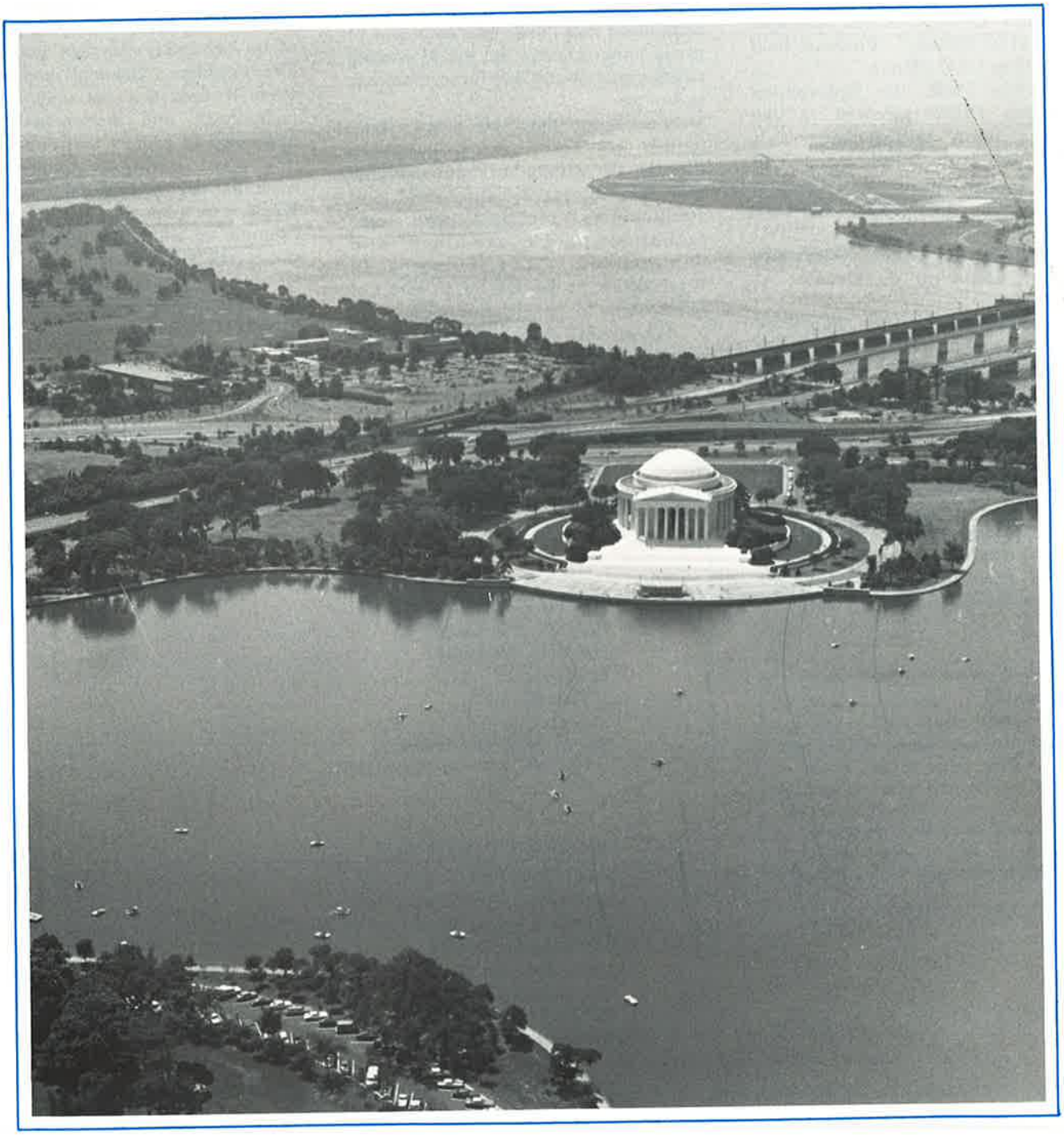
THE POTOMAC IN WASHINGTON



INTERSTATE COMMISSION ON THE POTOMAC RIVER BASIN

Introduction

The public has been confused about the Potomac cleanup. No wonder. The following random newspaper headlines on the river over the last couple of years are confusing: "The Potomac Cleanup Being Successful," "Despite LBJ's Billion-Dollar Clean-Up Program, Potomac River is Still Polluted," "The Newly Scrubbed Potomac: Come On In, the Water's Fine," "$1 Billion and River Still Dirty," "A River Revived," "GAO Study says Effort to Clean Potomac Wasted $120 Million," "Potomac Said Cleaner than GAO Thinks."

In early 1982, the Government Accounting Office reported to the Congress in a critical tone that "Environmental, Economic, and Political Issues Impede River Cleanup Efforts." Later in the spring, the U.S. Environmental Protection Agency (EPA) countered with its report, "Tidewater Potomac Clean-up, A Decade of Progress."

This ICPRB publication follows up on its November, 1982 Fall Public Meeting, "The Potomac in Washington: Recovery, Reflection, and Future Role." The meeting focused on the tidal freshwater Potomac, the upper estuary in the Washington, D.C. area, just above Chain Bridge down to approximately Mason Neck, Virginia or the Prince George's/Charles county Md. border. ICPRB attempts here to answer two questions: How Clean is the Potomac? and Where Do We Go From Here?

Abel Wolman, preeminent U.S. environmental engineer and one who has studied the Potomac since 1912 has said, ". . . Always back in the minds of Congress and Presidents, is that we have this perfectly beautiful stream, potentially more beautiful within the capital area . . . the record is full of intentions for a demonstrable showcase of the Potomac River."

On the cover: *An aerial view of the National Capital Region Potomac River.*
Photo: courtesy of the National Park Service—Bill Clark.

States Serving the Public

Joseph D. Gebhardt
ICPRB Chairman, 1982-83

Maryland, West Virginia, Virginia, Pennsylvania, and the District of Columbia signed an interstate compact in 1940, and created the Interstate Commission on the Potomac River Basin (ICPRB) to protect the water quality of the Potomac River. At that time, these Potomac basin states recognized that public education was of prime importance in the job of abating existing and controlling future Potomac pollution.

For more than 40 years, then, ICPRB has been serving the public through a variety of informational methods—lectures, seminars and symposiums, technical and non-technical public meetings and publications. "The Potomac in Washington" is the latest in its series of publications for the general public.

While more than 75 percent of the basin's population live in the metropolitan Washington area, the Commission does not limit its activities to that portion of the basin. For the past five years, for example, the Commission has held its annual Fall Public Meetings in Front Royal, Va., Harper's Ferry, West Va., St. Mary's City, Md., Keyser, West Va., and Washington, D.C.

On behalf of my fellow Commissioners, who represent the basin states and the federal government, I would like to thank all those who have contributed to the success of these efforts, and, in effect, to a better understanding of past achievements and remaining problems of an extremely complex public task. The Potomac "cleanup" process has made it clear that not only are laws, technology, and management skills necessary to protect and enhance this important national resource, but essential also is regional cooperation. We like to think that ICPRB is a fine example of what five different states, states reflecting a diversity of people and interests, can accomplish together to protect a shared resource, the Potomac River.

Contents

HOW CLEAN IS IT?

How Clean Is Clean?

"Clean," like "pollution," is useful as a news media term, but not as a scientific term. What is meant by the Potomac "cleanup?" How clean is "clean?"

In spite of the lack of data, it is safe to say that the Potomac was very clean when Captain John Smith sailed up the river in 1608. With a population of over 3 million people in the metropolitan Washington area today, the Potomac won't ever be that clean again.

This is not cause for dismay, however. The federal government committed the nation in 1972 to cleaning up its waters. Congress stipulated that the national goal was to "restore and maintain the chemical, physical, and biological integrity" of its waters, and stated that "fishable" and "swimmable" would be interim goals. What seemed like a big, but manageable, job at the time, has turned into a costly and complex task.

"Clean" can be in the eye of the beholder. The Potomac cleanup, however, has required that river waters be measured against standards assigned to them for specific uses. The most stringent standards are for Class "A" waters, used for water contact recreation (swimming). The least stringent requirements are for navigational waters (Class "F").

Currently, the Potomac River from Key Bridge to the Prince George's County line is protected for secondary contact recreation (boating) and aesthetic enjoyment, for propagation of aquatic life, as a raw water source for industrial water supply, and for navigation. The goal is to protect the portion above Key Bridge as a raw water source for public water supply, and this entire segment of the Potomac for water contact recreation.

In the sometimes confusing water quality jargon of the scientist and manager, a simple definition of clean can be helpful for the public. One is offered by Dr. L. Eugene Cronin, who says, "a biologically healthy estuary will permit all of the desired uses and is essential for any imaginable best-use combination of the nation's river . . . an estuary that doesn't stink or cause disease, provides large-scale recreation, allows appropriate development, yields usable emergency water, provides food, and serve other valuable uses."

The Way We Were

The Potomac had experienced significant pollution problems for well over 100 years by the time the 1960s rolled around, but at this point, the "Nation's River" had deteriorated to an alarming degree.

Twenty years ago, pollutants and unseemly debris formed a year-round insult, which floated past revered national monuments. Fish kills were commonplace. Oxygen-depleting algal mats arrived in July and stayed until October. Algae blanketed 100,000 acres of river below Mt. Vernon. The Potomac had become an embarrassment and a health hazard.

The river's woes were the result of a population which consistently outstripped past projections. Sewage treatment plants (STPs) were poorly operated and maintained, and they were overloaded.

When the Blue Plains waste treatment facility began operating in 1938, it was expected to be adequate for 20 years. It was overloaded 6 years later. Expanded in 1949, flows were again exceeding the plant capacity in 1950. All the metropolitan area treatment plants were badly overloaded by the end of the 1960s. Millions of gallons of raw sewage were entering the river daily. It is believed that by the early 1970s, more raw sewage was being discharged into the Potomac than in 1932, before the area had treatment facilities.

In 1965, President Lyndon B. Johnson heated up the growing local cleanup commitment when he vowed to make the Potomac "a model of scenic and recreational values for the entire country."

Significant action came as a result of the 1969 Potomac Enforcement Conference, which brought local, state, and federal officials together in the most comprehensive attempt to date to deal with the area's water quality management. The conference recommended pollutant load limitations and removal levels for sewage treatment plants, chlorination at all treatment plants, control of sewer overflows, coordination of water quality monitoing, and soil erosion ordinances. The conference participants agreed on long-range water quality standards and required that advanced waste treatment technology be installed in all local treatment facilities.

The Federal Water Pollution Control Act Amendments of 1972 (PL92-500), known as the Clean Water Act, set national goals and spurred on metropolitan Washington jurisdictions even further. This legislation marked a significant change in national water pollution control policy, and provided the crucial funding support that allowed expansion of old area plants and the construction of new ones.

The annual "Ramblin Raft Race" always attracts several hundred river enthusiasts who believe the Potomac is a cleaner river.

The Evidence

In 1965, one well-meaning citizen conceived the idea that the tidal flow along both sides of a gated, concrete median strip built down the center of the Potomac River, would allow clean water to flow up the Virginia side of the river to Washington, and take the unclean District waters down the Maryland side.

The sincerity of the suggestion not withstanding, what it took to reverse the declining trend of the upper estuary was a concerted effort among all three levels of Government—local, state, and federal—plus modern technology, public support, time, and money. Of the more than $1 billion spent in the metro area over the last decade, approximately 75 percent was supplied by the federal government. Most of that amount was used to upgrade the Blue Plains Wastewater Treatment Plant, which treats about 70 percent of the region's sewage.

The cleanup effort has focused on "point sources" of pollution (identifiable discharge points such as pipes), and on oxygen-depleting sewage contaminants and excess nutrients.

Dissolved oxygen is required to maintain good fish populations and a balanced aquatic community. In the Potomac's normal self-cleaning process, the oxygen that is used up by decomposing organic matter is replaced by the air. An overload of pollutants such as sewage, however, overwhelms that process. The increased competition for oxygen short-changes aquatic life.

The health of the river is dependent on a diversity of aquatic animals and plants. Phosphorus and nitrogen are essential for plant growth. Plants use these nutrients in low concentrations, and an over-abundance of nutrients results in too few of the right kind of plants.

An evaluation of the Potomac cleanup, therefore, includes measurement of dissolved oxygen available in the river and oxygen-demanding organic materials (indicated by biochemical oxygen demand or BOD), and nutrient levels. Chlorophyll **a** is a primary plant pigment which is another useful indicator.

The "evidence," a comparison of the levels between when the clean-up began in 1969 and recent years, shows a significant improvement in water quality: more dissolved oxygen and a lowered demand for oxygen, a decrease in nutrient and organic levels, and a growing and generally more-balanced aquatic plant community (see Box).

Although wastewater flows in the metropolitan Washington area increased by 40 percent between 1970 and 1982, BOD and the phosphorus loadings from area wastewater treatment plant discharges were reduced by over 80 percent. Dry weather sewage overflows have been eliminated and wet weather overflows are less frequent.

In spite of this progress, the algae outbreak in the summer of 1983 caused alarm. The phenomenon was discouraging and unexpected in as much as point-source nutrient loadings from area STPs into the Potomac were at their lowest levels in perhaps 40 years. Heavy spring rains laden with upstream nonpoint source nutrients followed by the year's hot, dry summer were unusual and, unfortunately, ideal for algal growth.

There has been a net gain for the Potomac, however. While the ultimate goal for the river is still some distance away, the fact remains the river is experiencing a "rebirth." The boaters, the windsurfers, the waterskiers, the fishermen, and the waterside strollers are perhaps the clearest evidence of all.

POTOMAC TIDEWATER CLEANUP RESULTS 1970-1982

Even though total wastewater flows received at area treatment plants have increased by 40 percent during this period (from 324 to 464 million gallons per day), the following reduced loadings of pollutants to the upper estuary from plant discharges were achieved.

Biochemical Oxygen Demand	V	77%
Suspended Solids	V	72%
Phosphorus	V	85%
Ammonia & Organic Nitrogen	V	68%

† Metropolitan Washington Council of Covernments

† (see "Selected Reading")

A Cleanup Chronology

1957-U.S. Public Health Service declares Potomac unsafe for swimming.
1957-58-First Potomac Enforcement Conference sets goal of secondary treatment (80 percent BOD removal and disinfection) and control of combined sewer overflows, but no nutrient removal.
1959-Secondary treatment is added at regional Blue Plains Treatment Plant.
1965-Congress establishes Federal Water Pollution Control Administration (FWPCA). Requires states to set water quality standards.
1965-70-D.C. area jurisdiction adopt fishable-swimmable standards. FWPCA approves. Deadlines set for 1972-75.
1968-Chlorination begins at Washington area sewage treatment plants.
1969-The Potomac Enforcement Conference reconvenes because goals are not being met. The river is characterized as "grossly polluted" and "a severe threat to the health of anyone coming in contact with it." Blue Plains is overloaded. Conference recommends expansion of area treatment plants and sets goals for BOD and nutrient removal.
1970-More Pollutants discharged to WMA estuary after existing treatment than was discharged in 1932, when no area treatment plants existed. D.C. area jurisdictions adopt Memorandum of Understanding to upgrade and expand all area treatment plants, allocating added capacity and local share of costs among jurisdictions. The Environmental Protection Agency is established with responsibility for water quality improvement programs.
1971-The "Georgetown Gap," a missing section of sewer pipe near Key Bridge, spews raw sewage and becomes a public issue.
1972-The Georgetown Gap is closed. The Clean Water Act passes Congress. Fishable-swimmable goal is set for all U.S. waters.
1973-The algal mats occur on the Potomac in August instead of June and are thinning out.
1974-Federal District Court issues consent order regarding Blue Plains management. EPA issues Blue Plains discharge permit for 309 mgd average flow, and plant begins phosphorus removal trial program.
1975-EPA defers permit requirement for Blue Plains nitrogen removal. Phosphorus removal favored in view of lower cost.
1976-Pleasure boaters rediscover the Potomac and largemouth bass reappear in Washington, D.C.
1977-Blue Plains secondary treatment expansion operational. Noxious algal forms declining.
1978-The first annual Potomac Raft Race is held. A full-time fishing guide begins working the Potomac. The area-wide Upper Occoquan Sewage Authority plant replaces eleven outdated treatment facilities in Northern Virginia.
1980-Blue Plains nitrification becomes operational. Further dissolved oxygen improvements observed. The Aquia (Stafford County) and Mooney (Prince William County) regional treatment plants go on line.
1981-"The Awakening," a week-long event celebrating a cleaner, fishable Potomac, is held on the Mall. Approximately 100,000 persons attend.
1983-Potomac cited as cleanup example in Water Pollution Control Federation's "Decade of Progress."

A Fishable River

Fish are good indicators of water quality since they reside at the top of the aquatic food chain. Pollution causing a weak link at the lower end of the chain will ultimately affect the quantity and quality of the fish community. Pollution in the upper reach of the Potomac estuary, the tidal freshwater zone, is of particular concern. This zone is an important spawning and nursery area due to its high phytoplankton and zooplankton production.

Of the approximately 100 species of fish that live in the Potomac ecosystem, very few are tolerant of pollution. Carp and catfish can withstand low levels of dissolved oxygen and high pollutant levels, but the most lively sport and best food fish—small and largemouth bass, shad and perch—need cleaner water.

The river's fishery potential is significant. The Potomac is the second largest tributary to North America's largest and most productive estuary, the Chesapeake Bay. The estuary of the Potomac is a key link to Chesapeake and Northeast coast fisheries.

History confirms the Potomac's fishery significance. Capt. John Smith reported that in 1608 ". . . Neither better fish, more plenty, nor more varied for small fish had any of us ever seen in a place." His crew allegedly tried to scoop them up with frying pans. By 1802 the leading press of the day was carrying advertisements about the "Potomack's" "commodious fish houses." Overfishing was a concern by 1817, particularly of shad and herring. After a respite of 50 years following the Civil War, that almost brought commercial fishing to a standstill, over-fishing again became a concern.

The Harley family of Mason Neck, Va., has fished the Potomac for over five generations. A family member reported that the river went into a "nose dive" about 1940. Fishkills from pollution were evident from the 1950s to the early 1970s. The fishing in the upper river appeared to recover around the mid-1970s.

The great Potomac fish news of 1976 was that a largemouth bass had been caught in Washington. In 1978, a man abandoned his office job to become the first professional bass guide on the Washington stretch of the Potomac. In 1981, "The Awakening" was held on the Mall, an event which heralded the return of sportfishing to the Potomac and its tributaries.

Most fishermen are no longer fearful of eating their catch. According to the D.C. Department of Environmental Services, there is "no cause for concern for the public health relative to consumption of fish from the waters of the District if the fish are properly cooked." Normal cooking—until the flesh flakes—is sufficient to kill pathogenic bacteria. (Fishing reporter Angus Phillips reminds: "It is very hard to undercook fish.")

The Department embarked in 1980 on a program to analyze fish tissue annually. The fish are checked for a variety of heavy metals, pesticides and organic contaminants. The program serves only as a "checkup," and does not reflect a known problem. No significant differences have been discerned between Potomac and Anacostia fish flesh data.

While large numbers of fish are returning to the Washington Potomac, concern remains with regard to overall declining fish populations of two species —shad and striped bass.

Over 2.5 million pounds of shad were taken from the Potomac in 1899, but landings have declined steadily since the 1920s and dropped precipitously in the 1970s. Striped bass (rockfish) landings have declined steadily since the bonanza year of 1973, and hit a startling low in 1979. The commercial rockfish catch in Maryland was only 400,000 pounds in 1982, the lowest since 1933 and less than 10 percent of what it was in 1973. Almost 300 pounds of sturgeon were landed in 1880, but no catches have been recorded for years. Not only are there fewer fish, but they are smaller overall. According to Potomac chronicler Fred Tilp, shad used to weigh 7 pounds on an average. They now seldom exceed 3 to 4 pounds.

The reasons for the decline are unclear. Overfishing, chemical contaminants, and natural environmental and climatic fluctuations are all suspect. Because of the complexity of the estuarine environment, there is probably no single cause for the decline, but rather a combination of factors.

For the time being, however, the return of the more desirable sport and food fish has excited the numerous fishermen in the metro Washington area.

One corpulent carp departs his home in the Tidal Basin. The annual Washington fishing derby always nets many fine catches. In the 1982 derby, a 57-pound, 13-ounce carp lost his freedom because of a cornmeal doughball. It may go down in local fishing history, if it is certified that it broke a world's record.

Photo: D.C. Dept. Environmental Services

Can You Swim?

In 1970, the Metropolitan Washington Council of Governments (COG) took a survey of the most popular recreational activities in the District of Columbia. Swimming was first on the list.

Back in 1957, Abel Wolman and his colleagues believed that swimming in the metro Washington Potomac was a desirable goal, but they did not sound optimistic: "Fishing in the estuary is poor and swimming is unsafe except above Three Sisters Islands. Although it may never be possible to improve the water in the estuary so swimming will be safe everywhere, it will be possible, at a price, to provide much larger areas where the public may enjoy this sport. . ."

Swimming in the Potomac is not a new idea. River bathing was undoubtedly common in the pre-colonial and colonial periods. President John Quincy Adams (1767-1826) reportedly "disported himself daily in the yellow waters of the Potomac." President Theodore Roosevelt quite often enthusiastically immersed himself (and his friends and, reportedly, reluctant diplomatic visitors) in the waters of both the Potomac and Rock Creek.

The Tidal Basin had a supervised public bathing beach between 1918 and 1924, closed officially due to pollution. Swimming "up the river" above Key Bridge was publicized during the 1920s when summer cottages lined both Potomac banks. The purchase of shoreline property for the C&O Canal Park and the George Washington Memorial Parkway between 1938 and 1942 forced their removal.

While hot summer days drew swimmers into the waters between Great Falls and Quantico, the area was restricted for swimming in the 1950s. District of Columbia regulations promulgated in 1971 still officially prohibit water contact recreation in the Potomac and Anacostia Rivers, the Washington Ship Channel, Rock Creek and Oxon Run and their tributaries, "due to high levels of fecal (bacteria) and other pollutants."

The 1971 regulations have not been changed by the cleanup results. The major criterion for swimming is that of fecal coliform bacteria from humans and animals, which are indicators of potentially harmful bacteria and viruses. The cleanup has eliminated the high fecal coliform levels hazardous to swimmers during dry weather periods. These hazards continue to exist, however, after storms. Storms cause overflows from storm sewers and combined storm and sanitary sewers continue to cause pollution problems. Bacterial levels drop to normal ranges after a few days. Because the health hazard for water contact sports during dry weather periods has been reduced, the language, "This water is a health hazard . . ." has been removed from signs along the river.

Swimming in the Potomac is not a new idea. Photo: Library of Congress

Not health hazards, but safety remains a primary swimming constraint. The lack of supervision and facilities, debris, deceptive and dangerous currents and periodic swift flows discourage swimming. While swimming (and water skiing and scuba diving) are still prohibited within the District, the Harbor Police have permitted annual raft races off East Potomac Park since 1978. During these races many of over a thousand participants are in the water much of the time.

With some cleanup progress made, there is some hope for swimming—at least in some part of the Potomac. The D.C. water quality standards now reflect the goal of protecting the entire length of the Potomac in the District for water contact recreation in the future. The Potomac in Maryland above and below the District line, and the Virginia embayments below the District line are classified for primary water contact recreation. The Washington Area Waterfront Action Group (WAWAG), a volunteer, non-profit organization, has identified 11 potential D.C. bathing beach sites.

Controversy over swimming in the District's Potomac waters will remain in spite of cleaner waters. There still are some reservations regarding health concerns, and the safety hazards are not easily resolved: the provision of appropriate facilities and personnel would propose a substantial allocation of strained District funds. In addition, there is the question of public demand. While swimming would appear to remain an important recreational activity, there are a number of other factors that will effect demand for river bathing: access to the river, availability of public transportation, price of auto fuel, safety and aesthetic considerations (currents, shoreline characteristics, bottom conditions), and the prime factor, how clean people *believe* the water is.

The River & The Town

"The entire Potomac and Anacostia river system should be a constant source of natural enjoyment, urban orientation, and visual delight." This vision of the National Capital Planning Commission (NCPC), the federal government's central planning agency for the Nation's Capital, is not the reality. In spite of having a luxuriant degree of open space (80 percent of the shoreline), the shoreline of metropolitan Washington falls short of its potential.

The Washington Area Waterfront Action Group (WAWAG) has identified a number of problems: inadequate public access; lack of commitment to improve the waterfront; limited coordination between public agencies with jurisdiction over the shoreline; lack of policy follow-through and plan implementation; an imbalance of uses; inadequate facilities and services; poor shoreline conditions; and remaining pollution.

re vitalize/*vt:* to impart new life or vigor to: restore to a vigorous active state.

These problems are not new. Interest in resolving them, however, remains strangely laggard and uninspired. Does this indifference cause Pierre Charles L'Enfant to turn over in his Arlington Cemetery grave? Probably. L'Enfant was the Federal City's first planner (1754-1825). His 1791 dream, states the NCPC, was a city *with* two rivers, not simply beside them. The Washington area's response to the innovative and revitalized waterfronts realized by many U.S. cities in recent years has been largely apathetic.

One exception to this apathy is Alexandria, Va., where its waterfront has been "rediscovered with a vengeance." Resolution of a 10-year litigation with the federal government over title to parts of its shoreline is now allowing the city to forge ahead with its waterfront plan. Alexandria's aggressive effort to capitalize on its historic preservation and renewed waterfront plans is paying off both in aesthetic and financial terms. A prime factor in the city's success: a consensus reached among its energetic civic leaders and the cooperation of the city government.

Consensus and cooperation is not abundant across the river, however. The smaller waterfront of Alexandria's historic competitor, Georgetown, has not fared as well. The Georgetown waterfront has been beset by controversy. Georgetown has become one of the District of Columbia's most productive economic enclaves, but its ¾-mile waterfront edge has not shared in the prosperity and attention resulting from an unprecedented building boom that began in the 1970s. Its shoreline is generally unkempt and relegated to inappropriate uses such as parking lots.

While Alexandria and Georgetown waterfront issues have evoked enthusiasm or divided passions, it is the prevailing view that the D.C. government has only a "ho-hum" attitude toward waterfront issues. The District controls a small, but obviously valuable, portion of the shoreline, about 1½ miles. To some people, the waterfront renewal that has taken place (Southwest D.C.), has proven disappointing.

Several reasons are offered for the apparent lack of enthusiasm for waterfront enhancement on the part of the District government: the dominance of the federal presence, the fact that D.C. "home rule" is relatively recent (1973), the lack of agreement among citizens, and the pressure of other priorities and fiscal constraints. The District of Columbia Government does not always have the desired "muscle" or flexibility in the planning or decision-making process. Waterfront development is basically complex; the political character of the Nation's Capital makes its waterfront doubly so.

While the shoreline of the Nation's Capital may have its own unique problems, some basic waterfront planning lessons still apply: Clean water is critical for waterfront revitalization; urban waterfronts have not been and should not be static; waterfronts have special problems and special possibilities; although waterfronts have similarities, each has a unique character that denies "single approach" planning; access is essential for urban shorelines; waterfronts must be designed for everyone; citizen participation plus leadership and commitment are essential ingredients in successful waterfront revitalization.*

*Based on Breen and Rigby, Wrenn.†

A significant aspect of this complexity is the conflicting policies and interests among the federal agencies. The National Park Services (NPS), which has jurisdiction over 80 percent of the metropolitan Washington shoreline, has the challenge of reconciling its conservation mission with the demand for public access. Another federal landlord, the Department of Defense, believes its mission precludes public access to its shoreline. This latter view is shared by the Department of Transportation, which controls a major and controversial shoreline planning constraint, National Airport. The kind of waterfront development that would disturb the NPS excites the Department of Commerce, initiator of the "Commerce in the Cities" project which promoted waterfront development. Reaching a consensus on appropriate waterfront development for the Nation's Capital would appear to be difficult, if not impossible. Even members of Congress have been known to take a proprietary view of the shoreline.

Reaching a consensus, achieving a comprehensive, updated but appropriate vision of the shoreline should be a priority goal, however. Citizens in the metro Washington area will continue to demand a higher quality urban environment in which their cleaner rivers and shorelines are key elements.

A government agency is housed in this building which uses the Anacostia River as a neglected and uninspired "backyard."

The Potomac above and below the District boundary line is within the State of Maryland as a result of old royal grants. Western embayments of the main stem of the Potomac in these areas are under Virginia jurisdiction.

Water Quality Index

Rock Creek

Fair

Dalecarlia Reservoir

Little Falls

1

Chain Bridge

Fletcher's Boat House

Georgetown Reservoir

DISTRICT OF COLUMBIA

Bladensburg

National Arboretum

Georgetown

Key Bridge

2

Roosevelt Island

W. Potomac Park

Tidal Basin

Kenilworth Aquatic Gardens

ARLINGTON

Washington Channel

Anacostia River

Fair-Good

E. Potomac Park

Fair-Poor

3

VIRGINIA

Hains Point

Buzzard Point

Greenleaf Point

MARYLAND

National Airport

Potomac River

Bolling A.F.B.

Fair-Good

Blue Plains

ALEXANDRIA

4

Oxon Cove

Wilson Bridge

Smoot Bay

POTOMAC URBAN ESTUARY

Area: 43 main stem Potomac miles, from Little Falls Dam above Washington to Indian Head, Md., and includes the major population of the river

Major Tributaries: Anacostia River, Rock and Piscataway creeks, Md., Four Mile Run, Hunting and Pohick creeks, Va.

Water Quality: Fair-Good

Problems: Urban runoff and combined sewer overflows, some localized agricultural runoff

Trend: Continued improvement from upgraded treatment plants; urban runoff and upstream contributions will require further attention

A TRIP ON THE POTOMAC

(1) LITTLE FALLS - KEY BRIDGE

By the time the Potomac has reached Little Falls, it has traveled 266 miles from its headwaters (Fairfax Stone in West Virginia). It will travel 117 miles more until it meets the Chesapeake Bay, North America's most important estuary.

Little Falls is a significant Potomac landmark, since it is just below this point that the river becomes an estuary and under the influence of tides. From here to Indian Head (some 40 miles), the river forms a tidal freshwater zone and serves as an important spawning and nursery area for some 60 species of resident and anadromous fish.

Too few river lovers are aware of the treacherous hydraulic effect of the waters that churn at the base of the Little Falls Dam. The rapids below this point are considered highly dangerous. By the time the river has reached Little Falls, it has dropped some 100 feet in a series of falls starting with the biggest, Great Falls. It now abruptly rushes full throttle through a narrow (only 100 feet at one point) channel. The water in the upper reach can be deceptively swift, and in some spots, deep—as much as 80 feet.

Most of the 3½-mile section of the Potomac between Little Falls and Key Bridge has retained its centuries old natural character, and it is this portion which is probably the cleanest part of the metro Washington river. The water is not pristine, however, having picked up some upstream organics and much sediment, particularly in heavy winter-spring flows. The water quality is good enough, however, to warrant its being considered for potential swimming sites.

The portion of the river between Little Falls and about ¼ mile below Fletcher's Boat House is particularly popular with fishermen. A variety of sport fish entice: white perch, herring and shad (early spring), striped bass and perch (late spring), smallmouth and largemouth bass (spring-fall), catfish, carp, pike, and sunfishes (year round).

(2) KEY BRIDGE TO HAINS POINT

When the river gets to Georgetown, it has begun to slow down. The improved water quality here has resulted in a notable largemouth bass fishery, particularly good between the spring and fall.

Rock Creek forms a Georgetown boundary. It was a favorite swimming "hole" for President Theodore Roosevelt. Even the dauntless Roosevelt would no doubt refrain from such activity today, however. The 25-mile long creek drains a large portion of the heavily urbanized section of Montgomery County, Md. and the District of Columbia. It is subject to heavy suburban/urban runoff and to the added "insult and injury" of several combined sewer overflows. The creek boasts some good fishing, however, with crappies and white perch being caught in its lower portion.

The Tidal Basin (the site of a swimming beach between 1918-1924) is an ever-popular fishing spot. Its turbid waters yield gizzard shad, catfish and carp, which flee the frantic gyrations of the basin's popular paddle boats before they fill a local dinner pail.

Many people are unaware that West and East Potomac Parks are man-made, and represent a significant change in the Potomac's original shoreline. This area had shoaled to form mudflats by the mid-19th century. In order to improve navigation and to alleviate what had become a highly unsanitary and unsightly area due to raw sewage discharges, the Army Corps of Engineers dredged some 20 million cubic yards of fill between 1874 and 1913 to form these two parks. Hains Point is named after Col. Peter C. Hains, the Corps officer originally in charge of the operation.

(3) HAINS POINT TO BLADENSBURG

The choppiest part of the Potomac in the Washington area is at Hains Point, where wind and water currents often collide. Waves as high as 4 feet have been created on occasion. This point is also a catch basin for dead fish and debris.

The Washington Channel, however, is a relatively calm area, and one which is protected from the large quantity of suspended sediments that can turn the Potomac to a familiar chocolate brown. The less turbid water preserves one of the few remaining areas of submerged aquatic vegetation in District waters. The Channel offers excellent fishing.

Buzzard Point is a reminder of the Potomac's historical abundance of fish. This abundance astonished the early explorers. It is thought that this area attracted numerous scavengers which fed off discarded fish from the numerous commercial fish operations in the area. Records show that in the 1830s, for example, there were 150 commercial fisheries in the Potomac and its tributaries.

The Anacostia, also known as the Eastern Branch, was once proud, a river deep enough for ocean-going vessels until 1830. The last vessel of any size out of Bladensburg left in 1843. By 1978, silting had reduced the mouth of the river to half its original width. The Anacostia at Bladensburg had narrowed to one-fifth its original size.

Contributing to the river's poor water quality are overflows from the 16 combined sewer discharge points, part of the oldest portion of the District's sewerage system.

The Anacostia is sluggish and has a relatively small flow, with the result that contaminants have a long residence in the river. This is particularly true in the summer, with the result that the normally low dissolved oxygen levels become lower, the high bacteria levels become higher.

The middle stretch of this neglected river is markedly different from the lower river, some liken it to a "step into the past." Despite its poor health, the river is able to support a small commercial fishery. Eel, snapping turtles and brown and channel catfish are caught here.

(4) HAINS POINT - WOODROW WILSON BRIDGE

Leaving the Anacostia, the Potomac makes an abrupt turn south. Past Bolling Air Force Base and the Naval Research Laboratory, on the District side, is the Blue Plains Wastewater Treatment Facility. Blue Plains is one of the world's largest advanced wastewater treatment plants, treating over 300 million gallons of wastewater daily. The discharge, or effluent, from the plant is substantially cleaner than the receiving waters. The improved effluent is a significant contributor to the recovery of the Potomac, though it still contains nutrients that can encourage algal growth.

At this point, there are two channels, in effect. There is the tendency for the bulk of the Potomac's flow to go down the Virginia side of the river, with the bulk of the Blue Plains discharge hugging the D.C./Md. side.

The worst water quality recorded in the metropolitan Potomac has been found at Woodrow Wilson Bridge. Conditions have improved significantly as a result of the 1970s cleanup, however.

WHERE TO NOW?

Point, Nonpoint

The summer 1983 algal bloom in the upper Potomac estuary was a distressing phenomenon. It may have been a disguised blessing, however. It is a reminder not to become complacent, that the cleanup process is indeed far more complex than at first imagined, and that we know far too little about the intricate behavior of the Potomac. In fact, more knowledge is needed about all rivers and all estuaries. It is discomforting to realize that at a time when our financial resources have narrowed, our efforts need to be broadened.

The first phase of the cleanup process, which began in 1969, has been successful. That success has been the result of a concentration on point sources of pollution—principally sewage treatment plant discharges. This phase has resulted in the major restructuring of STPs in the upper 30 miles of the estuary, and improved wastewater treatment.

Point sources will remain on the Potomac cleanup agenda. The future expansion needs of the area's treatment plants, the disposal of sewage sludge, and the implementation of the District's combined sewer overflow abatement program will retain their prominence on that agenda. Overflows of sewage and stormwater that occur at discharge points in the District (particularly along the Anacostia) and Alexandria are concerns. In fact, if the quality and utility of the Anacostia River is to catch up with the Potomac main stem, implementation of the combined sewer overflow abatement program is essential.

The consensus is, however, that nonpoint sources will have to take greater priority than in the past. It is not news that nonpoint sources of pollution —pollution that results from activities dispersing contaminants over large areas (such as urban runoff)—are a significant part of the Potomac's problem.

According to COG, during 1982, "the largest single portion of the annual pollutant load entering the free-flowing and estuarine segments of the Potomac River around the Washington area was generated from nonpoint sources." COG points out that the dominance of nonpoint pollutants is, to a certain extent, a reflection of the lower point-source loads resulting from advanced wastewater treatment.

Sediment — Still Pouring In

"Like the meek, the upper estuary inherits the earth," stated a 1968 Potomac River report. While the river doesn't get all of the earth, it gets far too much.

The unappealing chocolate brown color of the Potomac is not the worst part of the problem. Sediment can cause serious, long-term imbalances in the entire aquatic food chain: it decreases light penetration needed for plant photosynthesis, smothers the habitat of fish and other aquatic life, and transports other pollutants such as bacteria and excessive amounts of nutrients.

The problem is chronic. It began with the agricultural practices of the 18th century. Silt sealed the fate of Bladensburg, Md., the state's leading seaport for some 50 years between the late 1700s and 1800s, by the mid-19th century.

Abel Wolman warned in 1957 that the silt problem was so bad that should the annual load continue unabated, it would fill in the tidal Potomac from Chain Bridge to Fort Foote, just below Alexandria, Va., in just 50 years. This grim deadline is now only 24 years away. It would appear that slow headway is being made.

A U.S. Geological Survey (USGS) study done in the early 1960s indicated that over 50 million tons of soil eroded annually in the basin, and that almost 3 million tons found their way into the estuary. At that time, USGS estimated that about 50 percent of the sediment load was coming from upstream of Point of Rocks, Md., with an additional 12 percent added by the Monocacy River. The balance, 38 percent, was believed to be contributed by the urban/suburban area around Washington, D.C. The latter contribution would be high since the metro region represents a small portion (5-10 percent) of the drainage basin.

While no basin-wide analysis of sedimentation has been done since that USGS study, more recent data from downstream of Little Falls suggest that the sediment loads may be significantly lower now, particularly for the Washington area. Erosion control programs and a reduction in construction activities are given credit for the lower loads.

The problem is a complex challenge: there is no single source of sediment, it literally comes from everywhere. The quantities that are deposited in the Potomac are highly variable. They are determined by soil type, different uses of land, the amount of rainfall, and river flows. Predominantly forested Potomac watersheds, for example, yield less sediment than do agricultural or urban watersheds. Most of the annual sediment load is discharged a few days each year, during the late winter and early spring rains.

According to COG, most area jurisdictions now have effective stormwater management policies, and many encourage pre-development planning measures to protect water quality. COG states that the regional commitment of resources to stormwater management has been extensive. Nearly 3,100 stormwater management structures have been installed in the Washington area since the early 1970s. Structural aids, such as porous pavement, collection ponds, infiltration trenches, filter strips, etc., also remove urban nonpoint source pollutants.

Prevention of sedimentation has often proven more cost-effective than treating sediment-laden water. Both structural and non-structural preventive measures have been introduced. In addition to detention ponds, best management practices (BMPS) are used. These practices include improved farming techniques such as contour farming, strip cropping, and "no-till" farming.

COG estimates that there was a dramatic reduction in the average sediment load in 1982: 1.1 million tons, or roughly half that of previous years. The improved farming practices, a decrease in tilled acreage, construction site controls, as well as slightly below average flows during that year have contributed to the reduction.

Continued educational efforts focusing on the nature and magnitude of the problem are essential. A survey of soil conservation districts conducted for EPA's Chesapeake Bay Program indicated that only 45 to 50 percent of all farmers in the upper Potomac Basin above Washington have entered into conservation agreements. Only 15 percent actually applied all the best management practices called for by the agreement. Farmers should not carry the entire burden, however. The suburban/urban areas also must carry their share of responsibility.

Nutrients

Eutrophication is an "aging process," during which a water body becomes over-enriched by nutrients and productivity (plant growth) increases. It is a sign of deteriorating water quality. The key nutrients in this process are nitrogen and phosphorus. Dissolved oxygen and species diversity are often reduced as a result of excessive plant growth. An overabundance of algae can be a serious threat to a water supply, may cause fish kills, and diminishes the aesthetic and recreational value of water.

There are four predominant sources of nutrient loadings entering the upper estuary: (1) wastewater discharges; (2) upriver (above Little Falls) nutrient load; (3) suburban/urban runoff; and (4) biochemical and chemical processes. The treatment plants provide the most constant source of nutrients, but depending on river flow, turbidity, and water temperature, or other factors, any one of these sources can dominate.

Progress has been made in reducing sewage treatment plant nutrient loadings, but excessive nutrients, particularly from nonpoint sources, remain a crucial issue. One of the priority decisions for the 1980s is the establishment of a cost-effective basin-wide nutrient control strategy for the Potomac.

Scientific controversy makes nutrient control a thorny management question. The basic question is: Which nutrients should be controlled? What approach is the most cost-effective?

Plants use about 16 parts of nitrogen to 1 part of phosphorus. If either nitrogen or phosphorus is unavailable, or cannot be manufactured by the plants, plant growth stops. Based on this and other information, the 1969 Potomac Enforcement Conference recommended that point-source loadings of phosphorus be reduced by 96 percent and nitrogen loadings by 85 percent. In these early days of the cleanup, however, nutrient removal techniques were in their infancy, and knowledge of the behavior of the estuary was more limited and cost was not a concern. The high cost of nitrogen removal resulted in the decision of 1975 to concentrate on phosphorus removal and reduction. Nitrogen removal was indefinitely deferred.

The results of the program have been favorable. While wastewater flows have increased (approximately 40 percent) from 1970 to 1982, loadings of phosphorus have been reduced by almost 90 percent. Although total nitrogen loadings from point sources is about the same, oxygen-demanding forms of nitrogen, e.g., ammonia, have decreased by 70 percent.

Some people object to the deferral of nitrogen removal. The Environmental Defense Fund, for example, is a vociferous challenger of the current approach. Supporters of the existing phosphorus removal program recognize the important role that nitrogen plays in the estuary dynamics, but believe they are on the right track. They cite the significant decrease in pollutant concentrations in upper estuary water samples, evidence that indicates phosphorus removal in wastewater is a significant factor in its improvement, and they point to the prohibitive cost of alternatives.

A key factor in considering the future nutrient control strategy is the shift from point- to nonpoint-source dominance. COG reports that during a year of average rainfall and river flow, as much as 40 percent of the total phosphorus load delivered to the upper estuary is supplied by local and upstream nonpoint sources. This figure will tend to increase as further improvements are made at local treatment facilities.

Nonpoint sources generate even more of the total nitrogen load entering the estuary. Over 57 percent of the nitrogen load delivered to the tidal freshwater Potomac in 1982 came from nonpoint sources. According to COG, the largest portion of this load (43 percent) was generated from the Potomac basin above Washington, principally from agricultural runoff.

Seeking a Strategy

Washington area jurisdictions (working through the Metropolitan Washington COG Water Resources Planning Board), state regulatory agencies, and Region III of the U.S. Environmental Protection Agency have joined together in an effort to maintain and improve Potomac water quality in future years. In order to establish a strategy for further cleanup, a number of studies and efforts have been initiated:

BLUE PLAINS ALTERNATIVE DISINFECTION STUDY: An effort to determine what disinfection processes can be used at the Blue Plains wastewater treatment plant to achieve reduced discharges of chlorine from the plant.

BLUE PLAINS FEASIBILITY STUDY: A comprehensive evaluation of the 20-year needs of the Blue Plains Services Area, which handles some 70 percent of the metropolitan area's wastewater. The study estimates that in Year 2005, wastewater flows will exceed the capacity of current sewage treatment plant structures and equipment by 60 million gallons per day.

BLUE PLAINS SLUDGE/SOLID WASTE CO-DISPOSAL STUDY: Parallel to the Feasibility Study, an evaluation of the feasibility of combining the processing, marketing, and disposal of both municipal refuse and sewage sludge produced at the Blue Plains treatment plant, or alternative options. The study also addresses the feasibility of composting or incinerating sludge by itself.

D.C. COMBINED SEWER OVERFLOW STUDY: An evaluation of both the structural and non-structural ways of reducing pollution from overflows of untreated sewage and stormwater from older sections of the D.C. sewer system.

ESTUARY MODELING: Studies aimed at improving computer models that simulate the Potomac Estuary. These models would allow assessment of the impact of treated effluent discharges and combined sewer overflows on the river's water quality in the short-term (Dynamic Estuary Model), and in the long-term (Potomac Eutrophication Model).

REGIONAL POTOMAC MONITORING: A cooperative, inter-agency effort aimed at obtaining the best water quality data on the Potomac River in the Washington, D.C. region. Involves state and locally funded data collection, data storage, and quarterly and annual reporting of water quality trends.

VIRGINIA EMBAYMENT STUDIES: A series of separate monitoring and modeling studies sponsored by the Virginia State Water Control Board. These studies will investigate pollutant loading conditions and impacts in eight of the northern Virginia Potomac Estuary embayments to determine future state discharge permit requirements.

EPA CHESAPEAKE BAY PROGRAM STUDIES: Studies with management implications for the Potomac. The Potomac is the second largest tributary of the Chesapeake Bay, and is, therefore, a key element in research and management studies of the Bay ecosystem undertaken by EPA. Findings from the 5-year program began to become available during the fall of 1983.

The Chlorine Debate

The use of chlorine as a disinfectant in the treatment of metro area wastewater and to prevent biofouling in power plant cooling systems has been put under heavy scrutiny.

No incidents of fish or shellfish kills in the upper Potomac Estuary due to chlorine residuals have been documented to date (there is such documentation for Virginia's James River fishkills), but the circumstantial evidence appears weighted in favor of those who say chlorine jeopardizes the river's returning health. The Potomac's watermen have been upset about chlorine for some time.

Some important "knowns" in the debate: (1) Laboratory research has shown that chlorine and its byproducts are toxic to aquatic life in minute concentrations—particularly to larvae and young adults, and to bivalves such as oysters; (2) Although the fish are coming back to cleaner waters, their overall numbers are lower. The Potomac fisheries (shad, striped bass, perch, etc.) along with those of the Chesapeake Bay and its other tributaries, have declined significantly during the 1970s. This alarming decline has taken place in the very waters that have benefited from the unprecedented investment in sewage treatment plant construction for river cleanup. Chlorine has been a federally required component in the cleanup, used to kill fecal coliform bacteria in sewage (a reduction of these organisms, which live in the intestinal tracts of all warm-blooded animals, implies a reduction in disease-causing pathogens). In 1982, about 1.3 million pounds of residual chlorine were discharged into the upper estuary from the area's sewage treatment plants.

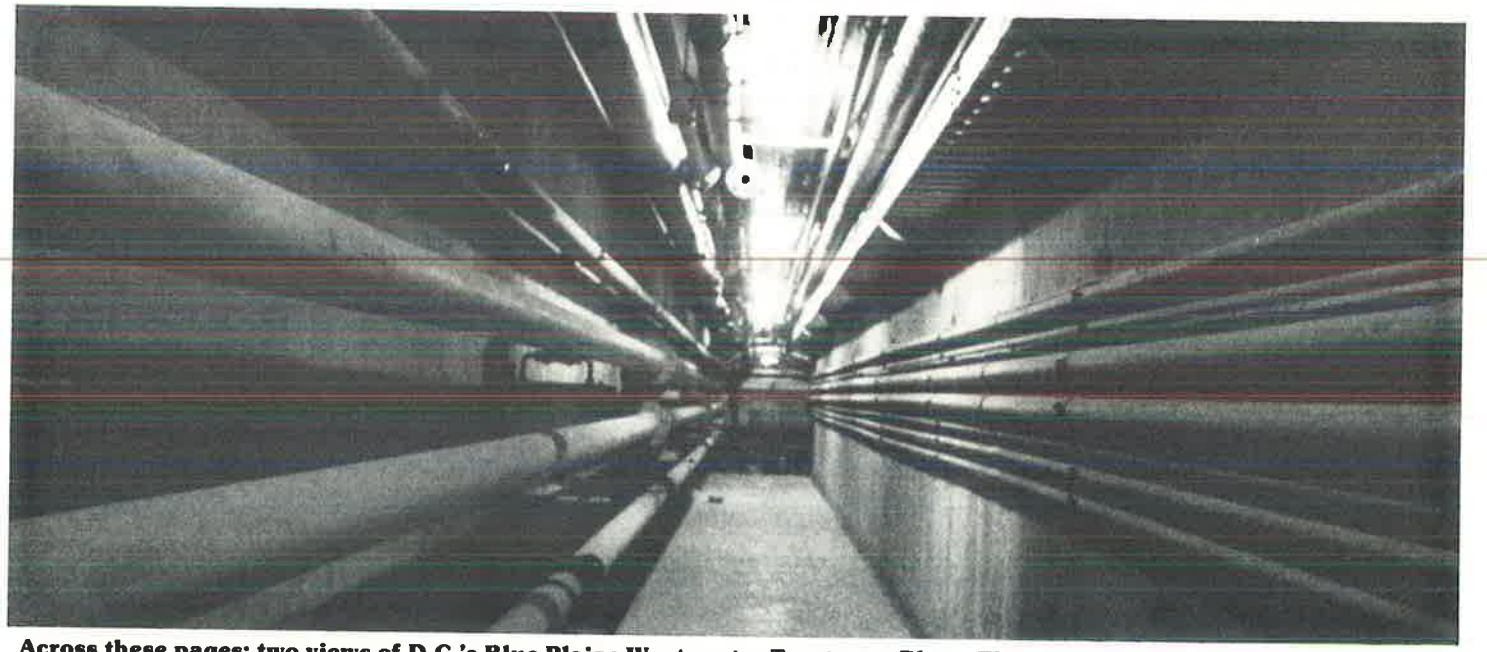
EPA has found itself caught in an uncomfortable middle between the argument that chlorine is necessary to protect public health, and the opposing argument that challenges that "protection," and cites the damage to aquatic life.

That chlorination of drinking water has been beneficial as a public health measure has never been questioned. Following the introduction of chlorine into municipal water supply systems shortly after the turn of the century, deaths due to waterborne diseases such as typhoid and cholera dropped dramatically in the U.S. (The reduced diseases are enteric, those in which pathogens are ingested.)

Those who support continued chlorine use cite the success of water supply chlorination as their fundamental argument. They also believe that chlorination is consistent with a "multiple barrier" approach to disease prevention. Chlorine supporters also cite the several thousand cases of waterborne diseases that occur annually, and say that swimmers have a higher over-all incidence of disease compared with non-swimmers. Another argument in support of chlorine is the fact that sewage disinfection effectively reduces numbers of pathogens in treatment plant discharges and minimizes their dissemination. Chlorine defenders believe that public benefits of sewage disinfection outweigh the available field evidence of environmental damage.

The challengers of chlorine emphasize that area fisheries have declined where chlorine use has increased, and they cite laboratory evidence that shows that chlorine has lethal and sublethal effects on aquatic life—it kills fish eggs and larvae and interrupts the food chain. Those who are against chlorine use note that it is a biocide that kills indiscriminantly—the beneficial along with the harmful bacteria. Chlorination, they say, destroy's nature's own disease-destroying barrier. The anti-chlorine group charges that there is no evidence that illnesses have decreases as a result of STP disinfection. They also point to the fact that chlorine is not a true disinfectant—it does not kill *all* pathogens, and believe the public is under a misconception that its health is protected. Their other arguments against chlorine: chlorinated organic compounds can jeopardize drinking water supplies; chlorination poses an occupational hazard for STP workers.

The Potomac states are concerned about the issue: Maryland initiated a new "case-by-case" policy that allows selective use of chlorine. Virginia's State Water Control Board has set up a review committee. The District's Blue Plains Treatment Plant is actively considering adding a dechlorination process. Meanwhile, too, research continues on alternative to chlorination—dechlorination, ozone treatment, and ultraviolet radiation. Chlorination continues to be the least costly disinfection method, however.



Across these pages: two views of D.C.'s Blue Plains Wastewater Treatment Plant. These above and below ground perspectives give some idea of the immense facility needed to process almost 70% of the area's wastewater—over 300 million

Intractable Sludge

Sewage sludge is not a "sexy" topic. Few people want to talk about it. This is unfortunate, because it remains the most formidable daily water quality management problem in the Washington area.

The members of COG's Chief Administrative Officers Committee, who represent local jurisdictions, have been forced to talk about it for some time. The talking has been frequently heated and sometimes has lasted until 2 a.m. Local jurisdictions have been agonizing over sludge disposal since 1974, and D.C. area governments have been repeatedly involved in litigation over the issue.

The motivation of local jurisdictions has been driven by the immediacy, constancy, and sheer magnitude of the problem: the nine treatment plants in the upper Potomac Estuary generate some 2,500 tons of sludge daily. Blue Plains produces the lion's share. Its managers currently face the awesome challenge of disposing of 1,880 tons of sludge every day—enough to fill almost 200 dump trucks.

While area governments have not been able to evolve a long-term management strategy, they have been able to keep all the sludge out of the river—no small task. Currently, a combination of disposal methods are being used—composting, landfilling, landspreading, soil injection, and incineration.

The irony of this problem is that it is a direct result of the Potomac cleanup success: sludge is the leftover byproduct of advanced wastewater treatment—a byproduct resulting from a costly, energy-intensive and complex process in which sewage liquids are separated from solids. The more advanced the treatment of sewage, the more sludge is produced. (Back in 1953, Blue Plains' primary treatment produced only 60 tons daily.)

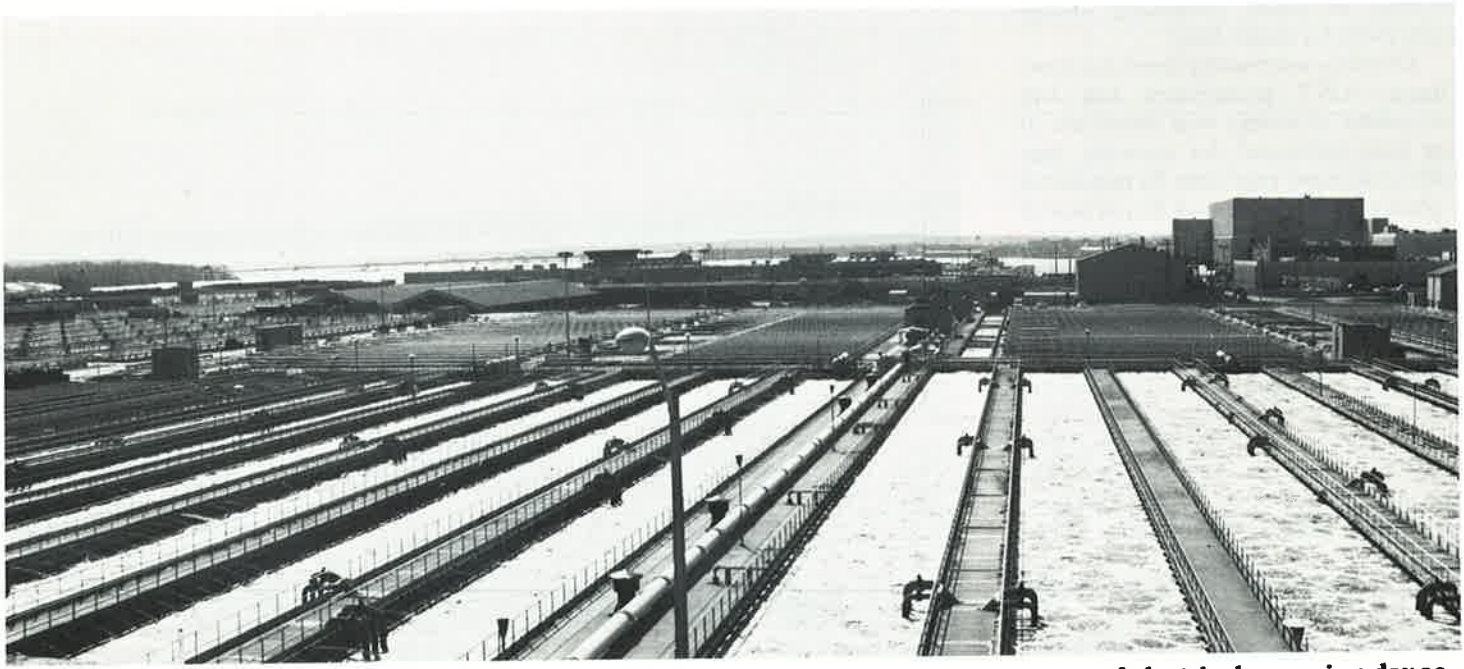
The pain of the management problem has increased as disposal options have decreased. The limited options—ocean dumping, incineration, landfilling, land treatment—have either been eliminated, deferred, or constrained due to health, safety, cost or public opposition reasons.

Ocean dumping is not a desirable disposal alternative because it is dangerous to both human and marine life, and it is expensive. Incineration, which was the assumed option for Blue Plains in 1975, was indefinitely deferred as a significant option due to increasing fuel costs, and because of air pollution control standards.

Landspreading or landfilling are constrained because of limited available land, for health considerations, and because of what is referred to as the NIMBY, or "Not In My Back Yard," syndrome. People recognize the need for landfills, prisons, oil refineries, sewage treatment plants, but the general public attitude is that to put them somewhere means to put them somewhere *else.*

Adverse environmental and health impacts are real considerations. Metro area sludge is very "clean" compared to most urban sludges, because of limited industrial wastes. Sludge constituents, however, normally include pathogens, heavy metals (cadmium, copper, mercury, nickel, lead, zinc) that are toxic to humans in minute concentrations, and other toxic substances such as PCBs, in addition to desirable nutrients (phosphorus and nitrogen). There continues to be some controversy as to the acceptable levels of these constituents for land disposal.

There is neither a simple nor inexpensive way of managing sludge. Sludge processing and disposal currently represents anywhere from 50 to 85 percent of treatment plant operating costs and reportedly produces 90 percent of the headaches. The most desirable approach, of course, is to use sludge as a revenue-yielding resource, not as a costly waste product. Here too, the picture is far from rosy. The value of sludge as a fertilizer or soil conditioner is based on its composition and on marketing conditions. Using sludge as an energy source is limited because the state-of-the-art technology is still in its infancy. Blue Plains has concluded that the co-disposal of sludge and solid waste is not feasible and must explore alternatives. It appears that much more talking, more thinking, and more money will have to be expended before the continual sludge disposal crisis stops.



gallons a day. Blue Plains occupies approximately 145 acres and consumes the same amount of electrical power in a day as that used by a city of some 50,000 people.

The Cost to Clean

With the job of cleaning the Potomac appearing to be increasingly more complex, and the economic resources to do the job diminishing at a comparable rate, the question of costs is troublesome. There are related and fundamental questions currently plaguing local water quality managers as their governments strain to balance budgets: What facilities, management practices, and treatment levels are necessary to maintain a standard of cleanliness for the Potomac? What should that standard be? How much will it cost to get that standard and maintain it? How much can and will the taxpayer, who ultimately foots the Potomac cleanup bill, pay? Unfortunately, the answers to these questions are unclear.

The cleanup of the upper estuary has cost over $1 billion over the past 10 years. The federal government paid roughly 75 percent of the cost, with local governments shouldering the balance. This money was spent to expand and advance the area's wastewater treatment facilities beyond the conventional biological (secondary) treatment levels to what is called advanced wastewater treatment (AWT).

This first phase of the cleanup turned out to be far more complex and costly than at first imagined. Various early assumptions, i.e., the costs versus benefits of phosphorus and nitrogen removal, sludge disposal by incineration, skidded into the harsh, changing realities of the mid-1970s. This period saw a dramatic increase in general inflation in which escalating energy costs played a major role.

Cleaning wastewater does not come cheap—AWT processes are big consumers of energy and chemicals. It has been estimated, for example, that AWT processes represent 30 percent of a plant's capital cost, and 55 percent of its operating cost. Local governments, which have not found it easy to pay the 25 percent required share of advanced treatment construction costs, will now face a bigger burden as of October 1, 1984. As of that date, the federal support will be reduced to 55 percent.

Operation and maintenance (O&M) costs have always been a significant concern to local governments, since they must bear their total burden. These costs, of course, tend to rise rather than fall. The O&M costs for the Blue Plains facility for the fiscal year 1983 was over $32 million, exclusive of sludge disposal costs. Sludge treatment and disposal represent a major share of total wastewater treatment costs. It is estimated that sludge disposal and treatment at Blue Plains adds on about 50 to 60 percent to the facility's cost of operation.

It is generally accepted that users should pay for O&M costs with water utilities using a fiscal system that matches revenues with expenditures. The O&M costs borne by users in the metro area vary, and not all of the costs are covered by user charges.

The annual sewer bill for metro area households ranges between $64 (Alexandria) and $194 (Occoquan). The variance reflects differing levels of treatment and differences in costs between older and newer facilities. The average household sewer bill for the entire area is $123 annually, about one third less than that of the national average, $187.

The Washington Suburban Sanitary Commission (WSSC), which services Montgomery and Prince George's counties in Maryland, has a system wherein its costs are covered by water bills. The District of Columbia, however, is currently not matching revenues with expenditures, and has had to draw from general funds to cover perennial shortages in its water/sewer fund ($17 million deficit in 1982).

There have been suggestions offered where savings might be realized for both O&M and construction costs, among them: water conservation and pricing techniques, seasonal treatment practices, holding treatment at current levels, and a relaxing and/or modification of the 10-year old water quality standards, which some feel are too costly to meet. Regional water resources management is another cost-saving suggestion (EPA has long been frustrated by the area's failure to construct a second regional plant).

Conservation is undoubtedly helpful in lessening flows to treatment plants, but there is skepticism about the effectiveness of pricing as a cost-saving technique. Seasonal treatment practices are being explored to lower operating costs, and a new approach to water quality standards (selective, rather than uniform application) is being considered. Uncertainty remains in both of these latter areas, because of an inadequate understanding of the estuary's behavior —a factor also that inhibits acceptance of current treatment levels. Regional solutions are constrained by the natural tendency for jurisdictions to compete and to protect their self-interests.

Further, cost-effectiveness is made difficult by the limitations of cost/benefit analysis. Managers seek the ability to make decisions which can be justified on the basis of benefits outweighing costs. While incremental costs can be determined, the incremental benefits to be derived continue to defy reasonably accurate measurement.

A better understanding of the Estuary would help immeasurably. Area water quality managers are hoping that improved computer modeling will begin to provide the information they need—the levels of treatment needed to achieve various levels of "clean" water. such information will put cleanup costs in better perspective.

An advanced wastewater treatment plant, like the Occoquan facility shown here, comes with a high price tag.

SELECTED READING

Bandler, B. G. 1981. *The Issues for the 1980's.* (ICPRB, Rockville, Md.)

Blanchard, Steven, Richard H. Coupe Jr., and Joan C. Woodward. 1982. *Water Quality of the Tidal Potomac River and Estuary,* Hydrologic Data Report 1981 Water Year, Open File Report 82-575. (U.S. Geological Survey, Reston, Va.)

Breen, Ann and Dick Rigby. 1981. "Designing Your Waterfronts." (National League of Cities, Washington, D.C.)

Champ, Michael A., Orterio Villa and Robert C. Bubeck. 1981. *Historical Overview of the Freshwater Inflow and Sewage Treatment Plant Discharges to the Potomac River Estuary with Resultant Nutrient and Water Quality Trends.* (U.S. Department of the Interior, Washington, D.C.)

Chesapeake Bay Foundation, Chesapeake Research Consortium, Inc., and Citizens Program for the Chesapeake Bay. April, 1982. *Chlorine—Bane or Benefit?* Proceedings of a Conference on the Uses of Chlorine in Estuaries. (Md. Department of Health and Mental Hygiene, Annapolis, Md.)

Coulter, James B. January, 1982. "Don't Chlorinate Sewage." Paper presented to the second EPA National Symposium on Municipal Wastewater Disinfection.

Eastman, Paul W. January, 1981. "Residual Chlorine in the Tidewater Potomac: Problems and Remedies." (ICPRB, Rockville, Md.)

_____. September, 1982. "The State of the Potomac Basin 1982." (ICPRB, Rockville, Md.)

GKY and Associates, Inc. April, 1982. *Tidewater Potomac Cleanup: A Decade of Progress.* (ICPRB, Rockville, Md.)

Greater Washington Research Center. December, 1982. *Report of the Task Force on Local Government Response to Fiscal Pressure.* (Washington, D.C.)

ICPRB, *Nonpoint Pollution Control—Tools and Techniques for the Future,* Proceedings of a Technical Symposium. January, 1981. (Rockville, Md.)

Jaworski, Norbert A. November, 1982. "An Historical Perspective of the Upper Tidewater Potomac," (U.S. Environmental Protection Agency)

Librach, Austan S. November, 1982. "Remaining Problems in Potomac River Estuary Water Quality Management." (Metropolitan Washington Council of Governments)

Metropolitan Washington Council of Governments. August, 1983. *Potomac River Water Quality - 1982, Conditions and Trends in Metropolitan Washington.* (Washington, D.C.)

_____. December, 1980. *Water Quality Management Plan,* Plan Supplement. (Water Resources Planning Board).

National Capital Planning Commission. December, 1972. *The Urban River,* A Staff Proposal. (Washington, D.C.)

O'Brien & Gere. February, 1983. Combined Sewer Overflow Abatement Program. (D.C. Department of Environmental Services, Washington, D.C.)

Palmer, Richard N. January, 1975. *Non-Point Pollution in the Potomac River Basin.* (ICPRB, Rockville, Md.)

Rasin, V. James, and Keith M. Brooks. December, 1982. *Potomac River Basin Water Quality 1980-81.* (ICPRB, Rockville, Md.)

Tilp, Frederick. 1978. *This Was Potomac River.*

U.S. Environmental Protection Agency. October, 1982. *Construction Grants Audit Task Force Report: Assessment of Wastewater Treatment Works Construction Projects in the Washington, D.C. Metropolitan Area.* (Washington, D.C.)

_____. November, 1972. *The Potomac River Estuary in the Washington Metropolitan Area: A History of its Water Quality Problems and their Solution,* Technical Report 57.

U.S. General Accounting Office. January, 1982. *Environmental, Economic, and Political Issues Impede Potomac River Cleanup Efforts,* Comptroller General, Report to the Congress of the U.S.

_____. September, 1978. *Sewage Sludge—How Do We Cope With It?,* Comptroller, General, Report to the United States.

_____. August, 1977. *Unnecessary and Harmful Levels of Domestic Sewage Chlorination Should be Stopped,* Comptroller General, Report to the Congress of the United States.

Walker, Willie and Clifford Jarmon. May, 1982. "The Swimming Survey," An Evaluation of the Potential for Primary Contact Recreation in the Potomac River. (D.C. Department of Environmental Services)

Washington Area Waterfront Action Group, Fishing Committee. April, 1982. "Fishing in the Nation's Capital." (Washington, D.C.)

_____. May, 1982. "Potential for Bathing Areas on the Potomac and Anacostia Rivers in Washington, D.C., Metropolitan Area," a preliminary report by the Ad Hoc Task Force.

Wrenn, Douglas M. 1983. *Urban Waterfront Development.* (Urban Land Institute, Washington, D.C.)

Sources of Information *

Alexandria, City of,
Wastewater Treatment.....(703) 549-3381
Stormwater Management and
Erosion Control.....838-4966

Arlington County
Wastewater Treatment.....(703) 684-6607
Stormwater Management and
Erosion Control.....558-2521

Charles County
Wastewater Treatment.....(301) 743-5441
Stormwater Management and
Erosion Control.....645-5000
ext. 682
.....934-9588

D.C. Department of Environmental Services
Wastewater Treatment.....(202) 767-8150
Water Quality Monitoring.....767-7370
Stormwater Management and
Erosion Control.....767-7614

Fairfax City
Stormwater Management and
Erosion Control.....(703) 385-7820

Fairfax County
Wastewater Treatment.....(703) 691-3381
Stormwater Management and
Erosion Control.....691-2401

Fairfax County Water Authority...(703) 698-5600

Interstate Commission on the
Potomac River Basin.....(301) 340-2661

Loudoun County
Wastewater Treatment.....(703) 777-0325
Stormwater Management and
Erosion Control.....471-6050

Maryland, State of
Wastewater Treatment:
Office of Environmental
Programs (EOP).....(301) 383-4214
Water Quality Monitoring (EOP).....269-3677
Fisheries Management:
Department of Natural
Resources (DNR)
Tidal Potomac.....269-3061
Non-tidal Freshwater.....269-3195
Stormwater management and
Erosion Control (DNR).....269-3825

Metropolitan Washington
Council of Governments
Department of
Environmental Programs.....(202) 223-6800,
ext. 320

Montgomery County
Wastewater Treatment:
WSSC.....(301) 699-4431
Department of Environmental
Protection.....251-2380
Stormwater Management and
Erosion Control.....251-2630
.....251-2290

Northern Virginia Planning
District Commission.....(703) 642-0700

Northern Virginia Soil
Conservation District.....(703) 591-6660

Potomac River Fisheries
Commission.....(804) 224-7148

Prince George's County
Wastewater Treatment
WSSC.....(301) 699-4431
Environmental Matters.....952-3400
Stormwater Management and
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794-6800
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