WATER FACT SHEET

U.S. GEOLOGICAL SURVEY, DEPARTMENT OF THE INTERIOR

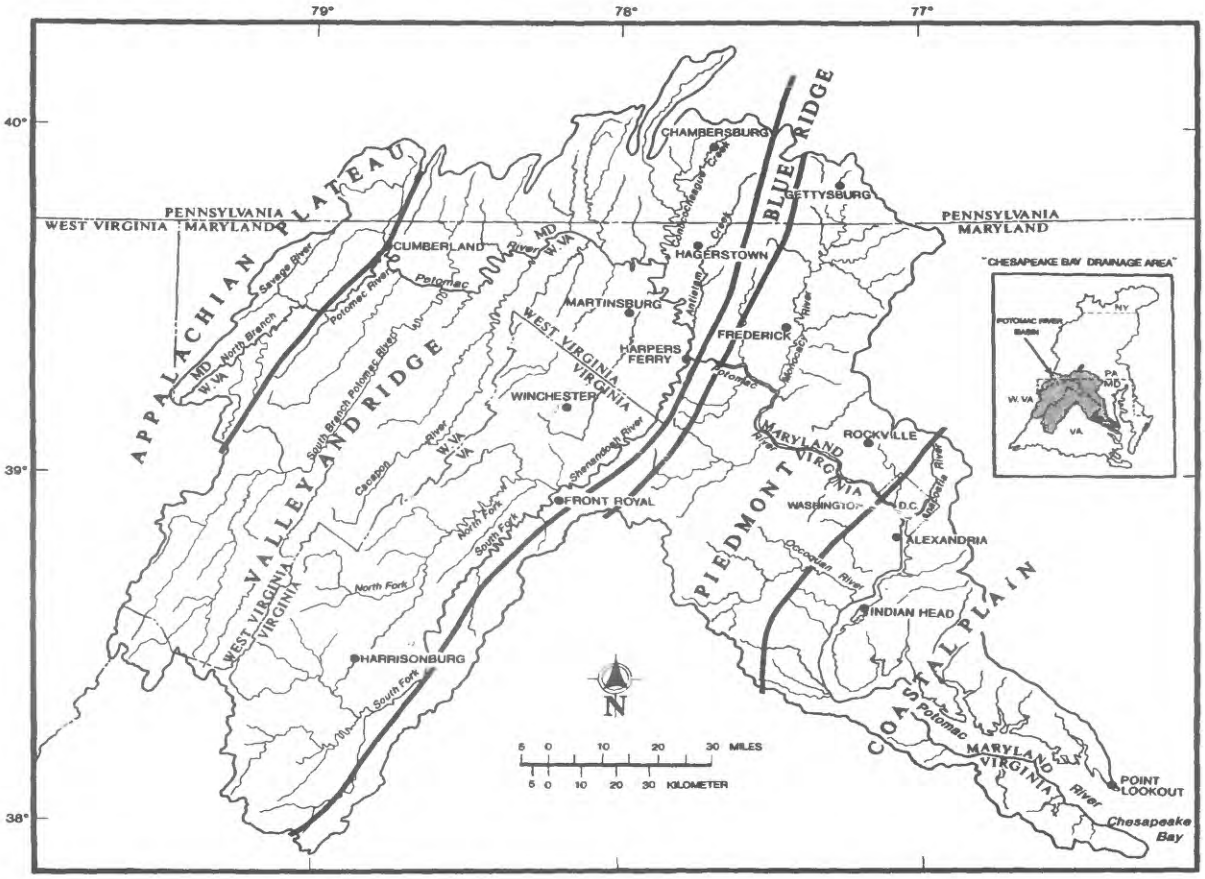
NATIONAL WATER-QUALITY ASSESSMENT PROGRAM—The Potomac River Basin

In 1991, the U.S. Geological Survey (USGS) began to implement a full-scale National Water-Quality Assessment (NAWQA) program. The long-term goals of the NAWQA program are to describe the status and trends in the quality of a large, representative part of the Nation's surface-water and ground-water resources and to provide a sound, scientific understanding of the primary natural and human factors affecting the quality of these resources. In meeting these goals, the program will produce a wealth of water-quality information that will be useful to policy makers and managers at the national, State, and local levels.

The design of the NAWQA program will enable water-quality information at different areal scales to be integrated. A major component of the design is the inclusion of study-unit investigations. These investigations comprise the principal building blocks of the program on which national-level assessment activities are based. The 60 study-unit investigations that make up the program are hydrologic systems that include parts of most major river basins and aquifer systems. Individual study units cover areas of 1,200 to more than 65,000 square miles and incorporate about 60 to 70 percent of the Nation's water use and population served by public water supply. In 1991, the Potomac River basin was among the first 20 NAWQA study units selected for study under the full-scale implementation plan.

DESCRIPTION OF POTOMAC BASIN

The Potomac River basin encompasses 14,670 square miles in Virginia (5,723 square miles), Maryland (3,818 square miles), West Virginia (3,490 square miles), Pennsylvania (1,570 square miles), and the District of Columbia (69 square miles). In 1990, an estimated 4.6 million people lived in the Potomac River basin, approximately 75 percent in the Washington, D.C., metropolitan area. In addition to Washington, D.C., other important population centers include Alexandria, Front Royal, Harrisonburg, and Winchester, Va.; Rockville, Cumberland,



Hagerstown, and Frederick, Md.; Harpers Ferry and Martinsburg, W. Va.; and Gettysburg and Chambersburg, Pa. Major industries include agriculture, forestry, coal mining, paper, chemicals, electronics, and recreation.

Five physiographic provinces, the Appalachian Plateaus, Valley and Ridge, Blue Ridge, Piedmont, and Coastal Plain, are included in the Potomac River basin. Forest and agriculture are the dominant land use. In 1985, 52 percent of the basin was forested, 32 percent was used for agriculture, and only 12 percent was urban. The climate is temperate, with average annual temperatures ranging from 48 degrees Fahrenheit in the western part of the basin to 58 degrees Fahrenheit in the eastern part. Average annual precipitation ranges from 35 inches in the central valleys to 44 inches in the western mountains and the Coastal Plain province.

The Potomac River begins as a small spring in West Virginia and flows 383 miles to discharge into Chesapeake Bay at Point Lookout, Md. The river becomes tidal where it crosses the Fall Line into the Coastal Plain province just upstream from Washington, D.C. Farther downstream near Indian Head, Md., the river is brackish and its salinity gradually increases until it flows into the Chesapeake Bay. The Potomac River basin study will focus on the freshwater part of the river upstream from Indian Head, Md.

The average flow of the Potomac near Washington, D.C., is 7,440 million gallons per day for the period 1930–89. The maximum flow during that period was 312,800 million gallons per day on March 19, 1936; the minimum flow was 388 million gallons per day on September 10, 1966. The major tributaries of the Potomac River are the North Branch Potomac, South Branch Potomac, Shenandoah, Monocacy, Savage, Cacapon, Anacostia, and Occoquan Rivers, and Antietam and Conococheague Creeks. During 1951–90, the Potomac River provided about 15 percent of the estimated 49,300 million gallons per day total inflow to Chesapeake Bay.

Less than 3 percent of the drainage in the Potomac River basin is regulated by dams. Only three reservoirs have surface areas of more than 1,000 acres: Jennings Randolph Lake (1,184 acres), Mt. Storm Lake (1,100 acres), and Occoquan Reservoir (1,840 acres).

Total natural runoff in most of the basin (those parts not affected by reservoirs or drainage from coal mines) ranges from about 9 to 22 inches per year. The contribution of ground-water inflow to total runoff ranges from 39 to 61 percent and averages 52 percent in those parts of the basin upstream from Washington, D.C. Total runoff and the percentage of ground-water contribution generally are largest for areas underlain by limestone.

The Potomac River basin is underlain by many different types of rocks. The rocks in the mountainous Appalachian Plateaus and Valley and Ridge provinces are sedimentary (sandstones, shales, and limestones). The mountainous Blue Ridge and rolling Piedmont provinces are underlain mostly by crystalline rocks. The bedrock in all four of these provinces is blanketed by a mantle of weathered rock material, or regolith, which is more than 100 feet thick in some places. The Coastal Plain province is underlain by relatively younger, unconsolidated sediments (sands, silts, and clays) in layers that dip to the southeast.

Ground water is present primarily in joints, faults, and other fractures in the sedimentary and crystalline rocks of the western and central parts of the basin, and in the pore spaces in the overlying regolith mantle. Ground water is present in pore spaces in the unconsolidated sediments of the Coastal Plain province. Of all of the ground-water-producing units in the basin, the limestone units of the Valley and Ridge province, parts of the regolith, and the sands of the Coastal Plain province produce the most ground water.

In 1985, water withdrawn from streams and aquifers in the Potomac River basin averaged 5,681 million gallons per day, over 95 percent of which was surface water. Most of that water was used for thermoelectric and hydroelectric power production—only 570 million gallons per day were for public supply.

MAJOR WATER-QUALITY ISSUES

Water-quality problems have occurred historically and are still occurring in surface and ground water in certain parts of the Potomac River basin. Some of the major water-quality issues for the freshwater resources of the basin are:

- Acid drainage from coal mines in the North Branch Potomac River;
- Bacteria, nutrients, and heavy metals from sewage-effluent discharges, particularly downstream from major urban areas;
- Sediment, nutrients, and pesticides from agricultural activities, particularly in streams in the Valley and Ridge and Piedmont provinces;
- Heavy metals, organic chemicals, and high biochemical oxygen demand from industries and businesses, particularly in the North Branch Potomac River and developed areas;
- Sediment, nutrients, heavy metals, and organic chemicals in runoff from urban and suburban areas;
- Degradation of ground water by nonpoint-source contaminants, such as fertilizers, manure, pesticides, septic effluent, and road salt, particularly in areas underlain by limestone;
- Acidification of streams by atmospheric deposition, especially in reaches underlain by quartzite, sandstone, and other rocks whose composition cannot neutralize acidic input; and
- Natural radioactivity (primarily radon) in ground water in crystalline rocks of the Blue Ridge and Piedmont provinces.

COMMUNICATION AND COORDINATION

Communication and coordination among 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 the exchange of information about water-quality issues of regional and local interest; the identification of sources of data and information; assistance in the design and scope of study products; and the review of planning documents and reports.

SELECTED REFERENCES

Interstate Commission on the Potomac River Basin, 1990, Healing a river—The Potomac, 1940–1990: Interstate Commission on the Potomac River Basin, 23 p.

Leahy, P.P., Rosenshein, J.S., and Knopman, D.S., 1990, Implementation plan for the national water-quality assessment program: U.S. Geological Survey Open-File Report 90–174, 10 p.

Trainer, F.W., and Watkins, F.A., Jr., 1975, Geohydrologic reconnaissance of the upper Potomac River basin: U.S. Geological Survey Water-Supply Paper 2035, 68 p.

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

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Open-File Report 91–157 J.M. Gerhart, 1991

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