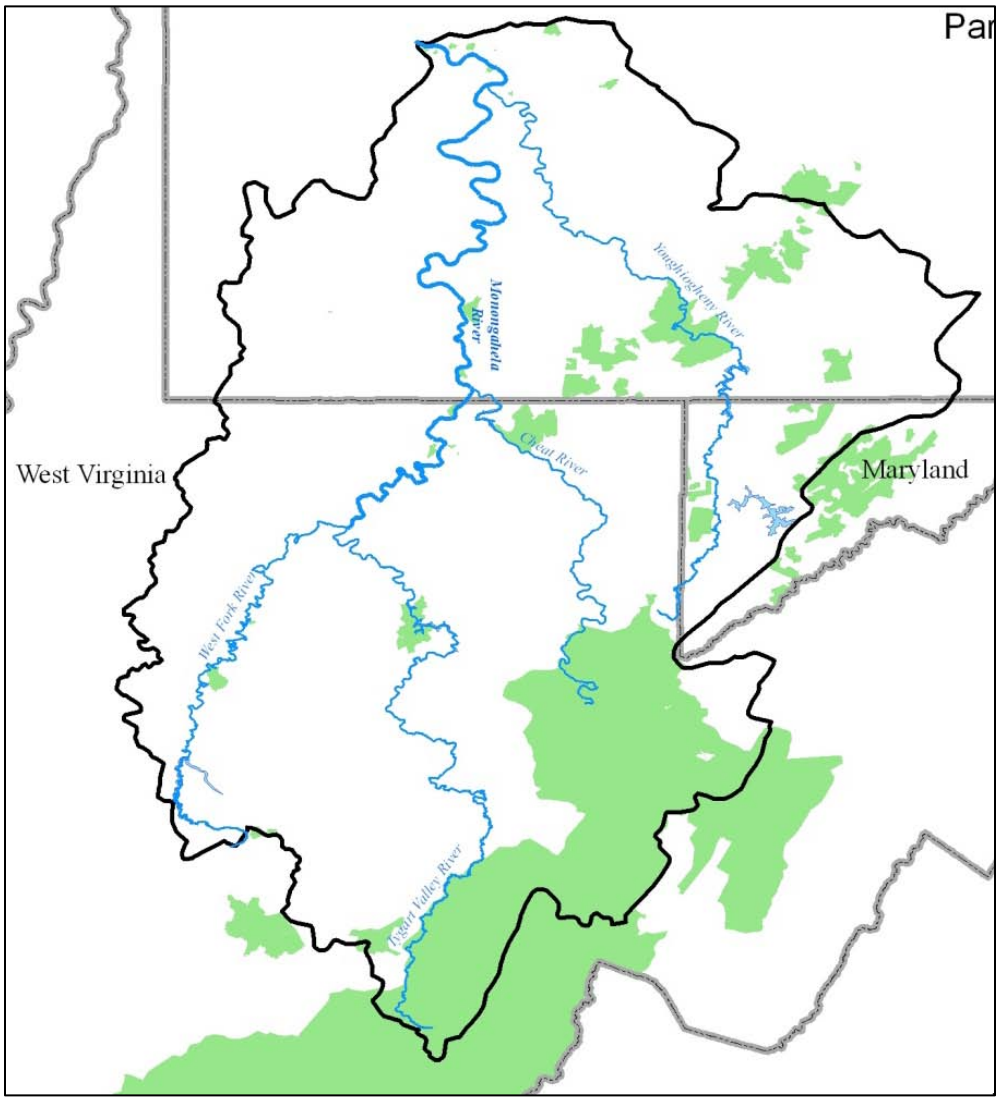

Figure 14. Recreational and Scenic resources in and around the Study Area.

7 Outreach and Stakeholder Concerns

Information regarding stakeholder concerns and problems and opportunities in the watershed was gathered from several sources, including a stakeholder outreach meeting conducted by the Pittsburgh District. This information was then compiled and examined for similarities and a recurring theme. The following sections detail the input obtained from the various sources.

7.1 Ohio River Basin Comprehensive Reconnaissance Study

The first source for stakeholder concerns and outreach information was gathered from the Ohio River Basin Comprehensive Reconnaissance Study (ORBCS). The ORBCS identified problems and opportunities regarding water resources development and management for the entire Ohio River Basin, as well as for each of the 15 sub-watersheds within the basin. Multiple stakeholder meetings and a website dedicated to outreach were used to compile concerns of interested parties. All four Corps Districts involved (Pittsburgh, Huntington, Louisville, and Nashville) and a majority of non-Federal stakeholders agreed on the top five issues throughout the Ohio River basin, including:

- Water quality degradation from runoff, by land use conversions and combined sewer overflows,
- Water quality effects on threatened and endangered species (especially mussels) in the Ohio River and its tributaries,
- Sufficiency of water supplies in view of projected population increases & potential climate changes,
- Repair and rehabilitation of aging infrastructure in the basin (dams, levees, floodwalls, locks and dams), and
- Need for additional flood protection in many major cities and smaller communities.

Appendix I of the ORBCS contains information specific to each sub-basin in the study, including potential projects and key issues. The significant numbers of brownfields found throughout the Monongahela River watershed were identified as suitable for Section 216, Section 205, Section 206 (aquatic ecosystem restoration), or Section 22 (planning assistance to states) study. Many communities also expressed interest in pursuing floodwalls and levee construction under Section 581 of WRDA 1996, which authorizes the design and construction of 100-year flood control measures in portions of the Monongahela River watershed. The recent loss of aquatic life in Dunkard Creek (a multi-state, pristine stream in the Upper Monongahela watershed between Monongalia County, West Virginia and Greene County, Pennsylvania) presents an opportunity to investigate and study, under Section 206, the source of the problem and provided guidance for the future as well as restore the aquatic ecosystem. Possible Section 22 studies identified include developing reports and recommendations for the use of water resources in relation to natural gas extraction operations. The following issues were also identified by the ORBCS in reference to the Monongahela River watershed:

- Marcellus Shale wastewater,
- Aging river and flood protection infrastructure,
- Acid mine drainage,
- Stormwater runoff,
- Municipal and industrial combined-sewage overflows, and
- Point source/non-point source pollution.

7.2 Upper Monongahela River Association

The Upper Monongahela River Association (UMRA) is a group in the watershed that focuses on promoting general development of the Upper Monongahela River basin, primarily in West Virginia. The group's primary concerns are economic development and quality of life issues related to the environment and recreational opportunities. Activities that the group undertakes and which are directed towards their purpose include; recreational boating activities, development of river based facilities, development of river based commerce, working with government and other groups on behalf of UMRA goals, and working with the Corps on boating recreation issues and lock facility schedules.

UMRA in association with a multitude of local watershed groups has formed a West Virginia/Pennsylvania Monongahela Area Watersheds Compact which holds monthly meetings to discuss the status of water resource issues in the Monongahela basin. This group was first formed in August 2010 when UMRA held a gathering with the goal of discussing different issues facing the Monongahela River basin. Invitations were sent primarily to watershed and conservation groups focused on streams within the Monongahela River basin. Each group talked about its biggest concerns, most of which dealt with access for recreation, acid mine drainage, removal of water and drilling discharge being put back into streams. The group tallied the top problems of about 18 different watershed groups and resource groups (e.g. Trout Unlimited). The five problems most frequently identified, in order of frequency, were:

- Water withdrawals,
- Sedimentation,
- Acid mine drainage,
- Water quality, and
- Natural gas drilling wastewater and disposal.

7.3 US Army Corps of Engineers Stakeholder Meeting

The Pittsburgh District also hosted a stakeholder meeting in Morgantown, West Virginia on February 17, 2011. The purpose of this meeting was to obtain input from stakeholders regarding the problems and opportunities within the Monongahela River watershed. The meeting notes and attendee list for the stakeholder meeting can be found in Appendix C. This meeting was attended by Federal and state agencies, non-profit groups, academia, local groups and industry representatives that included:

- Alpha Natural Resources
- Carnegie Mellon University
- Greene County Conservation District
- Guardians of the West Fork
- Mepco
- Morgantown Utility Board
- Pennsylvania Department of Environmental Protection
- Pennsylvania Environmental Council
- The Isaac Walton League

- Tygarts Valley Conservation District
- U.S. Environmental Protection Agency, Region 3
- University of Pittsburgh, Center for Healthy Environments and Communities
- Washington County Conservation District
- West Virginia Department of Environmental Protection
- West Virginia Department of Natural Resources
- West Virginia Rural Water Association

At this meeting, the stakeholders were offered an opportunity to provide input to the Corps regarding their concerns and potential opportunities they saw within the watershed. Attendees were asked to provide such information as why the watershed was important to them, what portion of the watershed they represented, what were the problems that they saw in the watershed, what were the causes of the problems, what they would like to see done to improve the problems (opportunities), and what was their vision of the watershed over the next 20 years.

Their responses on problems and opportunities were generally similar to those of the other two sources and mainly related to water quality and quantity issues. The feedback was summarized into the following list:

Problems:

1. WATER QUALITY
   - AMD discharge/abandoned mine pool: Monongahela River basin is atop a "mine pool." A concern is abandoned mines and the water that catches in them
   - Marcellus drilling wastewater and impacts
   - Bromide contamination
   - Regulation of nonpoint sources
   - Combined sewer overflows

2. WATER QUANTITY
   - Competition for water: Water in the basin is "fully tapped" but new sources of pollution such as gas drilling are rapidly growing
   - During high TDS in 2008, the Corps increased flow and released more water for water quality improvement. The dilution efforts were negligible and there was not enough volume in the reservoirs to take care of the high TDS problems.
   - Insufficient public water supply

3. OTHER
   - Brownfields
   - Aging river infrastructure
   - Recreation
   - Land use/overdevelopment
   - Debris collecting at dams

Opportunities:

- Create a "water budget" of the entire basin. The budget could include all the water coming in, going out, who is treating it, what is the quality, how/why is it impaired, and how to fix/treat it. With a water budget, the data gaps will be easily understandable. (Quantify assimilative capacity of the watershed for TDS)
- Management of the mine pool from legacy coal mines
- Reuse of water from the mine pools
- Unify all of the ongoing efforts in the basin in one dataset: Address not only quality, but quantity. Bring it all together and look at the "big picture."
- RAIN, the Corps and West Virginia University all have ongoing monitoring efforts. By combining the datasets, could provide a good overview of water quality. (Consolidate all available water quality data)
- West Virginia University undertaking effort to calculate loadings from major tributaries: This could be expanded into the entire basin. (Develop correlation of subwatershed effects on the entire basin)
- Existing gated navigation projects should be re-examined to determine the feasibility of increasing aeration at low flow by the adjustment of the current operation schedule of the gates
- Institute a program to remove debris from dam sites instead of allowing to float downstream
- Improve water quality to allow for a healthy fishery
- Pass regulations to control gas drilling water use and water disposal
- Reevaluate reservoir operations
- Develop a bromide water quality standard
- Coordinate an effort for TDS discharges during certain time periods

During the stakeholder meeting, the geographic scope of the study area was also raised as a point of discussion. Stakeholders noted that the Corps is the only agency that due to state and political boundaries, with a unique position of having the "big picture" idea of the Monongahela River basin as a whole. At the moment, all other studies are being done on smaller scales, which can lead to lots of wasted efforts, and data collection that is not put to use or findings that are not implemented. Additionally, the Monongahela River watershed scope covers a vast area of the location for legacy and future resource extraction. Therefore, the stakeholder group was interested in seeing the Monongahela Basin studied as a whole and a Watershed Plan implemented that covers the entire basin. However, stakeholders warned that for the Corps led Watershed Plan to be relevant, it is necessary to avoid re-doing what other plans, groups and agencies are currently doing. For this reason it seemed that a water budget in particular for the Monongahela River basin that focused on both water quantity and water quality would be a useful product for the stakeholders of the watershed.

7.4 Stakeholder Concerns

Water quality and quantity issues appear as the common theme when comparing the input obtained through the stakeholder outreach process. With the decline of the major industries that helped this region thrive, it has become more important for communities in the watershed to find new sources of employment and economic development. This desire for economic growth has

proven to be a detriment to water resources in the Monongahela River watershed in the past, as seen with the coal mining legacy and continued AMD problems throughout the basin. In general, a water resource management strategy that seeks sustainable water resources management while taking into consideration environmental protection, economic development and social well-being was identified as the desired goal of the Watershed Assessment Management Plan (WAMP).

8 Non Federal Interest and Potential Sponsors

As can be seen by the above report, there is much non-Federal interest in performing watershed planning in the Monongahela watershed. Resource agencies, local, public and private organizations in both West Virginia and Pennsylvania are currently undertaking restoration and water quality monitoring activities in the basin. Those attending the stakeholder meeting held in February 2011 represent a vast group of non-Federal interest that have a stake in the water resources of the Monongahela River watershed. Although there is much non-Federal interest in watershed planning in the Monongahela River Basin, not all groups are willing or able to participate as non-Federal cost-share sponsors in a Corps led Final Watershed Assessment. The Greene County Department of Economic Development (Greene County) has been identified as the potential non-Federal sponsor for the cost-shared phase. Greene County currently has a grant from the Pennsylvania Department of Community and Economic Development that will be their main source of funding to support cost-share requirements under the Section 729 program. Although Greene County is the identified non-Federal sponsor, all groups including State, local and tribal governments, industry, non-profits and academia will be collaborated with throughout the Final Watershed Assessment and development of a Watershed Plan.

A main foundation of watershed planning includes coordinating planning with responsible Federal, tribal, State and local governments; promoting interagency cooperation that incorporates local, regional, tribal and national water resource management goals and leveraging of resources and programs among Federal, tribal, State and local interests. Also, soliciting public input to water resources development and management and working collaboratively with a broad range of stakeholders to help solve water resources problems in an integrated and sustainable manner is important especially within the Monongahela watershed where there are many competing interests. Public involvement and coordination with other Federal and non-Federal interests will therefore be an important part in undertaking the Final Watershed Assessment and developing the Watershed Plan for the Monongahela River watershed.

9 Scope and Objective of Final Watershed Assessment (Section 729 Assessment)

As mentioned throughout the IWA, water quantity and quality issues are the major concerns in the Monongahela River watershed. The scope and objective of the Final Watershed Assessment will therefore be multi-purpose with a major of the focus on water quantity and quality issues including legacy, current and future resource extraction and its relation to water quality and quantity issues, point and non-point sources of water pollution and water supply. Opportunities will at a minimum include examining a “water budget” for the basin. All of these water quantity and quality issues will directly support the Corps’ mission of aquatic ecosystem restoration and

environmental stewardship. In addition, flood risk management and flood plain management will be included within the scope of the Final Watershed Assessment.

Overall, the Final Watershed Assessment of the Monongahela River watershed will address the water resources needs detailed throughout the IWA and will provide a joint vision of a desired end state including potential solutions regardless of agency responsibilities and will reflect other Federal interests as well as potential Corps interest. The watershed planning effort for the Monongahela River basin will facilitate the collaborative evaluation of a more complete range of potential solutions to water quantity and quality issues and will be more likely to identify the most technically sound, environmentally sustainable, and economically efficient means to achieve multiple goals in the entire watershed over the long term. The Watershed Plan for the Monongahela River watershed may identify potential Corps projects consistent with priority missions; however, this will not be the primary consideration of the Final Watershed Assessment. In conducting watershed planning in the Monongahela River basin, the Corps will use its planning capability in a broader sense to meet the changing water resources needs of the basin.

The scope of the Final Watershed Assessment will also evaluate and compare alternative approaches which may include alternative courses of action and their expected outcomes, alternative ways to address identified needs through programs of other Federal, tribal, state, interstate and local government entities, alternative combinations of future efforts, basin wide strategies, and other alternatives. These alternatives will be developed in the context of options or choices and their resultant projected outcomes. Bringing stakeholders together in a collaborative approach will result in a shared vision of possible future conditions. In order to undertake a shared vision approach to watershed planning, the Corps in consultation with the partnership of Federal, tribal, state, interstate and local government entities will assess strategies and broad plans that are necessary to address significant identifiable watershed problems as discussed in the IWA. The Watershed Plan will reflect the shared vision and values of the partners for implementing activities and will identify the government entity (i.e., Federal, tribal, state, interstate and local government) best suited for accomplishing such activities.

Public involvement, collaboration and consultation with Federal, tribal, state, interstate, and local government entities are a keystone of the Corps watershed approach and are essential to the success of watershed planning. The goal of public involvement, collaboration and coordination is to open and maintain channels of communication in order to give full consideration to the views of others in the planning process. Consultation with other government entities enables Corps to leverage the expertise, authorities, and resources of those entities as well as to consider their issues and concerns. Both public involvement and consultation must occur, however, with the awareness that USACE cannot relinquish its statutory decision-making responsibly. Public involvement collaboration and consultation will therefore be one of the largest portions of the scope of the Final Watershed Assessment in order that all stakeholders may actively participate in the formation of a Watershed Plan.

Watershed planning for the Monongahela watershed will include strategies for implementation, both Federal and non-Federal, to allow programs to work together over time. Federal, State, Tribal and local government entity missions, goals, objectives, funding requirements, and

timeframes should be fully understood so that efforts can be accomplished by various entities in an integrated way in accordance with a collaboratively developed plan. Through data sharing and recognition of each entities' areas of expertise, limited resources can be used over time in a more integrated fashion to achieve a greater sum than if the agencies and stakeholders pursued action independently. The objective is to consider and apply the various capabilities, programs, resources, and authorities of the various collaborators to develop and implement effective watershed plans using innovative arrangements.

Based on stakeholder outreach along with non-Federal interest, the scope and objective of the Final Watershed Assessment will be to provide a water resource management strategy for the Monongahela River watershed that seeks sustainable water resources management while taking into consideration environmental protection, economic development and social well-being. The development of alternatives to address these problems will also be included and public involvement and collaboration with other Federal and non-Federal organizations will be heavily relied upon throughout the Final Watershed Assessment.

10 Recommendations

Based upon this Initial Watershed Assessment and strong sponsor and stakeholder support, I recommend that a Monongahela River Watershed Assessment Management Plan (WAMP) be developed and negotiated with a non-Federal sponsor that will define the complete scope and objective of a Final Watershed Assessment. Further, I recommend that if the WAMP and associated cost-sharing agreement are successfully negotiated, that the U.S. Army Corps of Engineers, Pittsburgh District participate in a comprehensive Final Watershed Assessment of the Monongahela River watershed as discussed in this report.

FEBRUARY 27 2012
Date

William H. Graham
Colonel, US Army
District Engineer

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Appendix A. Authorizing Language for Watershed Assessments

WATER RESOURCES DEVELOPMENT ACT OF 1986: PUBLIC LAW 99-662

SEC. 729. STUDY OF WATER RESOURCES NEEDS OF RIVER BASINS AND REGIONS.

(a) The Secretary, in coordination with the Secretary of the Interior and
In consultation with appropriate Federal, State, and local agencies, is authorized to study the water resources needs of river basins and regions of the United States. The Secretaries shall report the results of such study to Congress not later than October 1, 1988.
(b) In carrying out the studies authorized under subsection (a) of this section, the Secretaries shall consult with State, interstate, and local governmental entities.
(c) There is authorized to be appropriated $5,000,000 for fiscal years beginning after September 30, 1986, to carry out this section.

WATER RESOURCES DEVELOPMENT ACT OF 2000: PUBLIC LAW 106–541

SEC. 202. WATERSHED AND RIVER BASIN ASSESSMENTS.
Section 729 of the Water Resources Development Act of 1986 is amended to read as follows:

‘‘SEC. 729. WATERSHED AND RIVER BASIN ASSESSMENTS.

‘‘(a) IN GENERAL.—The Secretary may assess the water resources needs of river basins and watersheds of the United States, including needs relating to—
- ‘‘(1) ecosystem protection and restoration;
- ‘‘(2) flood damage reduction;
- ‘‘(3) navigation and ports;
- ‘‘(4) watershed protection;
- ‘‘(5) water supply; and
- ‘‘(6) drought preparedness.

‘‘(b) COOPERATION.—An assessment under subsection (a) shall be carried out in cooperation and coordination with—
- ‘‘(1) the Secretary of the Interior;
- ‘‘(2) the Secretary of Agriculture;
- ‘‘(3) the Secretary of Commerce;
- ‘‘(4) the Administrator of the Environmental Protection Agency; and
- ‘‘(5) the heads of other appropriate agencies.

‘‘(c) CONSULTATION.—In carrying out an assessment under subsection (a), the Secretary shall consult with Federal, tribal, State, interstate, and local governmental entities.
‘‘(d) PRIORITY RIVER BASINS AND WATERSHEDS.—In selecting river basins and watersheds for assessment under this section, the Secretary shall give priority to—
- ‘‘(1) the Delaware River basin;
- ‘‘(2) the Kentucky River basin;
- ‘‘(3) the Potomac River basin;
- ‘‘(4) the Susquehanna River basin; and
- ‘‘(5) the Willamette River basin.

‘‘(e) ACCEPTANCE OF CONTRIBUTIONS.—In carrying out an assessment under subsection (a), the Secretary may accept contributions, in cash or in kind, from Federal, tribal, State, interstate, and local governmental entities to the extent that the Secretary determines that the contributions will facilitate completion of the assessment.

‘‘(f) COST-SHARING REQUIREMENTS.—

‘‘(1) NON-FEDERAL SHARE.—The non-Federal share of the costs of an assessment carried out under this section shall be 50 percent.

‘‘(2) CREDIT.—

‘‘(A) IN GENERAL.—Subject to subparagraph (B), the Secretary may credit toward the non-Federal share of an assessment under this section the cost of services, materials, supplies, or other in-kind contributions provided by the non-Federal interests for the assessment.

‘‘(B) MAXIMUM AMOUNT OF CREDIT.—The credit under subparagraph (A) may not exceed an amount equal to 25 percent of the costs of the assessment.

‘‘(g) AUTHORIZATION OF APPROPRIATIONS.—There is authorized to be appropriated to carry out this section $15,000,000.’’.

WATER RESOURCES DEVELOPMENT ACT OF 2007: PUBLIC LAW: 110-114

SEC. 2010. WATERSHED AND RIVER BASIN ASSESSMENTS.

Section 729 of the Water Resources Development Act of 1986 is amended--

(1) in subsection (d)--

(A) by striking `and' at the end of paragraph (4);

(B) by striking the period at the end of paragraph (5) and inserting a semicolon; and

(C) by adding at the end the following:

(6) Tuscarawas River Basin, Ohio;

(7) Sauk River Basin, Snohomish and Skagit Counties, Washington;

(8) Niagara River Basin, New York;

(9) Genesee River Basin, New York; and

(10) White River Basin, Arkansas and Missouri.';

(2) by striking paragraph (1) of subsection (f) and inserting the following:

(1) NON-FEDERAL SHARE- The non-Federal share of the costs of an assessment carried out under this section on or after December 11, 2000, shall be 25 percent.'; and

(3) by striking subsection (g).

Appendix B. Watershed Plans, EC 1105-2-411

DEPARTMENT OF THE ARMY
U.S. Anny Corps of Engineers
CECW-P Washington, D.C. 20314-1000

EC 1105-2-411

Circular
No. 1105-2-411

15 January 2010

EXPIRES 15 JANUARY 2012
Planning
WATERSHED PLANS

1. Purpose. The purpose of this Circular is to provide guidance for conducting watershed planning and preparing watershed plans led by the Corps under Section 729 of WRDA 1986, as amended, and other specifically authorized watershed planning authorities. Watershed planning addresses problems, needs and opportunities within a watershed or regional context; strives to achieve integrated water resources management (IRWM); and, results in general, non-project specific, holistic plans or strategies to address those watershed needs. Watershed plans may recommend programs and the initiation of site-specific project implementation studies. Project focused planning is addressed in other guidance although the same watershed principles, as discussed in paragraphs 4b, 5 and 6 below, apply.

2. Applicability. This Circular applies to all Headquarters, U. S. Army Corps of Engineers (HQUSACE) elements, laboratories, major subordinate commands, and district commands having Civil Works responsibilities. These principles are applicable to all Corps of Engineers Civil Works planning studies, with the exception of Continuing Authorities Program (CAP) studies. See Continuing Authorities Program (CAP) guidance (ER 1105-2-100, appendix F) for procedures to accomplish more comprehensive planning under CAP.

3. References. See Appendix A.

4. Background.

a. The Corps approach to water resources planning heretofore frequently focused on problem solving and decision making for specific sites and projects. A common element of Corps planning is alternative plan formulation, evaluation and selection, plan recommendation, and related requirements, including environmental compliance, to support authorization and appropriation for implementation of a Corps project.

b. In the mid 1990s the Corps began to renew its emphasis on taking a more comprehensive view of project planning. Instead of primarily focusing on single purpose projects, the Corps recognized the need to undertake planning in a broader, integrated, systems context. The 1999 Policy Guidance Letter #61 was issued describing the importance of managing water resource

activities within a watershed context and the application of a watershed perspective to Corps activities. The Policy Guidance Letter lays out the principles for watershed planning which include integrating water and related land resources management; seeking sustainable water resources management taking into consideration environmental protection, economic development and social well-being; coordinating planning with responsible Federal, tribal, State and local governments; promoting interagency cooperation that incorporates local, regional, tribal and national water resource management goals; leveraging of resources and programs among Federal, tribal, State and local interests; identifying existing and future water resource use demands; using interdisciplinary teams; evaluating of the monetary and non-monetary trade-offs; using sound science and data; applying the principles of adaptive management; and, soliciting public input to water resources development and management. Similarly, the Planning Guidance Notebook (ER 1105-2-100, April 2000) emphasizes the importance of considering broad system aspects of problems and solutions as principles of analysis in Corps studies.

c. The existing Civil Works Strategic Plan (March 2004) emphasizes the increased application of these watershed principles and the proposed 2010 revised plan furthers these principles. The watershed approach is the unifying theme that links and integrates the Corps Civil Works goals together. Under these principles, the Corps will:

(1) work collaboratively with a broad range of stakeholders to help solve water resources problems in an integrated and sustainable manner;

(2) use systems approaches to understand the connection between natural and man-made systems;

(3) analyze water resources problems on larger geographic scales; and

(4) strive to achieve multiple goals and functions using water and related resources in a balanced manner.

5. Watershed Planning for IWRM. Watershed Planning, as described in this circular, goes beyond project planning for specific Corps projects towards more comprehensive and strategic evaluations and analyses. Integrated watershed approaches cross diverse political, geographic, physical, institutional, technical, and stakeholder considerations and are valuable to both project planning and watershed planning. Watershed planning will address the identified water resources needs from any source in the watershed and provide a joint vision of a desired end state including potential solutions regardless of agency responsibilities and will reflect other Federal interests as well as potential Corps interest. Watershed plans may identify potential Corps projects consistent with priority missions; however, this is not the primary consideration of watershed planning. In conducting watershed planning, the Corps uses its planning capability in a broader sense to meet the changing water resources needs of the nation.

Watershed planning is an approach for managing water resources within specified drainage areas or watersheds and addresses problems in a holistic manner that reflects the interdependency of water uses, competing demands, and the desires of a wide range of stakeholders in addressing watershed problems and opportunities. Watershed planning facilitates the collaborative

evaluation of a more complete range of potential solutions and is more likely to identify the most technically sound, environmentally sustainable, and economically efficient means to achieve multiple goals in the entire watershed over the long term, i.e., integrated water resources management.

6. Specific Considerations.

(a) Systems Approach: Within watersheds, there are many competing demands for available water resources. In utilizing a systems approach within a watershed, the planning effort should identify and characterize the systems of interest to the current and future needs of the watershed. A watershed contains many systems which may or may not interact with one another. Systems that may be considered in watershed planning include, but are not limited to, such things as river and drainage systems, geomorphic and subterranean resources, weather (including climate change), transportation systems, power grid systems, water supply and wastewater systems, economic systems, recreation systems, institutional systems and legal frameworks, regulatory frameworks, floodplain management, ecosystems, water management systems, navigation systems, human resources and any other characterized system pertinent to the needs of the watershed effort. Particular attention should be paid to the interrelationships among land resources and water bodies and the upstream to downstream linkages that characterize a watershed. The cumulative effects of any action that may occur among these systems and along these links must also be considered during the planning process. The interaction, coordination and integration of the applicable considerations and needs within the watershed across systems, agencies, and programs should seek interdependent, long term holistic solutions rather than piecemeal approaches and provide a blueprint for continued involvement in the watershed, regardless of the entity that might ultimately implement the proposed actions.

(b) Public Involvement, Collaboration and Coordination. Public involvement, collaboration and consultation with Federal, tribal, state, interstate, and local government entities are a keystone of the USACE watershed approach and are essential to the success of watershed planning. The goal of public involvement, collaboration and coordination is to open and maintain channels of communication in order to give full consideration to the views of others in the planning process. Strategies for developing effective public involvement are described in ER 1105-2-100, Appendix B. In addition, the Council on Environmental Quality has published a handbook that provides a framework for considering collaboration strategies (See Appendix A) and the Shared Vision Planning tool is available through the Corps Institute for Water Resources (IWR). USACE is required to consult with Federal, tribal, state, interstate, and local government entities when it is leading most assessments of a watershed under Section 729 of WRDA 86, as amended. Consultation with other government entities enables USACE to leverage the expertise, authorities, and resources of those entities as well as to consider their issues and concerns. Both public involvement and consultation must occur, however, with the awareness that USACE cannot relinquish its statutory decision-making responsibly.

(c) Leveraging of Resources During Implementation: Watershed planning should include strategies for implementation, both Federal and non-Federal, to allow programs to work together over time. Federal, State, Tribal and local government entity missions, goals, objectives, funding requirements, and timeframes should be fully understood so that efforts can be accomplished by

various entities in an integrated way in accordance with a collaboratively developed plan. Through data sharing and recognition of each entities' areas of expertise, limited resources can be used over time in a more integrated fashion to achieve a greater sum than if the agencies and stakeholders pursued action independently. The objective is to consider and apply the various capabilities, programs, resources, and authorities of the various collaborators to develop and implement effective watershed plans using innovative arrangements.

(d) Study Area: Watershed planning addresses resource conditions in the watershed, land uses, and multiple stakeholder interests. By definition, watershed planning focuses on a watershed, a geographic area that is defined by a drainage basin. Most frequently this geographic area is described using hydrologic cataloging units. Watershed planning should address a geographic area large enough to ensure that plans will address the problems and opportunities in the area under study and encompass areas that are potentially affected by or that could affect candidate solutions so the solutions can be examined appropriately. In some cases, aspects other than hydrologic interaction may contribute to defining the "planning area." For example, the planning area associated with an inland waterway and related port capability problems, is likely to include the regional transportation sector.

7. Corps Participation in Watershed Planning. There are two primary ways the Corps can participate in watershed planning: one as a participating agency and the other as the lead agency. Figure 1 illustrates these concepts.

a. Corps as a Participant in Watershed Planning (not lead agency). When the Corps participates in efforts led by others, it brings technical expertise, skills, tools and data to the table. Ultimately, there may be a watershed plan developed that may identify a potential Corps project under Corps mission areas which requires further project specific study under normal project planning and budget procedures. Alternatively, the watershed plan may identify limited or no further Corps involvement. Funding for such activities is available under Section 22 Planning Assistance to States and other similar technical assistance authorities. There is value to partnering with non-Federal entities in watershed planning.

b. Corps as Lead Agency in Watershed Planning. More comprehensive watershed planning which results in a holistic watershed plan (not a project) is the focus of this Engineering Circular. A watershed plan may or may not identify a potential Corps project. If a comprehensive watershed study identifies potential projects for Corps implementation, a separate and more detailed feasibility study may be initiated through the new start feasibility process in accordance with the annual budget circular. The watershed study may serve as the technical component of a reconnaissance study; however, the development of the Feasibility Cost Sharing Agreement (FCSA) and Project Management Plan (PMP) with the Review Plan (RP) are still required for the project specific study. If a watershed study is conducted under another authority, the cost sharing and other provisions associated with that authority will be used. In addition, site specific project planning will be conducted in a watershed context. Consistent with the planning process and the annual budget circular, the following process will be used for the preparation of a watershed plan under the authority of Section 729 of WRDA 1986 as amended.

(1) Initial Watershed Assessment (similar to a traditional reconnaissance study): The Initial

Watershed Assessment (IW A) will be used to identify a non-Federal sponsor(s), define the scope and the objective of the Section 729 Assessment, prepare a Watershed Assessment Management Plan (W AMP) and negotiate a cost sharing agreement. This effort should not exceed $100,000. Any IWA costs in excess of $100,000 will be shared with the non-Federal sponsor at 75 percent Federal and 25 percent non-Federal pursuant to the terms of a Section 729 Assessment Agreement executed by the District Commander and the non-Federal sponsor. No funds in excess of the $100,000 will be allocated to the assessment until the Section 729 Assessment Agreement is executed.

(2) Section 729 Assessment Agreement:- HQUSACE has initiated work on a model Section 729 Assessment Agreement and the Assistant Secretary of the Army (Civil Works (ASA (CW)) has designated the latest version of the draft model Section 729 Assessment Agreement as an interim model. Contact CECW-PC for a copy of the interim model. Until the model is completed and approved, the MSC Commander must forward, to the appropriate RIT, one hardcopy and an electronic copy of a Section 729 Assessment Agreement package containing: a clean copy of the negotiated draft assessment agreement; a copy of the draft assessment agreement with the deviations from the interim model along with detailed reasons for each deviation; Certificate of Legal Review signed by the District Counsel; current letter of intent from the non-Federal sponsor, and the non-Federal sponsor's signed Self-Certification of Financial Capability for Agreements. All documents requiring signature (Certificate of Legal Review, Letter of Intent, and the non-Federal sponsor's Self-Certification of Financial Capability for Agreements) must be scanned so that required signatures are contained in the electronic file. The appropriate RIT will coordinate the necessary HQ-Level review. If there are no deviations from the interim model (other than filling in assessment specific information), HQ can approve the agreement. If there are deviations from the interim model, ASA (CW) will approve the agreement. The Section 729 Assessment Agreement will be executed upon approval. Watershed assessments conducted under other authorities may require different agreements and CECW-PC should be contacted for guidance.

(3) Assessment Cost Sharing: Watershed assessments conducted under the authority of Section 729 of WRDA 1986, as amended, are cost-shared 75 percent Federa1 25 percent non-Federal. Non-Federal sponsors may contribute their share as work in kind under Section 729 of WRDA 1986, as amended. Watershed assessments conducted under other specific authorities will follow cost sharing specified in that authority.

8. Watershed Planning Process. The watershed planning process is built upon the establishment of a collaborative partnership between a Corps planning team, which includes Corps functional elements such as Planning, Operations, Regulatory and Engineering and affected Federal, tribal, state, interstate, and local government entities. A partnership of these entities should be formed at the outset of the planning process and should continue throughout the planning process. The Corps should also employ a public involvement plan to keep the public and other stakeholders informed of the Corps plan as it develops and to consider the public's views during the process.

In accordance with normal Civil Works planning guidelines and Federal law (i.e. Federal Advisory Committee Act), however, the collaborative partnership is limited to Federal, tribal, state, interstate and local government entities. The watershed planning process resulting in a

watershed plan will generally follow the six step Civil Works planning process. This framework is integral to any quality analysis and planning. The District Planning Chief must insure that the planning process and watershed principles are adhered to in watershed planning. The following elements are key to facilitating an effective watershed planning process:

a. Define the Study Area. Defining the appropriate watershed or study area is critical. The area needs to be broad enough to capture the impacts and influences of the problems and likely solutions on the significant resources under study in order to ensure that potential impacts and interactions are fully analyzed. This may mean including downstream areas that are otherwise technically not in the local watershed or perhaps including a much broader, more regional watershed to adequately capture the full ranges of influence as well as identifying all municipalities and entities that could potentially be part of the partnership. The study area should encompass the significant resources affecting the need for action or likely to be affected by potential actions, both directly and indirectly. The study area should be extensive enough to consider synergies and tradeoffs among affected resources, and among existing water resources projects and programs, including current or future planning by the agency or others and expected implementation that is related to but not part of the study under consideration.

b. Identify Problems and Opportunities. Engage the partnership of Federal, tribal, state, interstate and local government entities to determine problems, needs and opportunities in the watershed. By its very nature, these stakeholders will hold a more expansive view of problems, needs and opportunities than what is seen in more conventional project planning.

c. Inventory and Forecast Conditions. Engage the partnership of Federal, tribal, state, interstate, and local government entities to work together to inventory the water and related land resources,) the ecosystems that reside within or on those resources, agency programs and capabilities, jurisdictional delineations (who does what and why); identification of demands and needs within the watershed, existing models in use, problems, existing mapping and GIS data, water supply systems, wastewater treatment systems, water rights, current practices, transportation systems, existing knowledge base, existing data, or any inventory consistent with the needs of the study. Reasonable efforts must be made to obtain and analyze relevant data, even where available data may be limited at the outset. Inventory is not limited to those areas used to develop analyses directly related to site-specific project planning. Watershed planning will reflect the uncertainties and assumptions inherent in planning on a larger scale and will result in a more comprehensive and strategic vision or plan. Examination of anticipated future activities that reflect reasonable outcomes allows consideration of the likely effects of a range of activities, decisions, or other courses of action. Watershed planning may involve a number of likely outcomes (scenarios) that should be appropriately defined and understood to convey the acceptability of those possible outcomes. For watershed planning, the examination should be consistent with the needs of the study effort.

d. Evaluation and Comparison of Alternative Approaches. Watershed alternative approaches may include alternative courses of action and their expected outcomes, alternative ways to address identified needs through programs of other Federal, tribal, state, interstate and local government entities, alternative combinations of future efforts, basin wide strategies, and other alternatives. In watershed planning, alternatives should be developed in the context of options or

choices and their resultant projected outcomes. There may be a myriad of ways to address the needs within a watershed; structured assessment of the pros and cons of pursuing various courses over time allows a comparison of alternatives to one another based upon expected results. Bringing stakeholders together in a collaborative approach should result in a shared vision of possible future conditions. A number of accounts are established in the Principles and Guidelines to facilitate the evaluation and display of effects of alternative plans. These accounts provide an excellent framework for evaluating and displaying effects. Similarly, the four Principles and Guideline evaluation criteria (completeness, effectiveness, efficiency, and acceptability) provide a solid and flexible framework for comparing alternatives from a variety of perspectives.

e. Strategy Selection. The Corps in consultation with the partnership of Federal, tribal, state, interstate and local government entities should assess strategies and broad plans that are necessary to address significant identifiable watershed problems and will reflect the shared vision and values of the partners for implementing activities and will identify the government entity (i.e., Federal, tribal, state, interstate and local government) best suited for accomplishing such activities.

9. Other Considerations. During the development of a watershed plan additional considerations should be included during the planning process to develop as much information as possible to help evaluate appropriate solutions to identified problems in a watershed. Additional considerations include where such things as economic, environmental, social well being, engineering, cost data and data quality information.

a. Benefit Evaluation. Watershed planning may involve benefit analysis and evaluation including identification of economic and environmental benefits, cost-effectiveness and incremental cost analyses (CE/ICA) and trade-offs at a survey level. Watershed planning may involve a wide variety of proven economic methodologies appropriate to the study effort, including monetary and non-monetary assessments based on yielding the highest value or utility for an alternative's combined objectives, and identified needs. Corps economic principles and expertise should be applied in watershed planning to meet the needs of the study. Economic evaluations may include NED assessments, impacts on the local and regional economy including employment and income (Regional Economic Development (RED)), life and safety impacts and other social affects (OSE), ecosystem restoration (NER), and financial analyses In all cases, the uncertainties, assumptions, specifications and planning objectives need to be identified early in the study, be clearly documented and communicated, and must demonstrate their adequacy through review processes. The use of alternative procedures and/or new benefit categories, including the procedures to be used to estimate them, requires advance approval from HQUSACE (CECW-P) per ER 1105-2-100 (Appendix E).

b. Cost Estimates. Survey level cost estimates are useful tools to assist decision makers in assessing efficient allocation of limited resources. In watershed planning, cost estimates involving savings or least cost options and outcomes are encouraged.

c. Public Involvement. In addition to establishing a partnership of Federal, tribal, state, interstate and local government entities that will remain actively engaged in the watershed planning process, watershed planning must include a public involvement strategy to solicit input

and help ensure the transparency of the planning efforts to the public in general. ER 1105-2-100, Appendix B, provides guidance for developing a public involvement strategy. The public involvement strategy and the collaborative partnership strategy must be developed and included in the Watershed Assessment Management Plan.

d. Engineering. Engineering evaluations tailored to the watershed planning effort based upon the identified needs is appropriate. Corps engineering principles and expertise including hydrologic and hydraulic modeling should be applied in watershed planning to meet the needs of the assessment and not confined to project design and cost requirements.

e. National Environmental Policy Act (NEPA) and Environmental Compliance. Because a watershed study will normally fall short of generating a specific proposal for a major Federal action that could adversely affect the human environment as defined by NEP A, the preparation of a NEP A document is normally not required during the study phases. When a watershed plan generates one or more proposals for undertaking additional studies (e.g. a feasibility study) that could be expected to result in a specific proposal, the follow-on study will require a specific NEP A document. The watershed assessment will, however, give full consideration to potential environmental impacts in the development of a watershed plan. Data collection and analysis can be performed that later would be useful in preparing NEP A compliance documentation by either the Corps or others. Corps environmental principles and expertise may be applied in watershed planning to meet the identified needs of the study including environmental compliance requirements and should be tailored to the potential conclusions and recommendation.

f. Real Estate: Detailed real estate information is not required but real estate information should be tailored to a level of detail consistent with the watershed planning effort and consideration of potential real estate requirements should be acknowledged. A Real Estate representative should participate in the watershed planning effort as necessary.

g. Data Quality and Model Quality Assurance: In conducting watershed studies, and overall watershed planning, it is recognized that many agencies and stakeholders have developed numerous models and data. Use of existing models and data in watershed planning, whether it is from the Corps, other Federal agencies or local entities is encouraged through collaborative processes, but the quality and validity of these models and data must be evaluated and documented by the appropriate agencies. For Corps-led watershed efforts, all applicable product quality regulations, including but not limited to MSC quality plans, peer review guidance, and model quality assurance guidance apply. The approach to product review for each Corps-led watershed effort shall be specified in a Review Plan (RP) as described in the current guidance on independent review processes. Each RP will be coordinated, approved and posted as directed in the existing guidance on independent review processes. If the watershed assessment is expected to lead to specific feasibility studies, consideration should be given in the RP that would examine expected peer review needs in the watershed plan vis-à-vis spinoff feasibility efforts to conserve resources and preclude duplication of effort.

10. Reporting Requirements for a Watershed Plan.
a. Review and Approval process. The review and approval process for Watershed Plans will generally follow the procedures outlined in Appendix H of ER 1105-2-100. Initial watershed

assessment and associated Watershed Assessment Management Plan (a PMP) will be approved at the MSC. HQUSACE will be involved in scoping watershed assessments similar to that of a feasibility study to include a scoping meeting and a review prior to the release of the draft assessment for public review. Early vertical team involvement is strongly encouraged. Upon completion of the Assessment, the Watershed Plan will be submitted to the appropriate HQUSACE's RIT which will forward the submittal package to CECW-PC for Policy and Legal Compliance review. The HQ review role will be to ascertain that appropriate considerations have been made and that conclusions are consistent with overall Corps of Engineers policy and the Chief, Planning and Policy Division, HQUASCE, will approve the final document. Once this review is complete, the appropriate RIT will coordinate the report with the Assistant Secretary of the Army for transmittal to Congress for information in response to the study authority.

b. Recommendation. Identified future actions should be stated in the Conclusions section of the report. These actions must be supported by clear statements of responsibilities as agreed to by the partnership. If further Corps actions are identified, then an appropriate recommendation for further Corps involvement should be made following existing guidance.

11. Implementation. This guidance is effective immediately and shall be applied to all Corps watershed planning activities, which should embrace the principles and intent of this guidance to the fullest degree possible.

Appendix C. Stakeholder Meeting Notes

12:30 Welcome, Sign-In, and Introductions

12:45 Presentation: Background information on Corps of Engineers, Watershed Planning, and Initial Watershed Assessment Process (Ashley Petraglia, Corps of Engineers).

Q: Is a cost share limited to a single organization or can multiple groups contribute as cost share sponsors in a final watershed plan? A: multiple groups could combine to contribute to the 25 percent non-federal cost share.

Q: Time schedule for report completion? A: Recon level study has a year timeline. Document will be in draft form by the end of March. Final is estimated to be completed including internal reviews by September or October of 2011.

Q: What is the public accessibility to IWA? A: Will be shared with the public after reviews are completed by Headquarters, Corps of Engineers in Washington DC.

***1:00 Presentation*:** Initial Watershed Assessment Report Content (Mark Wozniak, Corps of Engineers).

Q: Why are not all dams included in report? A: Due to Mon Basin size, unable to put all dams in report… only included larger reservoirs at this point.

1:15 Presentation: Water quality in the Monongahela Basin including Corps monitoring and water quality trends (Rose Reilly, Corps of Engineers).

Q: Could we incorporate other data that may not have the same quality controls as existing? A: Possibly, would need further assessment.

1:30 Presentation: Anacostia Watershed Restoration Plan: A case study in Corps Watershed Planning (Jeff Benedict, Corps of Engineers).

Q: What would project construction cost share be? A: Most likely 65/35 Federal/Non Federal based on other authorities. However, the focus of this study will likely be on the implementation of policies rather than construction of physical projects.

2:00 Open Discussion/Stakeholder Input Session

Q: How much is 25% non federal cost share likely to be? Is there an estimate without knowing a scope? A: Just general ballpark available when it comes to budget. Depends on plan, time, effort, scope and can be covered by in kind services as well instead of just cash contribution.

<u>Discussion: Ongoing Efforts to be aware of</u>:

- PA Water Mgmt Plans: "Ohio River Basin Committee"
- 3Rivers Management Plan from PA FBC- Focusing on fisheries, but may be useful for IWA information. (public meetings to be held in coming weeks)
- Ohio River Basin Fish Habitat Partnership is going online soon with reports.
- Universities (Pitt, CMU, Duquesne etc) involved in study looking at water quality and biotic resources in Mon River and Ten Mile Creek. (might not be available until the fall)
- River Alert Information Network: www.3rain.org has river alert information and monitoring, trying to get more funding to provide more monitors in Mon basin. May need help with data management. Organization is focused on drinking water protection. Some monitoring points on Allegheny and Ohio River as well, but most on Mon.

Challenge: quicker to do watershed efforts and projects locally, or state based as there is less "red tape" and process. Challenging to get federal money/funding in a timely manner. Water quality issue on Dunkard Creek already being handled by EPA and DEP

Discussion: Group Opinion on current geographic "scope" of Mon Basin Watershed Assessment:

- Area directly overlaps the Marcellus shale formation and Marcellus continues to develop so it might be good to continue to look at the Mon Basin as a whole.
- Mon River basin also on top of the "mine pool." Big concern is abandoned mines and the water that catches in them.
- A "water budget" of the entire Mon basin would be a great/useful product. Could include all the water coming in, going out, who is treating it, what is the quality, how/why is it impaired, and how to fix/treat it.

Discussion: Goals or opportunities for the improvement of the watershed?

- Management of the mine pool from legacy coal mines
- Current mine operators are dealing with old AMD legacy problems. Current active mines are required to treat in perpetuity, based on bonds. What will happen with Marcellus legacy pollution when extraction is complete? Who will be responsible for treating Marcellus impacts?
- Steele Shaft=example of treating old AMD legacy problem in order to continue coal extraction.
- One opportunity is to reuse water from the mine pools. Mine water can have the opportunity for other uses. Discharge is required to be treated (as set up in trust fund).
- Water in the basin is "fully tapped" but new sources of pollution such a gas drilling are rapidly growing.
- If plan is to be relevant, avoid re-doing what the other plans are doing. There are so many plans in this area, and it seems they are all doing the same thing. Try something different from existing plans and focus on a topic that isn't being worked on in the watershed right now by state, local or private entities.
- What were the results of the meeting at Tygart dam in regard to watershed planning? That effort was not a Corps of Engineers led effort but actually a WV DEP led effort for water quantity issues & water withdrawal. Concerns were with water budget and competition for water. (WV DEP water management plans under development on the HUC 8 level)
    - An opportunity exists to "fill in the gaps" of the WV DEP plans
- What is the potential to increase water storage in the Corps reservoirs?
    - During high TDS in 2008, the Corps increased flow and released more water for water quality improvement. The dilution efforts were negligible and there was not enough volume in the reservoirs to take care of the high TDS problems.
    - Changing water quality storage is difficult at Corps reservoirs as it requires a feasibility study with public and agency coordination to determine that other authorized project purposes are not impacted

**Check out WWW.ORBOUTREACH.COM for full Ohio River Basin Reconnaissance Report

- The Corps needs to find a "niche" for its watershed plan… it is important to define what will be the value added for Federal government involvement.
- Water quality issue is the major issue in the basin. How can we unify all of the ongoing efforts instead of piecing it together?
    - How can one set of data fit into another? Address not only quality, but quantity. Bring it all together and look at the "big picture." What data is missing that could supplement or lead to better understanding of existing data?
    - All other studies on smaller scales, which can lead to lots of wasted efforts. Data collected is not put to use nor findings implemented.
    - So perhaps the study can address large picture items. More of a "cumulative assessment of the data", and problems addressed because of lack of compatibility. ** Water Budget is an option for the basin.
- If real time data is made available to water users and water dischargers then discharges could be withheld during "problem times"… similar to a TMDL without actual legal ramifications.
    - Dischargers of mine pool have "informally" agreed not to discharge during dry weather
- EPA was trying to look at RAIN's data earlier this year, trying to see what's been going on in the Mon since 2008. RAIN+ CORPS+WVU efforts could provide a good overview of water quality… might be a good idea to integrate these three data sets.
    - Data websites: monwq.net, 3rain4.com
- Coal companies are interested in remedying the water quality situation. It is preferable for industry to address the problems prior to being forced by government entities to address them.
    - Question was raised of what types of data does industry have available to them?
- WATER BUDGET was raised as a very good idea for the Mon Basin…with a water budget, the data gaps will be easily understandable. If we look at a water budget then we have a better idea of the big picture
- Another effort to be aware of is WVU's effort to calculate loadings from major tributaries…. This could be expanded into the entire basin?

2:45 Meeting Adjourned

Stakeholder Meeting Attendees

Name	Organization	Phone	Email
April Hawkey	USACE	(412)395-7159	april.l.hawkey@usace.army.mil
Ashley Petraglia	USACE	(412)395-7312	ashley.petraglia@usace.army.mil
Brian Osborn	Mepco	(304)296-9701	bosborn@mepcoinc.com
Curt Meeder	USACE	(412)395-7206	curtis.n.meeder@usace.army.mil
Doug Smith	Morgantown Utility Board	(304)242-8443	dsmith@mub.org
Ed Michael	Tygarts Valley Conservation District	(304)594-9380	edmichae@comcast.net
Frank Borsuk	USEPA	(304)234-0241	borsuk.frank@epa.gov
Frank Jernejcic	WV DNR	(304)825-6787	Frank.A.Jernejcic@wv.gov
Jeff Benedict	USACE	(412)395-7202	jeffrey.m.benedict@usace.army.mil
Jen Novak	PA Environmental Council	(412)481-9400	jnovak@pecpa.org
Jenifer Halchak	Washington County Conservation District	(724)222-3060	jhalchak@pawccd.org
Jessica Greathouse	USEPA	(304)224-3181	greathouse.jessica@epa.gov
Julie Maxwell	Greene County Conservation District	(724)852-5278	jmaxwell@co.greene.pa.us
Kevin Coyne	WV DEP	(304)926-0499	kevin.r.coyne@wv.gov
Lew Baker	WV Rural Water Association	(304)201-1689	lbaker@citynet.net
Lisa Snider	Greene County Conservation District	(724)852-5278	lsnider@co.greene.pa.us
Mark Wozniak	USACE	(412)395-7180	mark.a.wozniak@usace.army.mil
Nicole Marisavljevic	USACE	(412)395-7592	nicole.marisavljevic@usace.army.mil
Paul Bradley	Alpha NR	(724)852-5807	pbradley@alphanr.com
Rick Spear	PA DEP	(412)442-5874	rspear@state.pa.us
Robert Wolfe	TVCD	(304)457-3725	wolfeangus@yahoo.com
Roger Poling	Tygarts Valley Conservation District	(304)457-3026	rpoling@wvca.us
Rose Reilly	USACE	(412)395-7357	rosemary.j.reilly@usace.army.mil
Shannon Kearny	Center for Healthy Environments and Communities	(724)575-0186	smk75@pitt.edu
Sheldon Findley	Tygarts Valley Conservation District	(304)265-4330	JSFindley49@hotmail.com
Sue Thompson	California University of PA	(412)481-2157	sthomp@andrew.cmu.edu
Terry Dayton	Alpha NR	(724)627-2219	tdayton@alphanr.com
Tom Bond	Guardians of the West Fork	(304)884-7352	stombond@hughes.net
Troy Jordan	USEPA Region 3	(304)234-0267	jordan.troy@epa.gov

Appendix D. Letter of Intent for Final Watershed Assessment

BOARD OF COMMISSIONERS

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psnyder@co.greene.pa.us

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Legal Counsel
Cheryl Cowen

September 13, 2011

Lenna Hawkins, Deputy for Programs and Project Management
US Army Corps of Engineers, Pittsburgh District
William S. Moorhead Federal Building
1000 Liberty Avenue
Pittsburgh, Pennsylvania 15222

Dear Ms. Hawkins:

In accordance with the provisions of Section 729 of the Water Resources Development Act of 1986, as amended, the Greene County Board of Commissioners requests Corps of Engineers assistance in addressing water resource needs within the Monongahela River watershed. A Watershed Plan which recommends holistic actions and strategies for reducing water resource problems is needed in order to effectively address the myriad of needs and uses, and to improve the aquatic conditions in the basin while enhancing the economic vitality of the region.

We are aware of the following cost sharing requirements associated with projects undertaken under this authority:

a. The Initial Watershed Assessment Phase is federally funded up to $100,000. Any costs in excess of $100,000 will be shared with the non-Federal sponsor at 75 percent Federal and 25 percent non-Federal pursuant to the Section 729 Assessment Agreeement.

b. The Final Watershed Assessment is cost shared at 75 percent Federal expense and 25 percent non-Federal sponsor expense.

c. Non-Federal interests shall provide 25 percent of the cost of the Final Watershed Assessment in either cash contributions or work in kind after the project is approved for implementation. The funding we have identified for this project is available to us through a grant from the PA Department of Economic Development, contingent upon our ability to comply with all of their requirements.

We are aware that this letter serves as an expression of intent and is not a contractual obligation. Either party may discontinue the process at any time prior to the execution of a Feasibility Cost Share Agreement.

If you have any questions please contact Ms Robbie Matesic, Executive Director of Greene County Department of Economic Development at (724) 852-5300, or Ms Lisa Snider, Manager of the Greene County Conservation District at(724) 852-5278.

Sincerely,
GREENE COUNTY BOARD OF COMMISSIONERS

Pam Snyder, Chairman

Archie Trader, Commissioner

Charles J. Morris, Commissioner

Cc: Jeffrey Marshall, Greene County Chief Clerk
Cheryl C. Cowen, Greene County Solicitor
Robbie Matesic, Greene County Dept of Economic Development
Lisa Snider, Greene County Conservation District

Appendix E. LRD Approval Memorandum

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DIVISION, GREAT LAKES AND OHIO RIVER
CORPS OF ENGINEERS
550 MAIN STREET, ROOM 10032
CINCINNATI, OH 45201-1159

CELRD-PD

NOV 16 2011

MEMORANDUM FOR Commander Pittsburgh District, US Army Corps of Engineers, 1000 Liberty Avenue, Pittsburgh, PA 15222-4186. Attention (CELRP-P3-P) Curtis Meeder, Chief, Planning and Environmental Branch

SUBJECT: Section 729 Monongahela River Watershed Initial Watershed Assessment (IWA)

1. REFERENCE: CELRP-P3-E, Memorandum, dated 30 September 2011, Section 729 Monongahela River Watershed IWA.

2. The subject report has been reviewed by members the Planning Community of Practice, Counsel, and the District Support Team for the Pittsburgh District. I concur with the District's recommendations to proceed into cost share negotiations with the interested non-Federal Sponsor (Greene County, PA), and prepare a Watershed Assessment Management Plan and cost share agreement.

3. The report is approved for public release. The LRD Point of Contact for this action is Ronny J. Sadri (513)-684-3008.

for JOHN C. ZIMMERMAN P.E., L.S
Chief, Planning and Policy Division
Great Lakes and Ohio River Division

Appendix F; Part 1. Public Comments and Responses

1. BACKGROUND

The Pittsburgh District circulated the Monongahela River Initial Watershed Assessment for public review for four weeks in November and December 2011. The District received multiple comments from individuals and organizations whose names are listed below:

a. S. Thomas Bond, Ph. D.
b. Patrick Campbell, West Virginia Department of Environmental Protection
c. Martin Christ, Friends of Deckers Creek
d. Richard Dennis, Friends of Deckers Creek
e. Josie Gaskey, Pennsylvania Coal Association

2. COMMENTS AND RESPONSES

a. **Issue/Comment**: I think you are totally missing the importance of shale drilling. It will be a disaster far beyond strip mining. The Mon Basin lies almost entirely within the Marcellus area. You should be monitoring the water for both the expected pollutants and the unexpected. States are not going to do anything significant to regulate shale drilling. Water quality will be degraded on the geological time scale.

   i. **District Response:** The Corps has a water quality mission authorized by Congress and other Federal laws. Congressional authorizations direct the Corps to dedicate more than a million acre-feet of reservoir storage exclusively for the sake of water quality improvement. More than 1,000 miles of 21 major waterways are directly influenced by District reservoir releases. In addition, the District oversees over 8,000 miles of streams in watersheds above our reservoirs.

   The boundaries of the District overlay a significant portion of the Marcellus and Utica Shale gas deposits. Within its boundaries, the District operates and maintains 16 multi-purpose reservoirs and 23 locks and dams within the 26,000 square mile Upper Ohio River Basin. The District has a responsibility to understand and communicate issues that may impact or pose a risk to its missions. These missions include water quality, water storage, water supply, navigation, low flow augmentation, environmental restoration, fish and wildlife enhancement, recreation, and regulatory permitting.

   Because shale gas extraction activities represent an emerging consumptive use requiring significant volumes of water, the District is concerned with the cumulative impact of basin-wide water withdrawals above and below our reservoirs. Decreased surface or groundwater flow into and below our reservoirs, especially during dry conditions, may impact the District's

ability to maintain flow regimes used to mitigate water pollution (to include future sources of possible contamination from resource extraction such as natural gas or other future industries), improve water quality, augment low flows, ensure navigation, provide water supply, and enable recreational opportunities. Therefore, consumptive use of water resources, including that for gas withdrawals will be examined in the Final Watershed Assessment.

b. **Issue/Comment**: There is no reference to global warming, with the expected episodic change in rainfall and land cover.

    i. **District Response**: Page 44 discusses climate change as a concern within the Ohio River Basin. The problem specifically states that a concern is "sufficiency of water supplies in view of projected population increases & potential climate changes." In the Final Watershed Assessment, water resource changes and challenges expected from climate change will be discussed as future expected or forecasted conditions within the watershed.

    Additionally, the "Climate Change Handbook for Regional Watershed Planning to Assist Water Managers Plan for Climate Change" will be utilized for planning purposes during the Final Watershed Assessment. The long-term goal of this handbook is to serve as a foundation for a thoughtful planning process for incorporating climate change impacts.

c. **Issue/Comment**: Friends of Deckers Creek (FODC) is a grassroots, not-for-profit watershed association. The mission of Friends of Deckers Creek is to improve the natural qualities of, increase public concern for, and promote the enjoyment of the Deckers Creek watershed. Deckers Creek is part of the Monongahela River watershed.

    Deckers Creek and its tributaries are important resources. Deckers Creek is a Traditionally Navigable Waterway that is popular with whitewater kayakers. The creek is also appreciated by all those who use the nearby Deckers Creek Rail Trail. Deckers Creek supplies drinking water to a substantial portion of Valley District and Lyon District in Preston County.

    Deckers Creek has been polluted but it is improving through the efforts of Friends of Deckers Creek and government and business partners. Acid mine drainage (AMD), fecal coliform bacteria, and sediment all pollute the creek and its tributaries and have detracted from its designated uses.

    i. **District Response**: The Corps recognizes that Deckers Creek is included in the Monongahela Watershed and is an important resource within the basin for aquatic habitat, recreation and drinking water supply. Your efforts to improve aquatic conditions within Deckers Creek are greatly

appreciated and the Corps would be interested in including your organization and the work it does within the Final Watershed Assessment. We recognize your organization as an expert on conditions within the Deckers Creek watershed and would be interested in discussing water resource projects or recommendations you may have for the Deckers Creek portion of the Monongahela watershed.

d. **Issue/Comment**: Please take note of the following information for Section 4.1, Existing Reports. FODC has completed a Watershed Based Plan for elimination of nonpoint source pollution from acid mine drainage and fecal coliform bacteria pollution (http://www.deckerscreek.org/images/stories/pdf/Deckers%20Creek%20WV%20Watershed%20Based%20Plan.pdf). This document identifies the sources and loads of acid mine drainage and fecal coliform bacteria, describes projects to eliminate those sources of pollution, and identifies partners and resources necessary for accomplishing them.

   FODC has published a number of State-of-the-Creek reports summarizing water quality in the mainstem and in four major tributaries. Water quality is assessed with chemical measurements as well as with surveys of the fish and macroinvertebrate communities (http://www.deckerscreek.org/images/stories/pdf/sotc10_inside_final.pdf).

   FODC has published a report on the local economic benefits of restoration of Deckers Creek (http://www.deckerscreek.org/images/stories/pdf/DeckersEconomicAnalysis.pdf). Restoration of Deckers Creek would provide local economic benefits through increases in recreation business, increase in property values, and through the restoration project funds that circulate in the local economy.

   The aquatic communites in the Deckers Creek watershed are described in an additional brochure (http://www.deckerscreek.org/images/stories/pdf/upstream_sm.pdf).

   i. **District Response**: Thank you for providing these resources. We'd be interested in continuing discussions with FODC about projects or recommendations they have for needs and opportunities within Deckers Creek. These resources will be useful during completion of the Final Watershed Assessment.

e. **Issue/Comment:** Please take note of the following information for Section 4.2, Existing Projects. FODC has completed four projects that eliminate nonpoint source acid mine drainage. We are currently completing a fifth and planning three additional projects. Projects eliminate acid mine drainage from abandoned (before 1977) mines.

Slabcamp Run Ancillary Project (39°32'10.29"N, 79°48'59.80"W). FODC installed a limestone leach bed and a small steel slag leach bed)

Valley Point 12 (39°30'3.67"N; 79°44'54.75"W). FODC installed a limestone leach bed and sulfate reducing bioreactors)

Valley Highwall #3 (39°29'48.54"N; 79°45'0.02"W). FODC installed a hydrated lime doser to neutralize AMD

Kanes Creek South Site #1 (39°30'34.59"N; 79°45'33.55"W). FODC installed a hydrated lime doser to neutralize AMD
Sandy Run AMD Remediation Projects (39°29'50.15"N; 79°46'23.59"W). FODC is installing limestone leach beds and a vertical flow wetland to neutralize AMD.

Kanes Creek South Site #3 (39°30'7.40"N; 79°46'16.49"W). FODC is planning projects which will include limestone leach beds and a vertical flow wetland to neutralize AMD.

Slabcamp Run Mainstem Project (39°32'25.61"N; 79°49'9.19"W)

In addition to the work of FODC, various government agencies are working to restore Deckers Creek. Most importantly, the Natural Resources Conservation Service partnered with the West Virginia Department of Environmental Protection to plan a project to restore water quality in Deckers Creek. The most important of these projects is the Richard mine. This single AMD source (39°36'29.37"N; 79°54'6.60"W) discharges more than two tons of acidity per day to Deckers Creek, as well as 1,000 pounds of metals per day. This single source causes Deckers Creek to support an impoverished aquatic community through Morgantown, the most populous, economically productive part of the watershed. The creek is visibly polluted in that reach, and gives neighboring lands the appearance of a polluted, urban industrial corridor.

NRCS completed several studies (http://www.wv.nrcs.usda.gov/programs/watershed/richardMine/richard_mine.html) and concluded that there were five dependable, effective methods for eliminating that pollution, including active treatment with ammonia, hydrated lime, quicklime, or pulverized limestone, and piping the pollution to a larger water body. Local partners (the City of Morgantown and the Morgantown Utility Board) are prepared to operate and maintain a hydrated lime treatment plant. The West Virginia Department of Environmental Protection is prepared to support 80% of the operation and maintenance costs of such a project.

Please take note of the following information for Section 5.4.2, Water Quality

The State of the Creek Report (http://www.deckerscreek.org/images/stories/pdf/sotc10_inside_final.pdf) contains information concerning water quality.

A report on sediment in Aarons Creek (http://www.deckerscreek.org/images/stories/Aarons_Creek_Sediment_Report_2.3.11_FINAL2.pdf) describes the effects of development and farming on a clean-water tributary to Deckers Creek.

i. **District Response**: Thank you for providing detailed locations of current and planned future AMD treatment sites. This information will be especially useful for the Final Watershed Assessment as the Corps does plan on looking at AMD projects currently in place in addition to any other needed remediation projects within the Monongahela watershed. The Corps has an existing authority for restoration of aquatic ecosystems and we'd be interested in discussing possibilities for future partnerships on aquatic restoration projects.

f. **Issue/Comment:** P.12 The report references a flow of 340 cfs for the Monongahela River, I believe this to be an older number and the correct value is now 420 cfs.

P.27 Same 340/420 cfs comment as above, also on Table 2 it is not clear if these values represent the entire period of record for those gages, or only flows after Tygart and Stonewall Jackson Dams became operational.

i. District Response: Correct, 420 is the combined flow for Stonewall and Tygart… 340 cfs is from Tygart with 80 cfs from Stonewall. These are the targets that we meet at Opekiska. This was clarified in the pertinent sections. The table represents the period of record for each gauge.

g. **Issue/Comment:** P. 30 WVDEP needs to work with the Corps to better understand how the streams were classified in Figure 11. Please contact James Laine of the WVDEP to help resolve/understand the classification system used.

i. **District Response:** The classification used came from both WVDEP and PADEP 303d state reports. For segments with multiple impairments the impairment most relevant to discussion in the report was utilized.

h. **Issue/Comment:** P. 31 suggest this language "have fish consumption advisories related to elevated fish tissue concentrations of PCBs." be changed to "have fish consumption advisories due in-part to elevated fish tissue concentrations of PCBs."

i. **District Response:** Change incorporated.

i. **Issue/Comment:** P.32 Suggest adding the word "municipal" in front of wastewater treatment plants.

    i. **District Response:** Change incorporated.

j. **Issue/Comment:** P.32 Suggest changing "Increasingly, water is being withdrawn from non-degraded reservoir inflows that are naturally low in TDS. This results in the loss of dilution which interferes with reservoir operation schedules" to "Increasingly, water is being withdrawn from non-degraded reservoir inflows that are naturally low in TDS. This could result in the loss of dilution possibly interfering with reservoir operation schedules."

    i. **District Response:** Change incorporated.

k. **Issue/Comment:** P. 32 Suggest some additional language to clarify the changing nature of this point. "The Pittsburgh District Water Management Branch has determined that the TDS assimilative capacity of the Monongahela River has been reached." Please consider adding to this point a new sentence as follows. "Although, one mine drainage treatment plant (reverse osmosis technology) is now under construction in West Virginia which will lead to sizable critical condition TDS reductions."

    i. **District Response:** Any new additions such as treatment plants within the basin will be evaluated in the Final Watershed Assessment in regard to TDS capacity of the Mon River.

l. **Issue/Comment:** P. 66 Correct phone # for Kevin Coyne is 304.926.0499

    i. **District Response:** Change incorporated.

m. **Issue/Comment:** I am writing in regard to the US Army Corps of Engineers, Pittsburgh District's Initial Watershed Assessment for the Monongahela River Watershed on the behalf of Friends of Deckers Creek (FODC). Specifically, I am writing to suggest that you consider including the FODC organization, projects, activities and outcomes in the subject assessment as a successful model for improving water quality and protecting habitats that is holistic, community centered and that ultimately will improve the Monongahela River Watershed Basin.

    Recently Dr. Martin Christ, FODC's Water Remediation Director, wrote to you and outlined the FODC mission and some of our challenges and accomplishments. This information was provided as requested feedback to the subject assessment. I am sure you will recognize the FODC organization and accomplishments as the type of activities and results the US Army Corps of Engineers would like to see implemented, possibly on a wider basis, to improve the Monongahela River Watershed Basin. In conclusion, please consider the

FODC as a model organization for watershed improvement for inclusion in your recent assessment. Thank you for the opportunity to provide this feedback.

i. **District Response**: The Corps recognizes that Deckers Creek is included in the Monongahela Watershed and is an important resource within the basin for aquatic habitat, recreation and drinking water supply. Your efforts to improve aquatic conditions within Deckers Creek are greatly appreciated and the Corps would be interested in including your organization and the work it does within the Final Watershed Assessment. We recognize your organization as an expert on conditions within the Deckers Creek watershed and would be interested in discussing water resource projects or recommendations you may have for the Deckers Creek portion of the Monongahela watershed.

n. **Issue/Comment:** A cost-shared Final Watershed Assessment of the Monongahela River (collectively, a "Watershed Plan"), would duplicate the multiple existing restoration and water quality monitoring efforts within the Monongahela River Basin Watershed. Moreover, it would confuse stakeholders and delay the operations of the regulated community currently operating in the Monongahela River Basin, including underground and surface bituminous coal operators. There are a number of significant restoration and water quality monitoring projects ongoing in the Monongahela River Basin Watershed by a variety of stakeholder groups, including Pennsylvania and West Virginia state agencies, private entities, non-profit groups, academia, and local organizations. Some of these projects are noted in the IWA by the Corps. In addition to these projects, the Monongahela River was recently listed in the 2010 Integrated Water Quality Monitoring and Assessment Report, as impaired for other organics. This means that the PA Department of Environmental Protection (PADEP) is required to develop a Total Maximum Daily Load (TMDL) for the Monongahela River to attain applicable water quality standards, which will be subject to the approval of the U. S. Environmental Protection Agency (EPA). The PADEP has also solicited comments on a draft guidance document entitled "Coordinating National Pollutant Discharge Elimination System (NPDES) Permitting in the Monongahela Watershed" which includes a "[t]o protect the water quality standard exceedances for total dissolved solids (TDS) and sulfate in the Monongahela River Watershed by effectively managing the permitting activities" of the PADEP. If the Corps were to proceed with the steps necessary to research, draft, complete and implement a Watershed Plan, it would only further obfuscate stakeholders currently operating in the Monongahela River Basin. There is a significant risk that the Corps' Watershed Plan, as proposed, may duplicate current restoration and water quality monitoring projects and related obligations presently ongoing in the Monongahela River Basin Watershed. Such duplication would complicate the ability of stakeholders in the watershed to continue to conduct operations. A vague and unclear Watershed Plan would likely create a significant obstacle for coal mining operations in the Monongahela River Basin, an impediment that would directly impact development of Pennsylvania's bituminous coal reserves.

The Corps should currently set aside any plans to complete a separate Watershed Plan for the Monongahela River Basin.

i. **District Response:** Watershed planning is an approach for managing water resources within watershed boundaries and addresses problems in a holistic manner that reflects the interdependency of water uses, competing demands and the desires of a wide range of stakeholders. Watershed planning requires team thinking about water resources development and management in the context of multiple purposes rather than single purposes; facilitating the search for comprehensive, integrated and holistic solutions. The purpose of watershed planning is to undertake the planning process in a broad, integrated systems approach instead of solely focusing on single purpose projects. The result of the Final Watershed Assessment of the Monongahela River watershed will be the development of a Watershed Plan that identifies holistic strategies or plans for solving problems on a watershed scale and focused on two problem areas of water quality/quantity and flooding/infrastructure.

The District does not intend to duplicate efforts already ongoing, but augment and consolidate efforts where possible. For this reason, we do not anticipate any confusion for stakeholders conducting operations within the watershed.

o. **Issue/Comment:** According to Section 4.1.7 the IWA, the Monongahela River Basin Watershed was identified as a candidate for the completion of an IWA under the authority of Section 729 of WRDA 1986 pursuant to the Ohio River Basin Comprehensive Reconnaissance Study. However, neither the Ohio River nor the Monongahela River Basins have been identified as "Priority River Basins and Watersheds" in the subsequent amendments to Section 729 of WRDA. Furthermore, given that with enactment of WRDA 2007, the Corps now has an estimated "backlog" of more than 1,000 authorized activities, an activity that is redundant may not be the best use of appropriated dollars.

i. **District Response:** This watershed study is being conducted under Section 729 of the Water Resources Development Act (WRDA) of 1986(33 U.S.C. 2267a), as amended by Section 202 of WRDA of 2000 and Section 2010 of WRDA of 2007. This authority authorizes the USACE to assess the water resources needs of entire river basins and watersheds of the United States, in consultation with appropriate Federal, tribal, state and local agencies and stakeholders. In contrast to most USACE traditional planning, in which the desired output of the study would be to identify a USACE project, the Watershed Plan will have a series of recommendations which may or may not identify specific USACE projects.

The Monongahela River watershed was identified as a priority watershed from the Ohio River Basin Comprehensive Reconnaissance Report (completed in December 2009) which is why it was chosen for additional consideration under the authority of Section 729.

p. **Issue/Comment:** According to the IWA, "a main foundation of watershed planning includes coordinating planning with responsible Federal, tribal, State and local governments; promoting interagency cooperation that incorporates local, regional, tribal and national water resource management goals and leveraging of resources and programs among Federal, tribal, State and local interests." While IWA does summarize the Corps' proposed coordination with local interests, it is not apparent what interactions the Corps has had with the West Virginia Department of Environmental Protection (WVDEP) and the PADEP regarding the proposed Watershed Plan. In other words, it is not clear in the IWA how either the WVDEP or the PADEP has offered to participate in the proposed Watershed Plan. Nor is it clear that all stakeholders in the Monongahela River Basin are aware of the Corps' actions on this project. The current efforts of the WVDEP and PADEP address the significant identifiable issues in the Monongahela River Basin Watershed and the efforts proposed by the Corps would likely be duplicative of these already extensive efforts.

    i. **District Response:** The WVDEP and PADEP were coordinated with during preparation of the IWA and attended the stakeholders meeting held in February 2011. Also, it is the intent of the District to meet with other Federal, State and local organizations and agencies during research and preparation of the Final Watershed Assessment and to be as inclusive as possible in order to understand the views of stakeholders in the watershed. Throughout completion of the Final Watershed Assessment, stakeholders will continue to provide critical input into the watershed planning process and assist in proposing management strategies for future implementation. Public meetings in addition to meetings with other organizations are a main component of coordination during preparation of the Watershed Plan.

    Although Greene County is the identified non-Federal sponsor, all groups including State, local and tribal governments, industry, non-profits and academia will be collaborated with throughout the Final Watershed Assessment and development of a Watershed Plan.

q. **Issue/Comment:** Prior to issuing this IWA, the Corps hosted one stakeholder meeting on February 17, 2011. The Corps reports the following regarding that stakeholder meeting: Stakeholders noted that the Corps is the only agency that due to state and political boundaries, with a unique position of having the "big picture" idea of the Monongahela River basin as a whole. At the moment, all other studies are being done on smaller scales, which can lead to lots of wasted efforts, and data collection that is not put to use or finding that are not

implemented. Additionally, the Monongahela River watershed scope covers a vast area of the location for legacy and future resource extraction. Therefore, the stakeholder group was interested in seeing the Monongahela Basin studied as a whole and a Watershed Plan implemented that covers the entire basin.

The PCA disagrees with this statement by the Corps, specifically that the Corps is the only agency with ability to address water quality issues and implement a study for the Monongahela River Basin as a whole. Moreover, the PCA does not believe that the studies currently ongoing, such as those studies by the PADEP in association with the 303(d) impairment listing of the Monongahela River and the West Virginia Water Research Institute's water quality monitoring and reporting project, are being done on a "smaller scale" or have led to "wasted efforts".

On the contrary, PCA agrees with comments made by the stakeholders noting that the Watershed Plan proposed by the Corps runs the risk of "re-doing what the other plans are doing." Similarly, it is not clear what purpose or niche the proposed Watershed Plan would fill that is not already addressed by the multiple "[r]esource agencies, local, public and private organizations in both West Virginia and Pennsylvania [that] are currently undertaking restoration and water quality monitoring activities in the basin." Accordingly, PCA does not understand the need for the implementation of a new Watershed Plan for the entire basin by the Corps. PCA appreciates the opportunity to share our views and believes that the completion of a Watershed Plan for the Monongahela River Basin by the Corps at this time is a duplicative and unnecessary venture for the aforementioned reasons.

i. **District Response:** The above comment: "*At the moment, all other studies are being done on smaller scales, which can lead to lots of wasted efforts, and data collection that is not put to use or finding that are not implemented. Additionally, the Monongahela River watershed scope covers a vast area of the location for legacy and future resource extraction. Therefore, the stakeholder group was interested in seeing the Monongahela Basin studied as a whole and a Watershed Plan implemented that covers the entire basin*" was conveyed to us directly by stakeholders during the stakeholder meeting and was the view of the group attending the meeting.

   The Watershed Plan will not duplicate efforts within the basin but instead will evaluate and compare alternative approaches to solving water resource problems which may include alternative courses of action and their expected outcomes, alternative ways to address identified needs through programs of other Federal, tribal, state, interstate and local government entities, alternative combinations of future efforts, basin wide strategies, and other alternatives. The Watershed Plan will reflect the shared vision and values of the partners for implementing activities and will identify the government entity (i.e., Federal, tribal, state, interstate and local government) best suited for accomplishing such activities.

Appendix F; Part 2. Greene County Letter in Response to Public Comments

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February 10, 2012

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1000 Liberty Avenue
Pittsburgh, PA 15222-4186

RE: Monongahela River Watershed
Initial Watershed Assessment, August 2011
Greene County Comments

On behalf of the Greene County Commissioners, the Greene County Department of Economic Development is pleased to participate with the US Army Corps of Engineers (USCOE), Pittsburgh District, to accomplish a Final Watershed Assessment (FWA) for the Monongahela River. The Mon River Watershed is one of the most precious assets known to Greene County and the southwestern PA region, providing water and energy resources. The complicated challenges that we face today need to be thoughtfully and responsibly addressed to protect these irreplaceable assets.

Agriculture and the extraction of mineral resources have long been the mainstay of Greene County's economy. We are the largest bituminous coal producing county in the nation and plans are advancing to increase that production. Over thirty percent of Greene County's budget comes from the coal mining industry. In addition, Greene County has been the fifth most active county in PA in the Marcellus Shale gas play exploration, and the production of this natural gas in the very early stages. With the recent legislation that anticipates shale gas impact fee revenue to the county, our budget will be more representative of the value of mineral resources.

The importance of producing domestic energy independence cannot be overstated, nor can the importance of the Mon River Watershed. Greene County has been paying very close attention to water issues and we are willing to solicit, bring forth and partner to maximize the benefit of this project for all the significant interests in the watershed, and there are many. We welcome the opportunity to participate as the Non-Federal Sponsor primarily because we also recognize the need to "meet the changing water resources needs of the nation" as this pertains to the Monongahela River and USACE EC 1105-2-411.

In response to the circulation of the Monongahela River Initial Watershed Assessment, dated August 2011, and the comments received, we recognize these are the important matters on the forefront:

Executive Summary and Study Purpose:

Greene County agrees with the statement on page iv that " . . . watershed planning is an approach for managing water resources within particular watersheds and addressing problems in a holistic manner that reflects the interdependency of water uses, competing demands and the desires of a wide range of stakeholders in addressing watershed problems and opportunities."

The USACE is justifying the need for an Assessment on the basis that it is prudent to manage water resources in a holistic manner. Ironically, the environmental regulation of one of our mainstay industries—coal mining—is conducted by the federal, state and local governmental agencies in a holistic manner and the USACE intended involvement through this Assessment will undoubtedly disrupt this approach. In addition to administering federal water quality requirements, PA DEP also administers the federal Surface Mining Control and Reclamation Act (SMCRA) requirements under a primacy agreement. As such, it has integrated the requirements of both federal programs, as well as state program requirements into a single permit, compliance and enforcement program.

- In addition, some concern was raised regarding the openness and transparency of the USACE's process when its draft working agreement is replete with references that the USACE has ultimate authority on all Assessment findings, data, and analysis. Further on page 49, the USACE states "Both public involvement and consultation must occur, however, with the awareness that USACE cannot relinquish its statutory decision-making responsibility." We believe that the USACE is committed to an open and transparent process. Therefore, to alleviate these concerns that were raised and to show a good faith effort on the part of the USACE to ensure an open collaborative process, we request a formal stakeholders' Advisory Group be established and recognized by the USACE, that is representative of those with a vested interest in the Mon River, as the watershed assessment process goes forward.

- This Advisory Group should be balanced and limited in size, and convened on a regular basis throughout the Final Watershed Assessment process to represent all of the multiple stakeholders' interests, to participate in the decision-making including the Watershed Assessment Management Plan, and to provide meaningful input into the development of the Final Watershed Assessment report.

- We recognize that because there will be a large group of vested stakeholders, opportunities for conflicting or contradictory positions may occur. Therefore, the Advisory Group should be formally charged to work closely with the USACE and Greene County on this project to assure that the highest quality, peer-reviewed scientific information for this geographic region is utilized and recommendations are developed by consensus.

- Based on various statements throughout the Initial Assessment report, we would be remiss if we did not state that we believe that effort also needs to be invested to assure

that stakeholders do not conclude that the end result of this project may have already been decided. We are unable to determine from the IWA the type of parameters that you will be using in assigning weight to the information that will come forward from this stakeholder process. As a Non-Federal Sponsor, we need to ensure that findings will be based on comments substantiated by documented, peer-reviewed science and not unsupported opinions or anecdotal stories.

- We are well aware of many organizations that have already invested in some analysis and planning within the Mon River Watershed, and have not yet been made aware of this project. Therefore, their input has not yet become a part of this project and we wish to assure that during the Final Watershed Assessment process many more are given the opportunity to participate in a substantive manner. The opportunity to participate must be made available for any further studies and Greene County is committed to assist the USACE to assure that effort is robust. We will provide a spreadsheet of organizations and contacts, as well as the reports that have been generated during recent years, so that information is considered.

- Problems and pollution concerns in the watershed were identified through a nonprofit organization, a previous Corps study and a stakeholder public meeting. However, given the critical nature of this information, the primary areas of concern must recite actual evidence and scientific data available so that the character, amount and the level of severity of pollutants in the watershed can be established. Based on the work that we have been a part of, it's our understanding that water quality in the Monongahela River Basin is impacted largely by nonpoint source pollutants such as sedimentation, agricultural runoff, legacy Abandoned Mine Drainage, and, to a smaller extent, municipal and industrial runoff.

Section 3. Location of Watershed/Congressional Districts:

Depending upon the results of the PA Legislative Reapportionment Commission's efforts to gain the approval of the PA Legislative Reapportionment Plan, 2011, the number of congressional districts that are represented in the watershed may be changed during this project.

Section 4. Existing Reports:

Because water and the Mon River are a huge public concern, during recent years, an enormous investment of time, effort, and funding has been devoted to the Mon River watershed. In addition to the work of the jurisdictional resources agencies, studies have been completed by watershed groups, industry, Carnegie Mellon University, California University of PA, University of Pittsburgh Institute of Politics and the Southwestern Pennsylvania Commission. Ongoing water quality monitoring is being conducted by the West Virginia University Water Research Institute (WVWRI), the Harry Enstrom Chapter of the Izaak Walton League (IWL), and others.

Section 5, Existing Conditions

The IWA Executive Summary indicates that "throughout the watershed planning process, numerous problems were identified…however, water quality and quantity issues came to the forefront…" Further in the report on page 28, it states "Current trends indicate improved water quality on the Monongahela River over the past 40 years, attributable to low flow augmentation, AMD treatment projects, and natural attenuation of AMD pollution." It's important to note that had the significant effort by the mining companies themselves to effectively improve water quality and the pollutant contributions of other industries and municipalities, these conflicting statements could have been avoided. And again, this supports our belief that given the limited involvement by vested stakeholders and the critical nature of this effort, the Final Watershed Assessment must be supported by actual scientific data and analysis such that the character, amount and level of severity of pollutants in the watershed can actually be established.

The Monongahela River's water quality has improved to the point where it supports diverse uses. Water quality since early 2010 has not exceeded drinking water standards for metals, sulfate, chloride or TDS. This is the result of adequate assimilative capacity for inorganic constituents during the dry season. In the wet period between December and June, high flows guarantee that inorganic ion concentrations are well below the upper water quality limits. However, changes in mining practices and particularly, in shale gas development could exhaust the River's assimilative capacity unless steps are taken to manage water quality on a watershed basis. For that reason, this study is needs to ensure that regulatory agencies have the means to understand and quantify pollutant load sources and manage water quality to protect designated uses.

Since January 2010 the major coal producers in the Monongahela drainage have been managing their treatment system discharges to control TDS below the secondary drinking water standard of 500 mg/L and sulfate below 250 mg/L. Monitoring confirms that this program has been successful. Monitoring also shows an increase in brine-related ions from gas production. This monitoring was conducted by WV Water Research Institute in which they been collecting data since July 2009. This data applies to the main stem of the Mon River from Elizabeth, PA to Morgantown, WV.

Further, on page 32, the report indicates that "The Pittsburgh District Water Management Branch has determined that the TDS assimilative capacity of the Monongahela River has been reached" and page 33 states, "This was illustrated by a low-flow event, related to excessive withdrawals, in the watershed in 2008." It is our understanding that this was a "reconnaissance level" report with heavy reliance on existing reports. We are quite certain that the low-flow event in 2008 on the Monongahela River was in fact due to drought conditions. We attach a U.S. Department of Agriculture 2008 Drought Map in support of our position. Furthermore, the Pennsylvania DEP did not list the Monongahela River to be impaired for TDS in its May 2010 Clean Water Act Section 303(d) report to EPA.

With respect to the assimilative capacity of the Mon River being reached, we question the use of a literature review to make such a sweeping statement. The report includes no actual data that supports this statement. And while we recognize this is a reconnaissance report, we note that page 61 of Appendix B provides caution to the USACE with respect to data quality and assurance.

These types of subjective statements are not what we believe should be encompassed in a report.

In early September, 2009 during a period of low flow a golden algae bloom killed fish, amphibians and mollusks in Dunkard Creek. Mortality was first reported near Pentress, WV and moved first upstream then downstream for about 30 miles. No mortality was reported downstream of the treated, Shannopin Mine discharge at Steele Shaft which is located about six miles upstream of the confluence of Dunkard Creek with the Monongahela River. The golden algae bloom appeared to coincide with nearly stagnant water, high nutrient and TDS concentrations. While the causal mechanisms behind the fish kill are still unclear. However, restriction of mine pumping by the coal industry in 2010 resulted in maximum TDS concentrations that were roughly half or less then at the same period in 2009. This is compelling evidence that pollutants such as sulfate and TDS can be controlled through discharge management on a watershed level.

In recent years, an enormous investment of time, effort, and funding has been devoted to the analysis of the Mon River watershed. Countless restoration and water quality efforts are currently ongoing for the Mon River. In addition to the work of the Pennsylvania Department of Environmental Protection (PA DEP), industry itself has comprehensively sampled and analyzed data in support of mining permit applications and reported data according to the permit requirements under PA DEP. Sampling has been completed by volunteer watershed groups and local universities have sampled and analyzed results for various reasons. We believe this volunteer and academic data should be reviewed for scientific integrity. However, we believe that due to the comprehensiveness, geographic scope, and scientific integrity of the WVWRI's monitoring network, that this work should form the basis for the scientific data to be used in this project. Further, we request that the USACE, Pittsburgh District, enter into a contract with WVWRI for that specific purpose.

As evidence to support our request, the WVWRI has been studying the discharges of major coal mining companies in the upper Monongahela River Basin since 2009 and developing reasonable solutions to potential pollution challenges. Dr. Paul Ziemkiewicz, Director of WVWRI, developed a strategic monitoring program for the Mon River and began sampling water quality in July 2009. This project, funded by the US Geological Survey (USGS) 104B program, includes water quality monitoring and sampling on a bi-weekly basis at 16 locations in the watershed including four sites on the Mon River and at the mouths of twelve major tributaries. A working group was established to design and implement a Managed Discharge System. On any given day, this system takes into consideration the pumping capacities of the fourteen major mine pumping and treatment plants in the upper Monongahela River and their typical TDS concentrations, and then ties the TDS output to the flow in the Mon River based on the nearest USGS gage or permanently installed loggers at the sampling locations. The system allows the dischargers to look at the gauge reading and set their pumps to the indicated rate, thereby coordinating the outflows.

At the sixteen sampling stations, parameters measured in the field include electrical conductivity, pH, temperature, and total dissolved solids. Water samples are collected and analyzed at approved labs for pH, acidity, alkalinity, conductivity, total dissolved solids, total suspended

solids, aluminum, bromide, calcium, chlorine, iron, magnesium, manganese, sodium, sulfate and sulfur. In addition to quality, flow is recorded so that the chemical loading is determined biweekly. The WVWRI has developed a load-based model that indicates the assimilative capacity of the River and its tributaries over flow regime variations encountered during the hydrologic year.

This type of collaborative process is an indication not only of the intent of the mining industry to protect the Monongahela River, but demonstrates how a cooperative approach with vested stakeholders like the mining industry can achieve successful results in protection of the Mon River. This approach controls parameters without jeopardizing jobs or raising electricity or sewage rates, and shows that there are manageable strategies possible for working together to ensure a positive outcome for all.

Additionally, WVWRI is a partner in the multi-state, multi-institutional Appalachian Research Initiative for Environmental Science (ARIES) headquartered in Virginia Tech, which is developing science-based approaches in a collaborative effort to energy and environmental challenges in the Appalachian Region.

Scope and Objective of Final Watershed Assessment is Broad and Open-Ended

Given our current economic climate, Greene County is concerned about anything that could potentially and unnecessarily inhibit development and have a social and community impact in our County. As such, we have concerns that the scope and the objective of the Final Watershed Assessment is too broad and open-ended and may evolve into issues better left to the State to address. For example, Section 9, page 48 indicates that "Opportunities will at a minimum include examining a "water budget" for the basin." What does this mean? Does it mean regulation of water withdrawals or establishing water allocation standards? Both of these have tremendous consequences for development within our County and would duplicate State efforts. For example, the Pennsylvania Water Resources Planning Act (Act 220) was enacted in 2002 to answer basic questions such as how much water we have, how much water we use, and how much water we need and track this information. Major components of this legislation included requirements to:

- update the State Water Plan every 5 years,
- register and report water withdrawals,
- identify Critical Water Planning Areas and create Critical Area Resource Plans, and
- establish a voluntary water conservation program.

This program currently has six regional committees--including one for the Ohio River Basin--as well as a Statewide Water Resources Committee that includes among others, the Secretaries of PA DEP and the Department of Conservation and Natural Resources, the PA Fish and Boat Commission, and representatives of the River Basin Commissions.

In late 2008, the Chair of the Statewide Water Resources Committee and then DEP Secretary Hanger presented the citizens of Pennsylvania with the 2008 State Water Plan, which is a

functioning planning tool. Many people statewide participated in this process including over 169 members of the Statewide and Regional Water Resource Committees.

Of further concern is the statement on page iv of the Executive Summary "the lack of comprehensive management of water resources such as that done by the Susquehanna River Basin Commission", and the implicit message that such a basin be created for the Mon River. Although we recognize that stakeholders already involved in the IWA process have advocated for a Mon River Basin Commission, we feel it necessary to explain that Greene County does not support abdicating state and local control over water planning and permitting duties to a multi-state entity.

The Final Watershed Assessment Should Include a Comprehensive Economic Study

The watershed assessment should incorporate a comprehensive economic study in order to identify the needs of stakeholders who rely on the river for transportation and commerce. The Monongahela River is, historically and presently, a major resource for industrial transportation and this should be taken into consideration when developing strategies within the watershed assessment. Industry and commerce on the Monongahela River employs many individuals throughout the watershed, and we believe it is necessary to consider the impact to the social well-being of the region should the river cease to operate as a transportation resource.

1. **General Comment**

The captions under Photo 7 and Photo 8, pages 17 and 18, are reversed.

Conclusion

We hope we have imparted on you our belief in a balanced, collaborative, open, accurate and thorough assessment driven by peer-reviewed, high-quality data, where all vested stakeholders are involved. As a Non-Federal Sponsor, Greene County remains committed to preserve the industrial and agricultural sectors that have formed us and continue to support us. We feel confident that there is a balanced way to protect the Mon River Watershed that doesn't eliminate jobs and drive away business. We look forward to working with you and all vested stakeholders of significance to citizens and businesses along the Mon River.

Sincerely,
GREENE COUNTY
Department of Economic Development

Robbie Matesic

Ms. Robbie Matesic
Executive Director