STATE OF THE POTOMAC RIVER BASIN
1985

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The River and the Basin

The Potomac River and its tributaries drain 14,670 square miles, including parts of Maryland, Virginia, West Virginia, Pennsylvania, and the entire District of Columbia. Four million people call the basin home, and three-quarters of them live in the metropolitan Washington area.

The Potomac flows 383 miles from its source at Fairfax Stone in West Virginia, to its mouth at Point Lookout, MD, and Smith Point, VA, where it enters the Chesapeake Bay. It crosses six distinct physiographic regions on its journey to the bay, including the Allegheny Plateau, the Ridge and Valley Province, the Great Valley, the Blue Ridge, the Piedmont, and the Coastal Plain.

The river is free flowing from the source to the District of Columbia, which is over two-thirds of the total length. The only major dam in the entire basin is on the Potomac North Branch, the border between Maryland and West Virginia. The dam, completed by the U.S. Army Corps of Engineers in 1981, forms Bloomington Lake which provides for recreation, flood control and water quality improvement immediately downstream, and supplemental water supply during drought periods for the Washington Metropolitan Area. Because of Bloomington Lake, and also the 1982 coordination agreements among the Metro Area water utilities, the area residents and visitors are not threatened with a water shortage in 1985 as is the case in other large urban areas along the east coast from Virginia to Maine. At Washington below the scenic Great and Little Falls, the the more than 100 miles of tidewater Potomac begins and gradually changes from a fresh tidal river to a salty estuary en route to the mouth at the Bay.

One of the Potomac's characteristics is its "flashiness"--Potomac flows have reached as high as 200 billion gallons per day, but drought flows have been recorded of only 380 million gallons per day.

*Presented at the ICPRB Public Meeting, "The Potomac and The Chesapeake", May 16-18, 1985.

The Potomac and its tributaries are used for many important purposes, such as public drinking water supplies, power plant cooling water, commercial and sports fishing, boating and other water-related recreation.

Water Quality Overview

The water quality of the Potomac and its tributaries in the basin generally is good and improving. It is under stress in some areas and even poor in a few others, but generally it continues to provide both residents and visitors with the valuable benefits previously mentioned.

Especially in the past ten years many municipalities and industries have completed the upgrading and expansion of existing water pollution control facilities or the construction of new facilities. Nearly a billion dollars has been spent for this purpose in the Washington Metropolitan Area, including the rapidly growing suburbs in Virginia and Maryland. Relatively few of the municipal and industrial point sources in the basin have yet to provide the necessary new or upgraded treatment plants or other controls to remedy their pollution problems, and most of these have construction programs underway or scheduled.

The major remaining pollution problems in the basin are largely from nonpoint sources. This generally includes runoff from lands disturbed by human activity such as agriculture, silviculture, urban development, highway construction, abandoned mines, etc. In the Potomac basin the nonpoint source pollutants of special concern are sediments from land erosion, nutrients in any form that reach receiving waters by surface runoff or any other pathway, waste products including bacteria from farm animal production, urban storm and combined sewer overflows, acid drainage from abandoned mines, and the recycling of pollutants from river bottom sediments. I will refer to some of them later as we visit various parts of the basin.

Potomac Highlands

In the headwaters of the Potomac, the water quality is poor in many small streams because of acid drainage from abandoned and inactive coal mines in the North Branch Potomac River drainage. Almost half of the North Branch (about 50 miles) and approximately 700 miles of its tributary streams remain affected and are unsuited for aquatic life. Although municipalities in the area are improving their treatment facilities, most recently in the Georges Creek area of Maryland, water quality still depends on levels of acid drainage from abandoned mines. Efforts to obtain funds from the U.S. Department of Interior Abandoned Mine Reclamation Fund for acid mine drainage control in the Potomac North Branch (MD & WV) have been unsuccessful. Monies in the fund are collected from fees assessed on current coal mine production under the 1977 Surface Mining Control and Reclamation Act. Although control of pollution from acid mine drainage is a major purpose of the fund, the Department of Interior has allocated monies from the fund only to projects directly protecting health and safety. Since 1981, however, the operation of the new Bloomington Dam and Lake has reduced the damaging effects of acid mine drainage in that stretch of the Potomac North Branch.

South Branch Potomac River water quality is good, with only some localized problems, primarily from agricultural and dairy farm runoff. Many fisherman rate the South Branch as the best smallmouth bass stream in West Virginia, and it is well-suited to float-fishing.

Ridge and Valley Province and the Great Valley

Near or on the mid-Potomac main stem where it cuts through the ridges and valleys downstream from the Potomac South Branch, Berkeley Springs, Shepherdstown, and Harpers Ferry, including the National Historical Park at the mouth of the Shenandoah and all in West Virginia, ended decades of raw sewage discharges with the completion of secondary treatment plants within the past five years.

The Upper Great Valley north of the Potomac includes portions of southern Pennsylvania, Maryland, and West Virginia. The water quality of Conococheague, and Antietam Creeks are generally Fair. The major cities such as Chambersburg and Antrim Township, PA, and Hagerstown, MD, have recently completed secondary or better treatment facilities; also the Letterkenny Army Depot corrected previous industrial waste problems and has been in general compliance with permit limits during the past two years. Nonpoint source pollution such as sediments, nutrients, and bacteria that enter streams during storm runoff is the major influence on water quality. This region is extensively farmed, and agricultural runoff during storms affects the entire region. Water quality of a few specific streams ranges from poor-fair to good.

The Shenandoah in the lower Great Valley is the largest tributary to the Potomac and drains 21 percent of the Potomac basin. The Valley contains more industry and agriculture than any other sub-basin. The watersheds of the North and South Forks, which constitute most of the sub-basin and are solely in Virginia, are mostly forested due to the National Forests and Parks and the relatively steep slopes. The two forks meet at Front Royal to form the Shenandoah main stem which flows across the West Virginia Panhandle and joins the Potomac at historic Harpers Ferry.

The Shenandoah South Fork is the largest of the forks. Water quality has improved significantly in point source impacted segments of the South Fork and its headwaters due to the upgrading of both municipal and industrial wastewater treatment. Examples are in the headwaters below Staunton and Waynesboro and in the Hawksbill Creek tributary of the South Fork much further downstream near Luray.

In 1977 the discovery of mercury in soil at the duPont plant in Waynesboro and in the sediments and fish in a 130 mile stretch of the South River and Shenandoah South Fork led to a ban on taking of fish for eating. DuPont had used mercury at the plant in a manufacturing process which was discontinued 27 years earlier (1950). In 1982 the Virginia Department of Health replaced the ban with a health advisory warning against the eating of any fish from the 102 mile segment from Waynesboro to the Page-Warren County line by small children and pregnant women and no more than one meal (1/2 pound) per week by others. Studies sponsored by the State Water Control Board and duPont concluded that attempts to remove the mercury-contaminated sediments would be very costly and provide little benefit. Over many decades they will continue to move gradually downstream and become more diluted as they make their way to the Potomac estuary. This experience with mercury in the Shenandoah bottom sediments is a field demonstration of how slow river transport of sediments can be--also the many decades which may pass before the benefits from upstream sediment and associated nutrient reduction programs are likely to be detectable in the estuary.

Pollution of groundwater by carbon disulfide and other contaminants discovered in 1980 at the Avtex Fibers plant in Front Royal along the South Fork near its juncture with the North Fork is still a problem. Remedial action by the company includes the pumping of contaminated groundwater with recovery wells for treatment. The company also has purchased most of the affected property on the opposite side of the river and is providing water to other property owners whose domestic wells are affected. Studies and remedial action also are underway to correct groundwater contamination beneath the Merck and Co. Plant near Elkston about midway along the South Fork.

The Soil Conservation Service is assisting with federal-state-local cooperative programs underway to reduce sediment and nutrient yield in two watersheds tributary to the Shenandoah South Fork (Mill Creek in Page Co. and Moffett Creek in Augusta Co.) and one watershed is under study (Hawksbill Creek in Page Co.).

The Virginia Water Control Board reports no major water quality problems in the North Fork of the Shenandoah although several municipalities are planning for upgrading their treatment plants as required under the National Municipal Policy. Fecal coliform bacteria levels violate standards in many areas and increases in nutrients have been noted in a few areas. Both are attributed primarily to runoff from farmlands. The Soil Conservation Service is studying the Linville Creek watershed tributary to the North Fork for implementing sediment and nutrient control practices, the fourth of their priority watersheds in the Shenandoah sub-basin.

Water quality is generally good and has improved in the main stem watershed of the Shenandoah primarily due to the upgrading of the Front Royal municipal treatment plant and the movement of the outfall from the much smaller Happy Creek tributary to the main stem. As a result Happy Creek is much happier. The upgrading of treatment facilities at other smaller municipalities are under construction or planned. This is also true in the nearby upper Opequon Creek watershed in Virginia which runs north through West Virginia and discharges directly into the Potomac north of Martinsburg. The largest Virginia urban area in the Opequon sub-basin is the City of Winchester and surroundings in Frederick County. A Frederick County-Winchester Wastewater Recovery Facility is under construction with completion scheduled by 1988.

Potomac Piedmont

Downstream from the juncture of the Shenandoah with the Potomac at Harpers Ferry, the Monocacy River with headwaters (Rock and Marsh Creeks) in Adams County, PA, is the major tributary. The major pollution impact is on Rock Creek from in and around Gettysburg. It affects, and is affected by, the Gettysburg National Battlefield Park and its thousands of visitors each year. Cleanup was delayed by the long and complicated environmental impact evaluation process which was required due to the National Park involvement. A new advanced wastewater treatment plant for the Gettysburg area is about one-third completed which includes both phosphorus and ammonia reduction and will eliminate previous overflows and bypasses. Similar controls are included in the new treatment plant scheduled for completion by 1987 for the Lake Heritage residential community.

Farther downstream in the Monocacy sub-basin, treatment plant overflows and other problems at the City of Frederick, MD, have impacted the river. After many years of planning studies, the contract for construction of new treatment facilities to correct the problems was due for award in April of 1985. Allowing time for construction, the river should receive relief by 1987 from the Frederick problems. However the new permit expiring in 1990 requires no phosphorus reduction as required in the new Pennsylvania plants previously mentioned.

Overall in the Monocacy sub-basin, nonpoint source sediment and nutrients are the major problems. Sediment yield per unit volume of runoff in the Monocacy sub-basin is greater than in any other rural part of the Potomac basin. As a result both Pennsylvania and Maryland have classified parts of the watershed as critical areas for special assessment and implementation of best management practices.

The Soil Conservation Service in cooperation with the Adams County Conservation District and others in Pennsylvania recently started implementation of a plan for greatly reducing sediment, nutrient and bacterial problems in the Rock Creek watershed tributary of the Monocacy. A similar federal-state-local cooperative effort has been underway under the Rural Clean Water Program for the Double Pipe Creek watershed in Maryland. Also the Monocacy sub-basin is designated as a top priority area for Maryland's Agricultural Water Quality Cost Sharing Program in which farmers may receive up to 87 1/2% of eligible costs for reducing pollution from sediment and nutrient erosion, animal wastes, or agricultural chemicals.

Despite the problems, the quality of the Monocacy River generally is rated from fair to good. Washington Area newspapers frequently recommend the Monocacy for excellent bass fishing, and recreation is an important use of the river.

The Potomac Tidewater and Chesapeake Bay

As mentioned previously, the water quality of the Potomac and its tributaries in the nearly 15,000 square mile basin generally is good and improving. The improvements primarily have been the result of new or upgraded treatment or other facilities to control pollution from industrial and municipal point sources. The damages to water uses by the dispersed, human-affected stormwater runoff from urban and rural lands, that is, nonpoint source pollution, and the related water quality trends in the tidewater are much more difficult to evaluate and to link specifically with possible upper basin causes. For example, the EPA Chesapeake Bay Study highlighted as evidence of the degradation of the Bay, which includes tidewater Potomac, the disappearance in many areas of Submersed Aquatic Vegetation (SAV's) and the decrease in fish which spawn in fresh and low salinity waters (e.g., shad and striped bass). Over the same period the study showed that nutrients increased overall in the Bay from both point and nonpoint sources, but especially the latter. Although the circumstantial evidence is strong, the study could not definitely link the declines in SAV's and the fish spawning in fresh and low salinity waters to the increase in nutrients, especially from nonpoint sources, and other indications of water quality deterioration.

Nonpoint source nutrients especially are associated with runoff from rural agricultural lands. However the proportion of land use for agriculture, both crop and pasture lands, has decreased substantially with corresponding increases in forest and urban-residential land use. At the same time agricultural practices have become more intense, for example increased use of fertilizers and pesticides. However, the increased practice of low-tillage causes less land disturbance, less soil erosion and less runoff of sediments and associated nutrients.

Few, if any, would doubt that water quality in the Bay has deteriorated, at least until around 1980, the end of the period in which data were used for the EPA Bay Study. Coincidentally 1980 was the same time when water quality improvements began to be increasingly noticeable in the Potomac tidewater as the advanced waste treatment at municipal point sources in the Washington Metro Region became effective. This was the culmination of ten years planning and construction and the expenditure of hundreds of millions of dollars. Therefore the 1983 blue-green algae bloom in the 25 mile segment of the tidewater from below Washington, D. C. to near Quantico Creek was distressing to say the least. It occurred at the same time that oxygen levels in the upper tidewater were better than ever in recent decades and phosphorus loads from Metro Washington municipal point sources had been reduced to about 2,000 lbs/day from 23,500 in 1970 and about 4,200 in 1980.

Concurrently in 1983, the USGS in its studies of the Potomac tidewater identified more than ten species of submersed aquatic plants that had returned for the first time since the early 1900's when some of them were abundant on the shallow flats downstream from the District of Columbia. Most were desirable native species, but among them was Hydrilla, an import from southeastern Asia which is considered a nuisance species in the United States. In 1984 populations of both native plants and Hydrilla increased greatly. In contrast with the 1983 blue-green algae bloom, the return of these submersed aquatic plants is a sign of better water quality in the tidal Potomac along with the greatly improved oxygen conditions, the flourishing sport fishing in the Washington region, and other indicators.

Thus we are receiving mixed signals from the Potomac tidal river and estuary which many investigators are studying to determine what they mean and why they are occurring. We will be hearing some of the details about these studies in the sessions that follow during this meeting, as well as information about accomplishments of the cleanup program in the Potomac basin and especially the tidewater. I feel that there is ample reason to be pleased with the achievements at the same time that we are frustrated by our inability to better understand the role of nonpoint source sediment and nutrients and the degree to which they can be controlled efficiently along with the highly visible problems such as the 1983 blue-green algae bloom and the nuisance Hydrilla. I also feel that we have learned much and are continuing to learn from progress in the Potomac tidal river and estuary which is valuable to the much larger Chesapeake Bay cleanup program as a whole.