Potomac Basin
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C. Dalpra

A large stand of hydrilla reaches under the Woodrow Wilson Bridge just downstream of the Blue Plains regional wastewater treatment plant in 1991. Continuing enhancements at the plant are credited with helping increase submerged vegetation and reducing nuisance algae blooms.

Research Indicates Blue Plains Nitrogen Removal Significant Influence for Tidal Potomac

The regional Blue Plains wastewater treatment plant, which processes the majority of sewage for the Washington metropolitan area, has always been a critical part of the efforts to protect the Potomac River.

While the sewage generated by the metropolitan area represents a major impact to the river, the Blue Plains plant is recognized as a sophisticated facility that has over time lessened those impacts. The effects of enhanced nutrient removal at the plant has been a topic of discussion among engineers and scientists.

As part of that exchange, ICPRB Aquatic Ecologist Claire Buchanan analyzed data on nitrogen concentrations in the river to search for signs that the river was responding. Her assessment of water quality data indicates that improvements to the facility have helped decrease nitrogen concentrations in the tidal Potomac River. Increased nitrogen reductions will improve the river's health by promoting growth of aquatic plants and reducing algae blooms that can strip oxygen from the water.

Decreasing nutrient loadings from wastewater treatment plants has been a key strategy for restoring the Potomac River and Chesapeake Bay (the Potomac is the bay's second-largest tributary). Better farming and land development practices, stormwater and streambank erosion controls, restoration of submerged aquatic plants, and other management actions also contribute to improving aquatic health. Lower nutrient levels can help manage the nuisance algae blooms and ultimately help increase growth of desirable submerged plants, improve dissolved oxygen levels, and support greater numbers and diversities

Our mission is to enhance, protect and conserve the water and associated land resources of the Potomac River and its tributaries through regional and interstate cooperation.

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D. Loveland

In the 1970s, a touch of the hand on the surface of the metropolitan Potomac in summertime often yielded a thick slime of algae.

of fish and other creatures. All are important milestones in the restoration of the Potomac, and ultimately, the Chesapeake Bay.

The Blue Plains treatment plant, located in Washington, D.C., is the largest advanced, or tertiary facility in the world. It has benefitted from frequent enhancements since the Clean Water Act in the early 1970s. The most recent improvement to the plant came in 1996, with the installation of a biological nutrient removal (BNR) system. Biological systems use bacteria in a series of treatment processes that ultimately turn dissolved forms of nitrogen to a gas that escapes to the atmosphere. The system is more cost-effective than older, chemically based removal systems. The system was brought on line for several years as a pilot project, treating about half of Blue Plains' total flow, which averages about 320 million gallons per day. The plant has applied BNR to its entire flow since 2000. The plant's discharge permit does not require BNR during the winter, when the process is less efficient, although it was run during one of the two winters since the process was put online. Treating about 55 percent of the wastewater for the entire metropolitan area, Blue Plains by itself has reduced total nitrogen loadings from treatment plants by about one-third with the installation of BNR.

In reviewing river monitoring data, Buchanan compared conditions before and after BNR began functioning at Blue Plains. In an effort to eliminate the influence of other factors on ambient nitrogen concentration, she also sorted and compared data between seasons and similar river flow conditions. Comparing like seasons and flow conditions, Buchanan found that ambient nitrate concentrations have significantly declined in the tidal Potomac when BNR is operating.

As further evidence, Buchanan also observed much higher nitrogen levels during the winter that BNR was not run.

Nitrogen concentrations in estuaries are normally higher near their freshwater sources and steadily decrease downstream as nitrogen is absorbed by aquatic plants and diluted by tidal mixing with ocean waters. Before Blue Plains implemented

BNR, nitrogen concentrations rose sharply, nearly doubling, as the river journeyed the eleven miles through Washington, D.C. They did not subside to their initial, fall-line levels until approximately half way down the tidal river's 112-mile length.

Before and after comparisons indicate nitrogen concentrations decreased 22% to 63%, depending on season and flow, in the upper half of the tidal river after full BNR implementation. Smaller, more subtle deceases were observed in the lower river. The magnitude of the decrease was enhanced by the recent drought period, which reduced nutrient loads entering from the upper basin, making treatment plant loads relatively more visible. The effect will be less in wetter years in the upper estuary, but more pronounced in the lower Potomac.

The declines in nitrogen concentrations have shown some observable benefits in parts of the river. In the upper and middle portions of the estuary (upstream of the Route 301 Bridge), BNR appears to have contributed to declines in summertime blooms of blue-green algae. These algae blooms were at their peak in the 1960s and 1970s, when the river bore huge floating mats of algae from shore to shore each summer. The floating mats would rob the water below of sunlight, eliminating plant growth. The blooms would die off in the fall, their decay releasing nutrients and sapping the river of oxygen needed by fish. Phosphorus controls in the 1980s sharply curtailed, but did not eliminate the blooms. The BNR-related nitrogen reductions correlate with further reductions in the range and duration of the blue-green algae blooms, even under drought conditions that normally strengthen blooms in the upper part of the estuary.

The effect of the reduced upstream loadings on the lower estuary, where nitrogen levels are lower but exert a greater impact on the ecology, is difficult to measure. In the complex ecology of estuaries, the saltier waters are more sensitive to nitrogen concentrations (another nutrient, phosphorus, is more critical in freshwater). "Throughout the lower estuary, phytoplankton [algae] have plenty of nitrogen available to them. Although the concentrations are decreased, they are still too high for us to see measurable benefits from controlled plankton levels and improved dissolved oxygen," Buchanan said, "but the numbers are definitely moving in the right direction." Occasionally, nitrogen concentrations in the Potomac estuary were lower than those in neighboring Chesapeake Bay. Buchanan would like the benefit of further studies that could further define the contributions of BNR to the improved health of the river.

Continuing data analysis will be important in the coming years, as the Chesapeake Bay states set new nutrient reduction goals that can keep the Potomac and the bay a valuable recreational, economic, and quality-of-life resource that helps define the region.

While the benefits and costs of further enhancements at Blue Plains and other treatment plants will continue to be discussed, there is little doubt that BNR by itself will not solve the nitrogen problem, and that a combination of approaches will be needed to meet future nutrient reduction goals.

BNR Approved for Potomac Wastewater Plant

Maryland's Board of Public Works recently approved a $1.26 million grant that will allow Charles County, Md., to upgrade its Mattawoman Wastewater Treatment Plant with biological nutrient removal (BNR). The improvements to the plant will cost a total of about $27 million, paid for by the state, county, and the Washington Suburban Sanitary Commission, which owns some of the plant's capacity. With the completion of the facility upgrade in 2004 or 2005, all of Maryland's major treatment plants on the tidal Potomac will have BNR.

The plant, with a design flow of about 15 million gallons per day, is the county's major treatment plant, and will process water from the county's development area as it grows, noted Charles County Administrator Eugene Lauer.

"Charles County worked very hard with the state to achieve this environmental objective," Lauer said. "This represents the county and state's good stewardship." The upgraded facility is another step in the difficult job of reducing nutrient levels in the Potomac.

Conference Explores Shared Restoration Strategies

More resources, comprehensive education efforts, and a consistent message about the needs for and outcomes of restoration work are critical to future Potomac River basin restoration efforts, according to people at a recent conference hosted by ICPRB.

More than 130 attendees at the Shared Potomac Strategy Conference, held in Leesburg, Va., on November 20, convened to identify issues that must be addressed to meet nutrient-related water quality goals

throughout the basin. Many conference attendees also expressed a need for regional coordination of state and federal restoration efforts.

The conference was organized by ICPRB with assistance from the U.S. Environmental Protection Agency Chesapeake Bay Program, the Metropolitan Washington Council of Governments, and agencies from each of the basin jurisdictions: Maryland, Pennsylvania, Virginia, Washington, D.C., and West Virginia.

The Potomac Tributary Strategy entails goals developed from the multi-state and federal program to restore the Chesapeake Bay watershed, primarily through the reduction of the nutrients nitrogen and phosphorus and reduction of sediment pollution. Much has been accomplished in reducing nutrient pollution since the 1987 Chesapeake Bay Agreement was signed. The Bay Program signatory jurisdictions (the District of Columbia, Maryland, Pennsylvania, and Virginia) are at or close to the target load reductions agreed to in 1992. The bay remains impaired, however, and as part of the Chesapeake 2000 Agreement, the Bay Program partners agreed to reevaluate targets for bay restoration and develop new tributary strategies to accomplish them. The new pollutant load targets are due by April 2003 and are expected to require significant additional pollutant reductions.

The conference offered an opportunity for members of Potomac tributary teams, government officials and agency personnel, and other stakeholders to exchange ideas and hear presentations on existing and future restoration efforts. The conference featured a number of presentations, as well as breakout sessions that helped focus common ideas.

Attendees were welcomed by J. Charles Fox and W. Tayloe Murphy, secretaries of the Maryland and Virginia natural resource departments, respectively. Fox touted the state's enhanced nutrient removal policy for wastewater treatment plants as well as the difficulty in addressing nonpoint source pollution–runoff from agricultural and developed land. He also highlighted future state efforts focused on stream restoration carried out on the community level with state help. Murphy stressed the need to prioritize efforts, especially in light of the high costs associated with reducing nutrients to acceptable levels. He noted that there will be difficult choices, both in how to spend finite resources and in changing how we develop land while protecting water quality. He added that a vision for the bay needs to be further developed and enhanced.

Attendees heard from a range of other government representatives, who portrayed past success and future opportunities in restoring the Potomac. The panel presentations depicted the wide range of efforts that have helped to improve the watershed. Michael Marcotte, Chief Engineer of the District of Columbia Water and Sewer Authority, discussed the improvements in nutrient removal that have allowed the regional Blue Plains treatment plant to greatly improve conditions in the tidal river. The plant, which processes the bulk of the metropolitan area's sewage, is the world's largest advanced treatment facility.

Cameron Wiegand, with the Montgomery County, Md., Department of Environmental Protection, highlighted its ongoing innovative stream assessment and restoration program. Efforts by the county include protection of fragile stream valley land, construction of innovative stormwater control structures, county-wide assessment of all streams, and collaboration with government and public groups. He emphasized local government's focus on the restoration of local streams.

Tolif Hunt, Sideling Hill Creek project manager for the Western Pennsylvania Conservancy, described how a coalition of private and public entities have worked together to establish a monitoring plan and work toward protecting and improving Sideling Hill Creek, which drains portions of Pennsylvania and Maryland.

Mark Herring, a Loudon County, Va., supervisor, described efforts to manage growth and its impacts in the fastest-developing portion of the basin, including the use of innovative planning techniques to relieve some of the county's growing pains.

Kenneth Haid, with the U.S. Department of Agriculture National Conservation Research Service in West Virginia, described challenges to agriculture in reducing nutrient loadings in that state. He emphasized the cost-share programs and locally driven partnerships, that along with education, are having an impact.

A brief look at the future was covered by Tom Simpson of the University of Maryland, and Bob Koroncai of the U.S. Environmental Protection Agency Region III. Both presenters acknowledged the progress being made as a result of the previous success stories, as well as many others. Both noted that the hardest work in reaching bay and Potomac cleanup goals lies ahead. Attaining the

restoration goals will be costly and difficult, and steps toward the goals should be prioritized. Koroncai said that there is much to be done. He noted that about one-third of the nitrogen reduction goal and about half of the phosphorous goal had been attained. He added that more research will be needed to reach the goals, particularly a better understanding of how nitrogen and phosphorous loadings affect dissolved oxygen levels, which is critical to the types and numbers of fish and plants that live in a waterway.

Attendees broke into group sessions to search for common elements and efforts that could be strengthened through collaboration. The groups explored agriculture and urban/suburban land use issues, regional planning, and education and outreach challenges. Discussions allowed meeting attendees to hear about problems and solutions throughout the basin, and how existing and future efforts might be improved.

As members in each group discussed current policy for the various areas of the watershed, they also developed a range of ideas for improving those policies. Some of the most glaring differences across the basin came out as attendees discussed efforts to control runoff pollution, particularly differences between the Potomac basin states.

For many, those differences highlighted the need for greater coordination of regulation and education efforts. Many spoke of a growing need for a regional authority (ICPRB was repeatedly mentioned) that could work toward the standardization of land use policies and incentives for pollution reduction for the agricultural community, homeowners, and developers. It also was noted during the sessions that whatever organization or coalition that attempts that role will require the strong support of the watershed's state governments.

Differences in approach and regulation among the states also makes the job of educating the many stakeholder groups more difficult, several attendees noted. For many attendees, the importance of better education–for politicians, bureaucrats, the public, and students–was key to meeting restoration goals. This need was recently borne out in a survey by the Chesapeake Bay Foundation, which found high levels of concern for the environment, but a low level of knowledge on each individual's effects on and role in the cleanup. (See related story). Greater coordination in providing education throughout the basin to different stakeholders will be essential to the future of the cleanup, attendees agreed.

The conference received high praise from the attendees, and follow-up events are being planned to allow the group to continue coordinating their efforts. For more information on the conference, its goals, and copies of presentations and summaries of the breakout sessions, visit www.potomacriver.org.

ICPRB's New Website Online

Recently, the ICPRB website received a large and well-deserved facelift. The ICPRB's new site is designed to be one of the most useful and comprehensive sites devoted to the Potomac River Basin. The new cyberspace identity is navigable and well-organized with facts about ICPRB, the Potomac River Basin, and continuing projects with the commission. Users have the ability to quickly gather information about the commission and its tasks by clicking on one of nine main topics.

One of the most useful features of the new website is an interactive map of the Potomac River basin and watershed organizations of the area. This interactive map graphically provides contact information for basin watershed organizations to encourage citizens to get involved on a local level.

The "Living Resources" section offers information on tidal and non-tidal Potomac as well as the American shad restoration program. The "Tidal Potomac" page sports a thorough explanation of the efforts of the

K. Fligger

Learn more about the river at ICPRB's website.

Chlorophyll Criteria Team, a group that focuses on measuring chlorophyll-a as an indicator of plankton levels. The foci are on reducing excess plankton that degrade water quality and clarity in the Chesapeake Bay, which pose significant problems for the animals and plants that live in the area. Benthic macroinvertebrates, biological indicators for freshwater ecosystems, are

the subject of the “Non-tidal Assessments” page. This page offers detailed information on determining the health of freshwater streams in the Potomac basin through macroinvertebrate monitoring and habitat assessments. American shad, an important non-tidal species, was historically one of the key fish species in the Potomac River. Restoring the fishery is a long-term goal for ICPRB. More information about this project can be found on the “American Shad Restoration” page.

Water supply and demand issues are a growing concern in the Potomac River basin, particularly with last year’s drought and the uncharted future of water resources in the basin. The “Water Supply” section has a monthly update on the status of water throughout the basin. In addition, there are links to water flow and storage graphs, reservoir release graphs, and precipitation maps for understanding the fluctuation of water in the Potomac River and its tributaries. The site is now one of the foremost tools for helping the public and decision-makers to understand drought effects on and responses by the metropolitan-area water supply system. The site also assists ICPRB and the water suppliers in coordinating operations.

Citizen involvement is the key to protecting and restoring the Potomac River basin. The “Get Involved” section provides simple ways to improve water quality in and around your home, when you travel, and on the water. In addition, the calendar of events is updated regularly with information on presentations, clean-ups, and workshops.

The ICPRB website is a comprehensive information source on the Potomac River watershed, its health, and how it affects you. Please visit the website at **www.potomacriver.org** for more information about projects in your area and how you can get involved.

We will continue to enhance the site and provide the best information resource available about the Potomac basin. The site offers the opportunity to contact us with suggestions or comments. We look forward to hearing from you.

Watching the River Flow

Potomac River flows, as measured near Washington, D.C., reflected a wetter pattern in the basin, according to the U.S. Geological Survey.

October Potomac River flows averaged about 3.4 billion gallons per day (bgd), about 67 percent more than the historical monthly average of about 2.0 bgd. Daily extremes during October ranged from a low of about 1.3 bgd on October 10 to a high of about 7.6 bgd on October 19. Demand from metropolitan area suppliers averaged about 420 million gallons per day (mgd), about five percent more than October 2001. Freshwater inflow to the Chesapeake Bay averaged about 27.4 bgd during the month, about two percent below the historical average. The Potomac contributed about 17 percent of the total.

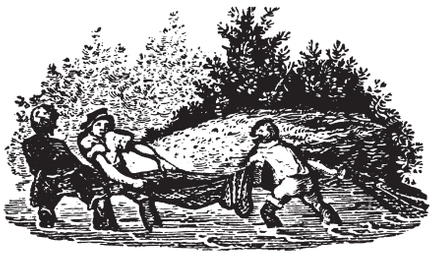
November continued with hoped-for flows well above average. Daily flows for the month averaged about 10.2 bgd, 93 percent higher than the historical average of about 5.3 bgd. Daily extremes for the motnh ranged from a low of about 5.8 bgd on November 7 to a high of about 18.9 bgd on November 19. Water withdrawn for drinking use in the metropolitan area averaged about 390 mgd, about one percent higher than in November 2001. Freshwater inflow to the Chesapeake averaged about, 57.2 bgd, or 47 percent above the historical November average. The Potomac contributed about 23 percent.

Groundwater levels, which had been at record low levels in some parts of the basin, have been responding to months of above average precipitation, and have made great gains. Many areas are back to near-normal levels.

Survey on Bay Watershed Health Shows Concern Strong, Knowledge Lacking

While nearly 90 percent of Chesapeake Bay watershed residents are concerned about its health, nearly half don’t strongly connect their actions or lifestyle to restoration efforts.

The survey, conducted for the bay program by Virginia Tech University, showed that education remains a strong



need in the effort to restore the bay and its tributaries. Most respondents believed that business and industry are the leading sources of pollution in local waterways.

Nutrient pollution, a major focus of cleanup initiatives, does come from wastewater treatment plants (see related article), agriculture, and construction, but is prevalent in all forms of stormwater runoff, from streets, rooftops, and lawns. How residents of the watershed maintain and fertilize their properties, control runoff, use water, and transport themselves and their families all have an impact on the water quality of local streams that feed the bay. Even small changes in behavior, if adopted by the majority, can have an impact on the environment.

Chesapeake Bay Program Director Rebecca Hanmer noted that "While bay leaders and government can take many steps to restore the bay, we will need the help of each citizen in the bay watershed to complete the job."

As with so many of the environmental challenges being faced, education is a critical aspect. The ICPRB continues a number of efforts toward educating the public on personal roles in the Potomac and bay cleanup, the foremost of which is its newly designed website, containing much information on getting involved in waterway health on a number of levels. The ICPRB and other agencies concerned with water quality clearly have more to do.

"The survey shows that many bay residents want to do their part to help, but don't quite know how. We hope to change that," Hanmer said.

The complete survey can be viewed at www.chesapeakebay.net/info/baysurvey.htm.

A Good Day's Swim

C. Dalpra

Ever wonder what its like to swim in water so big that you can't see the shore? You can ask people who know by attending the 2003 Potomac River Swim for the Environment on Saturday, May 31 at Point Lookout State Park, Md.

This will be the the 10th anniversary of the more than 7.5-mile swim across the river's mouth, where distance swimmers test their mettle against the river's tides and currents while raising awareness about the river, as well as money for several river organizations.

Last year, 31 swimmers began their journey with a boat ride from the park across the river to Hull Neck, Va., and swam back across the river in times that ranged from less than three hours to more than six. Ages of the contestants ranged from 16 (the winner), to 55 years old.

The race also provides an opportunity to network with members of environmental organizations in the southern basin, who also receive pledge donations collected by the swimmers. The Potomac River Association, Southern Maryland Sierra Club, Chesapeake Bay Foundation, Point Lookout State Park, and ICPRB benefit equally from the donations.

The swim would not be possible without a large group of volunteers, who provide safety services and pilot kayaks and motorboats that accompany the swimmers on their stroke across the river. Volunteers are needed to help in these safety and other roles, and spectators are welcome to join in a picnic lunch and cheer the swimmers to shore. Swimmers will board boats for Virginia at 8 a.m. for a 9 a.m. start across the river to the park. For more information or to volunteer, Contact Cheryl Wagner at (202) 387-2361, or email to cherylw@crosslink.net.

Help Needed for Potomac River Watershed Cleanup

Donate Three Hours and Make a Difference

C. Dalpra

Volunteers, site leaders, and other forms of support are needed to make the 15th Annual Potomac Watershed Cleanup the biggest and best ever. The event has grown continuously from a small cleanup on the grounds of the cleanup organizer, The Alice Ferguson Foundation Hard Bargain Farm. The cleanup now encompasses all the Potomac basin states and last year drew about 4,000 volunteers to 127 sites.

This spring's event, on Saturday, April 5, from 9:00 a.m. to noon can break new records in participation and awareness with your help. Cleanup organizers are looking for individuals or groups to sponsor new cleanup sites, volunteers for existing sites, and corporate support. More information is available from the Alice Ferguson Foundation website at **www.potomaccleanup.org,** or by calling (301)292-6665.

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