Contributions and Internet links are grouped in the general categories below and arranged in chronological order within each category. For the most part, downloadable documents are in a searchable Portable Document Format (PDF) format, although some PDF files contain documents as images and are not searchable. Use the search box on the right to find a particular topic, title, or author. PIA Guide to Contributors .

MORPHOLOGY AND SEDIMENTS

RIVER FLOW AND NUTRIENT LOADS

CONTAMINANTS

TIDAL WATER QUALITY

PHYTOPLANKTON AND AQUATIC PLANTS

ZOOPLANKTON AND BENTHIC INVERTEBRATES
FISH
WEATHER AND CLIMATE IMPACTS

GUNSTON COVE ECOLOGICAL STUDY

MORPHOLOGY AND SEDIMENTS

The shape of the estuary and the composition of its sediments have changed in the past three centuries. The changes have affected the estuarine habitats available to plants and animals.

2008 From a drowned river valley to a drowned river . [PDF, 43 KB]

Buchanan, C. (cbuchan@icprb.org). Conference paper prepared for the March 10-11, 2008 Potomac River Monitoring Forum (Metropolitan Washington Council of Governments)

The Potomac estuary is shallower, narrower, and fresher due to heavy sediment loads from the river basin over the last three centuries, and we do not have a good idea of its present ability to support restored animal and plant populations.

2006 Sediment phosphorus flux: pH interactions in the tidal freshwater Potomac River estuary. Final report. [PDF, 2.8 MB]

Bailey, E. M. (bailey@cbl.umces.edu), M. Owens, W. R. Boynton, J. C. Cornwell, E. Kiss, P. W. Smail, H. Soulen, E. Buck, and M. Ceballos. Technical report prepared for ICPRB. Technical Report Series No.TS-505-06-CBL, Ref. No. [UMCES]CBL06-005 of the University of Maryland Center for Environmental Science.

Field measurements and laboratory experiments were performed in 2004 and 2005 to further investigate the role of elevated pH in sediment phosphorus fluxes in the tidal fresh Potomac

River. (See also slide presentation by Bailey et al 2005.)

2003 Monitoring of sediment oxygen and nutrient exchanges in the Potomac River estuary in support of TMDL development . [PDF, 10.5 MB]
Bailey, E. M. (bailey@cbl.umces.edu), P. Smail, F. Rohland, B. Bean, M. Ceballos, N. Kaumeyer, W. R. Boynton. Technical Rept. to Maryland Dept. of Environment, Chesapeake Bay & Special Projects, Baltimore, MD. Ref. No. [UMCES] CBL 03-396.
Measurements of net sediment-water exchanges of nutrients (phosphorus and nitrogen) and oxygen, characterization of the nutrient content of surface sediments, water column respiration and measurement of water quality conditions in near-bottom water were made monthly during June, July and August 2002 within the Potomac River Estuary system.

2003 Dissolved oxygen and nutrient flux estimation from sediments in the Anacostia River . [PDF, 500 KB]

Bailey, E. K. M. (bailey@cbl.umces.edu), R. M. Stankelis, P. W. Smail, S. Greene, F. M. Rohland, W. R. Boynton. Prepared for the Government of the District of Columbia, The Health Department, Environmental Health Administration, Bureau of Environmental Quality, Water Quality Division. Ref. No. [UMCES] CBL 03-352.
This tidal Anacostia River study done in 2002 1) estimated of net sediment-water exchanges of phosphorous, nitrogen, and dissolved oxygen; 2) characterized the nutrient content and other features of surface sediments, including particulate carbon, nitrogen and phosphorus content, sediment Eh and sediment chlorophyll-a concentrations; 3) measured water quality conditions in near-bottom waters, including concentrations of dissolved nutrients, dissolved oxygen and hydrogen sulfide (only if measurable salt concentrations are present); and 4) measured water column respiration.

More to Come

RIVER FLOW AND NUTRIENT LOADS

Freshwater flows from the free-flowing river above Washington DC as well as tributaries in the Coastal Plain strongly influence tidal water quality.

2007. Water quality in the Upper Anacostia River, Maryland: Continuous and discrete monitoring with simulations to estimate concentrations and yields , 2003–05. [PDF, 5.3 MB]

Miller, C.V., A. L. Gutiérrez-Magness, B. L. Feit Majedi, and G. D. Foster. U.S. Geological Survey Scientific Investigations Report 2007–5142, 43 pp.

Continuous and discrete data for nutrients, sediments, and contaminants were collected in the Northeast and Northwest branches of the Anacostia River between 2003 and 2005, and were used to estimate loads, compare different models, and evaluate the sources and transport processes of contaminants.

2001 Effect of water residence time on annual export and denitrification of nitrogen in estuaries: a model analysis . [PDF, 200 KB]

Dettman, E. Estuaries 24(4):481-490
Responses of several estuaries to nitrogen loading rates and freshwater residence times were examined with a steady-state model. The Potomac estuary residence time for freshwater averages about 5 months. About 60.3% of its nitrogen inputs are lost to denitrification, sedimentation, and fish landings during that time; 39.7% is exported to Chesapeake Bay.

2000 Chapter 8: Potomac Case Study . [PDF, 640 KB]

US EPA. Chapter in "Progress in Water Quality: An Evaluation of the National Investment in Municipal Wastewater Treatment" EPA-832-R-00-008, June 2000.

Andrew Stoddard, Jon Harcum, James Pagenkopf, and Jonathan Simpson are the principal authors of this national study prepared for the US EPA Office of Water Management. Reductions in wastewater loading of BOD5, nutrients, and suspended solids resulted in demonstrable improvements in the ecological resources of the tidal Potomac.

1992 A watershed nitrogen and phosphorus balance: the upper Potomac River basin . [PDF, 1.5 MB]

Jaworski, N. A., P. M. Groffman, A. A. Keller, and J. C. Prager. Estuaries 15(1):83-95.

A watershed mass balance approach was used to evaluate inputs, outputs, and storage change of total nitrogen and phosphorus.

More to come

CONTAMINANTS

Contaminant loads to the Potomac estuary and contaminant concentrations in animals, sediments, and water are being measured and modeled.

2008 Finding contaminant sources in the Anacostia watershed using active biomonitoring with Corbicula fluminea . [PDF, 263 KB]

Phelps, H. L. (hphelps@hers.com). Conference paper prepared for the March 10-11, 2008 Potomac River Monitoring Forum (Metropolitan Washington Council of Government).

The bioaccumulation of chemical contaminants in Asiatic clams was used to identify sources of PBCs, PAHs,and metals in Anacostia River tributaries.

2007 PCB bioaccumulation factors in Potomac estuary fish . [PDF, 210 KB]

Buchanan, C. (cbuchan@icprb.org), C. Haywood, A. Nagel. Conference paper prepared for the November 26-30, 2007 Virginia/West Virginia Water Research Symposium, and available on pp 117-125 in the symposium proceedings [PDF, 5.7MB].

Bioaccumulation factors relating polychloroinated biphenyl (PCB) concentrations in fish tissue, water, and sediments were developed from state monitoring data and used in TMDL development.

More to Come

TIDAL WATER QUALITY

Water quality has responded to nutrient load reductions in the upper and middle reaches of the Potomac estuary, but not in the lower reach, which behaves more like an extension of Chesapeake Bay.

2003 Potomac River response to biological nitrogen reduction at Blue Plains WWTP . [PDF, 890 KB]
Buchanan, C. (cbuchan@icprb.org). Slide presentation prepared for multiple audiences.

Reductions in the Blue Plains WWTP nitrogen loads related to "biological nitrogen reduction" (BNR) technology have significantly reduced nitrogen concentrations in the upper and middle Potomac estuary, and appear to be reducing nitrogen concentrations in the lower estuary.

2000 Water quality section of the Potomac Integrated Analysis report . [PDF, 61 MB] *Note that it is a very large file*
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Romano, W. D. (bromano@dnr.state.md.us), B. D. Michael, and R. E. Magnien. Prepared by Maryland Department of Natural Resources, Tidewater Ecosystem Assessment Division.

Tidal Potomac water quality trends are hugely affected by which time period is analyzed. This very thorough report is an updated, more complete version of Appendix A in the 1999 Tidal Potomac Integrative Analysis Project report.

More to come

PHYTOPLANKTON AND AQUATIC PLANTS

Dramatic cyanobacteria (blue-green algae) blooms in the upper Potomac during summer months in the late 1970s and early 1980s, combined with the loss of underwater grasses

throughout the estuary, indicated an ecosystem over enriched with nutrients. Plant communities are slowly returning to more desirable levels.

2007 Long-term changes in abundance and diversity of macrophyte and waterfowl populations in an estuary with exotic macrophytes and improving water quality . [PDF, 1.2 MB]

Rybicki N. B., and J. M. Landwehr. Limnol. Oceanogr. 52(3):1195-1207.
Under improving water quality conditions, the exotic SAV species Hydrilla did not displace native SAV species. Waterfowl responded positively to SAV communities regardless of whether they were dominated by the exotic SAV.

2001 Investigations of the availability and survival of submersed aquatic vegetation propagules in the tidal Potomac River . [PDF, 900 KB]

Rybicki, N. B., D. G. McFarland, H. A. Ruhl, J. T. Reel, and J. W. Barko. Estuaries 24(3):407-424.
Habitat conditions rather than propagule availability appear to limit the establishment of plant communities in the tidal Potomac River.

2000 Linkages among submersed aquatic vegetation, nutrients, river discharge, and weather in the tidal Potomac River and Estuary . [PDF, 1.6 MB]

Carter, V., J. M. Landwehr, N. B. Rybicki (nrybicki@usgs.gov), J. T. Reel, and H. A. Ruhl. Available in the Potomac Integrative Analysis Online Collection at www.potomacriver.org
.

Linkages among primary producers, water quality, weather, and river discharge were explored to (1) evaluate the Chesapeake Bay Program submersed aquatic vegetation (SAV) restoration criteria; (2) develop a model for SAV success as related to Secchi depth; and (3) determine to what extent variation in SAV coverage can be explained by selected physical, chemical, and biological growing season variables.

1999 Chesapeake Bay habitat criteria scores and the distribution of submersed aquatic vegetation in the tidal Potomac River and Potomac Estuary, 1983-1997 . [PDF, 770 KB]

Landwehr, J. M. (jmlandwe@usgs.gov), J. T. Reel, N. B. Rybicki, H. A. Ruhl, and V. Carter. USGS Open-File Report 99-219, and Appendix E in the Tidal Potomac Integrative Analysis Project (1999).

A multivariate scoring system based on Chesapeake Bay Program habitat criteria was

developed to evaluate habitat conditions for SAV in different segments of the tidal Potomac River. Habitat scores were compared to yearly SAV coverage with mixed results.

More to come

ZOOPLANKTON AND BENTHIC INVERTEBRATES

A productive, healthy aquatic ecosystem efficiently moves the biomass produced by photosynthesizing plants through the food web to long-lived, large-bodied consumers such as fish, shellfish, and water birds. Two major components of the food web are the zooplankton and benthic invertebrates, both of which are still not as productive as they once were.

2004 Major findings of the 1984 - 2002 CBP zooplankton monitoring program [PDF, 750 KB]

Buchanan, C. (cbuchan@icprb.org). Summary paper prepared for Chesapeake Bay Program Living Resources Subcommittee, July 2004, and included in the January 12-13, 2005 Chesapeake Research Consortium “Zooplankton/Food-Web Monitoring for Adaptive Multi Species Management ” workshop materials.

*Zooplankton status in Chesapeake Bay was generally not good between 1984 and 2002. The Potomac River showed improving trends in abundance in low salinity waters, where anadromous fish spawn and grow up, but a declining trend in high salinity waters.*1994 The Asiatic clam (Corbicula fluminea) invasion and system-level ecological change in the Potomac River estuary near Washington, DC.
[PDF, 1.1 MB]

Phelps, H. L. Estuaries 17(3):614-621.
This paper presents evidence to support the theory the invasive Asiatic clam population in the 10 km below Washington, D.C., was responsible for SAV resurgence through filtration affecting turbidity. 1993 Zooplankton grazing in a Potomac River cyanobacteria bloom . [PDF, 2.7 MB]

Sellner, K. G., D. C. Brownlee, M. H. Bundy, S. G. Brownlee, and R. R. Braun. Estuaries 16(4):859-872.
Zooplankton grazing experiments on ambient phytoplankton populations suggest that the majority of cyanobacterial production remains ungrazed and may be transported to the lower estuary for salinity-induced aggregation and sedimentation.

1984 Effects of the Asiatic clam, Corbicula fluminea, on phytoplankton of the Potomac River, Maryland . [PDF, 1.3 MB]

Cohen, R.R.H., Dresler, P.V., Phillips, E.J.R., and Coy, R.L. Limnol. Oceanogr. 29(1):170-180. *High densities of Corbicula are implicated in the 1980 and 1981 phytoplankton "sag" in the upper Potomac estuary.*

More to come

FISH

Caught between their critical role in the natural world and their economic importance to human society, fish communities in the Potomac estuary have been in a state of flux since Colonial times. Some species that once supported thriving fisheries are now at record lows while others are slowly coming back.

More to come

WEATHER AND CLIMATE IMPACTS

The Potomac is located at the crossroads of two important weather patterns and experiences weather that is frequently difficult to predict. Sea level rise is impacting tidal shorelines, and the potential of other climate-related changes in the Potomac basin are becoming clearer.

2008 Consortium for Atlantic Regional Assessment (CARA) [website]

CARA provides resources that decision makers in the mid- and upper-Atlantic region can use for understanding current and future vulnerability to changes in land use and climate, and for developing and evaluating adaptation options.

2003 Mid-Atlantic Regional Assessment (MARA) [website]

The Mid-Atlantic Regional Assessment of climate change impacts (MARA) was one of 19 regional assessments conducted nationwide as part of U.S. National Assessment of the Potential Consequences of Climate Variability and Change.

More to come

GUNSTON COVE ECOLOGICAL STUDY

Carried out by George Mason University faculty, students, and staff since 1984, this remarkable study monitors and evaluates the water quality and many biological communities in the Gunston Cove area. Periodic reports contain valuable insights into how the ecosystem of a tidal fresh embayment of the Potomac estuary responds to point source reductions.

2008 An Ecological Study of Gunston Cove **2006** FINAL REPORT [PDFs, 2.3 MB]

Jones, R. C. (rcjones@gmu.edu), R. Kraus, and D. P. Kelso. Periodic report prepared for the Department of Public Works, Fairfax County, Virginia. Available on request.

2007 An Ecological Study of Gunston Cove **2004-2005** FINAL REPORT [PDFs, 4.0 MB]

Jones, R. C. (rcjones@gmu.edu) and D. P. Kelso. Periodic report prepared for the Department of Public Works, Fairfax County, Virginia.

Prior reports will be posted as they are scanned and made available