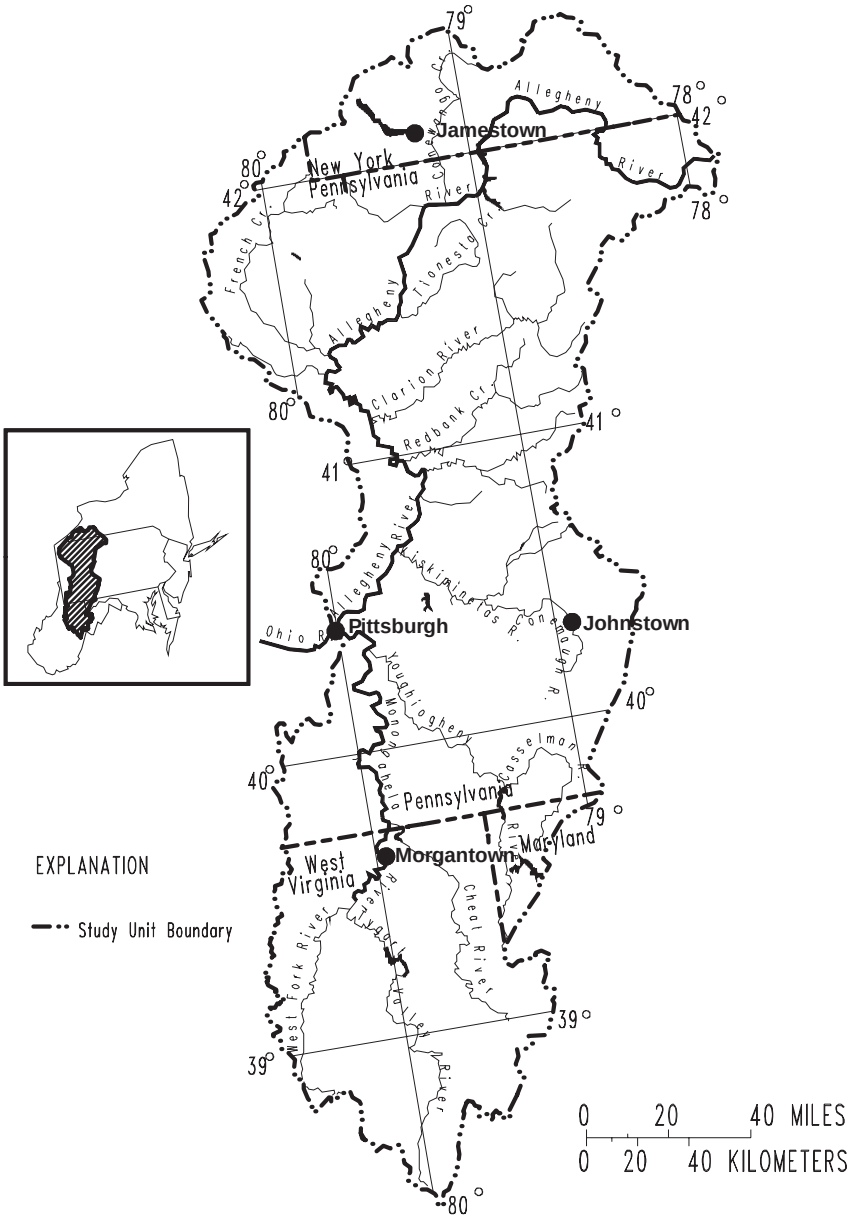
National Water-Quality Assessment Program–The Allegheny-Monongahela River Basin

In 1991, the U.S. Geological Survey (USGS) began a National Water-Quality Assessment (NAWQA) program. The three major objectives of the NAWQA program are to provide a consistent description of current water-quality conditions for a large part of the Nation's water resources, define long-term trends in water quality, and identify, describe, and explain the major factors that affect water-quality conditions and trends. The program produces water-quality information that is useful to policy makers and managers at the National, State, and local levels.

The program will be implemented through 60 separate investigations of river basins and aquifer systems called study units. These study-unit investigations will be conducted at the State and local level and will form the foundation on which national- and regional-level assessments are based. The 60 study units are hydrologic systems that include parts of most major river basins and aquifer systems. The study-unit areas range from 1,000 to more than 60,000 square miles and include about 60 to 70 percent of the Nation's water use and population served by public water supplies. Twenty study-unit investigations were started in 1991, 20 started in 1994, and 20 more are planned to start in 1997. The Allegheny-Monongahela River Basin was selected to begin assessment activities as a NAWQA study unit in 1994. The study team will work from the office of the USGS in Pittsburgh, Pa.



Description of Allegheny-Monongahela Basin

The Allegheny River drains about 11,805 square miles of New York and Pennsylvania. The Monongahela River drains about 7,340 square miles of Maryland, Pennsylvania, and West Virginia. The study unit consists of the total drainage areas (19,145 square miles) of the Allegheny River and the Monongahela River, which join to form the Ohio River at Pittsburgh, Pa.

All of the area of the Allegheny-Monongahela basin is included within the Appalachian Plateaus Physiographic Province. The area is characterized by broad, rounded uplands that are highly dissected by numerous valleys. Relief is generally greatest in the southeastern mountainous areas where the valleys are wide with steep sides and the uplands are broad, linear ridges. The relief is lowest, and valleys and uplands are wide in the northern areas that have been eroded by glacial activity. The land surface is underlain by sedimentary rocks (sandstone, shale, coal, and limestone) of Pennsylvanian, Mississippian, and Devonian age that are fractured and have been faulted and folded in many areas. The bedrock is blanketed by a layer of weathered rock material, and Quaternary glaciofluvial deposits, and alluvium. The weathered rock material is generally thin (less than 20 feet), the glaciofluvial deposits commonly range in thickness from 20 to 500 feet, and the alluvium is generally less than 100 feet thick. 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. The climate of the study unit is temperate. The average annual temperature is 49 degrees Fahrenheit. Mean monthly temperatures range from 29 to 72 degrees Fahrenheit. Average annual precipitation is 42 inches and ranges from 37 inches in northern areas to 60 inches in the southern, mountainous areas. The average annual runoff (1951-1980) ranges from 25 to 40 inches per year in the mountainous southeastern areas and from 18 to 26 inches elsewhere. The average annual recharge is estimated to range from 8 to 15 inches. The remainder of the average annual precipitation is estimated as evapotranspiration.

The 1990 U.S. Census Bureau population data indicate that approximately 4,166,000 people lived in counties that are wholly or partly within the study unit. Most of the population resides in and near Pittsburgh, an urban-suburban area. The 1990 population density within a 10-mile radius of Pittsburgh commonly exceeds 5,000 people per square mile, and the population density is greater than 13,000 people per square mile in parts of Pittsburgh. Areas distant from Pittsburgh are generally rural and the 1990 population density is less than 130 people per square mile except for towns such as Johnstown, Jamestown, Morgantown, and other towns near major transportation corridors. Major industries include manufacturing, coal mining, oil and gas production, construction industry, transportation industries, forestry, agriculture, and outdoor recreation. Forests are the dominant land use. In the 1970's, the most recent period for which land use/land cover data is available, the study unit was 64 percent forested, 30 percent agricultural land, 4 percent urban land, and 1 percent barren or mined land. The remaining 1 percent of the area was covered by streams, lakes, and wetlands.

The Allegheny River begins in northern Pennsylvania, flows north into New York, then bends to the south to flow again through Pennsylvania toward Pittsburgh. Major tributaries of the Allegheny River include the Conewango Creek, French Creek, Clarion River, Redbank Creek, Kiskiminetas River, and Conemaugh River. Mean annual flow of the Allegheny River 24 river miles upstream from the Ohio River is 19,660 cubic feet per second. The Monongahela River begins in West Virginia at the confluence of the West Fork River and Tygart Valley River and flows northward to Pittsburgh. Major tributaries of the Monongahela River generally flow northward and include Cheat River, Youghiogheny River, Tygart Valley River, and West Fork River. Mean annual flow of the Monongahela River 11 miles upstream from the Ohio River is 12,470 cubic feet per second. Streamflow in much of both river basins is controlled by reservoirs. Most of the reservoirs are used for flood control, and some are used for recreation and water supply, as well as for control of water quality and navigation during low flows. A series of locks and dams permits navigation over about 50 miles of the Allegheny River and about 100 miles of the Monongahela River.

Most of the unconsolidated glaciofluvial and alluvial sediments and the fractured and folded sedimentary rocks are aquifers. Many of the major Quaternary aquifers are in buried bedrock valleys. The alluvium sediments are also excellent sources of ground water in major river valleys. Yields from ground-water flow systems in the fractured rocks are difficult to predict, highly variable, and commonly of local extent.

In 1990, water withdrawn from aquifers and surface water in the Allegheny-Monongahela study unit averaged 3,531 million gallons per day, most of which was surface-water withdrawal. Nearly all water supply in the Pittsburgh area is withdrawn from surface water. Withdrawals from surface water were used for generation of thermoelectric power (66 percent of total water withdrawals) and for public supply (12 percent of total water withdrawals). About 19 percent of the total water withdrawn was for industrial and mining purposes. Only 2 percent of the water withdrawn was from ground water for public supply, and about 1 percent of total water withdrawn was for self supplied, domestic water supply. Ground water provides the domestic water supply of almost all rural residents in the study area.

Major Water-Quality Issues

Major water-quality issues in the study unit are related to the following conditions:

- Contamination of surface and ground water by acidic mine drainage is the most significant source of water-quality degradation. The quality of more than half of the river reaches in the study unit is degraded. Abandoned coal-mined areas are a major source of acidic mine drainage. High concentrations of acidity, trace metals, sulfate, and dissolved solids can eliminate aquatic biota.
- Degradation of water quality from oil and gas production, especially from abandoned wells and drilling and production sites, occurs in the upper Allegheny River Basin. Brines, methane, trace elements, and organic compounds are released to surface water and ground water.
- Surface-water and ground-water contamination by industrial wastes or chemical spills is a concern particularly near sources of large water supply near urban areas, along the major rivers, and in principal aquifers. Organic compounds and toxic trace elements from petroleum products, from storage tanks or pipelines, or from industrial sites are a hazard to aquatic biological communities and to water supply.
- Sedimentation and contamination of surface water can occur after urban runoff and combined stormwater-sewer overflow when the capacity of waste water treatment facilities are exceeded. Nutrients, bacteria, and turbidity affect water supplies in many areas.
- Contamination of surface waters and ground waters by nutrients and pesticides used in agricultural and urban areas can occur where land uses are highly mixed.
- Acidic precipitation affects water quality and biological communities.
- Naturally occurring radiochemicals, especially radon, affect the quality of ground-water supplies.
- The discharge of heated water used for cooling thermoelectric power plants adversely affects stream water quality and biologic communities and can cause reductions in dissolved oxygen concentrations, algal blooms, and growth of pathogens.

Communication and Coordination

Communication and coordination between USGS personnel and other interested scientists and water-management organizations are critical components of the NAWQA program. Each of the study-unit investigations will have a local liaison committee consisting of representatives who have water-resources responsibilities from Federal, State, and local agencies, universities, and the private sector. Specific activities of each liaison committee will include exchange of information about water-quality issues of regional and local interest; identification of sources of data and information; assistance in the design and scope of project products; and review of project planning documents and reports. The liaison committee for the Allegheny-Monongahela River Basin study was formed and convened in June 1994.

—Steven D. McAuley

Information on technical reports and hydrologic data related to the NAWQA program can be obtained from:

Project Chief, Allegheny-Monongahela
River Basin NAWQA
U.S. Geological Survey
1000 Liberty Ave., Room 2204
Pittsburgh, PA 15222
(412) 644-2707

Pennsylvania District Chief
U.S. Geological Survey
840 Market St.
Lemoyne, PA 17043-1586
(717) 730-6900