



Chesapeake Bay Program

Science. Restoration. Partnership.

Integrated Trends Analysis Team Updates

Greetings ITAT participants and interested parties,

In this newsletter, you'll find updates on our synthesis efforts, a summary of available tools for analyzing trends in tidal and nontidal water quality, and a list of recent journal articles from your fellow Chesapeake region colleagues. Journal articles are focused on topics related to explaining trends in ecosystem health and water quality.

Sincerely,

ITAT Organizers (Joel Blomquist, Jeremy Testa, Jeni Keisman)

Synthesis Efforts

Potomac River Basin Synthesis (Lora Harris)

This group has collaborated through a handful of meetings and conference calls over the past 10 months, and is busy conducting analyses linking water-quality trends in the Potomac's watershed with water-quality trends in its tidal waters. They are on track for submitting a manuscript and sharing some findings in the Spring of 2017.

SAV Synthesis (JJ Orth and Bill Dennison)

This group has held its first two meetings, is working on a review article, and has defined and committed to two new analytical projects. Both projects aim to advance understanding of factors affecting trends in SAV abundance and distribution. While some in the group focus on new research, others will work on

communicating the current state of knowledge to managers and jurisdictional partners. Stay tuned for communication products coming in Spring 2017.

Water Clarity Synthesis (Jeff Cornwell, Carl Friedrichs)

This group held its first phone call in September, during which they discussed the current state of knowledge on factors affecting trends in estuarine water clarity. The group also identified some analyses to be conducted in the coming months that will help to advance our understanding of the perplexing patterns that have been observed over the past 30 years. Future plans include a workshop in February 2017. The workshop will bring together subject matter experts to integrate recent findings and outline a synthesis report.

Tidal Water Quality Synthesis (Jeremy Testa)

This group has recently formed and will begin its work this Fall. The group's goals are: (1) to synthesize the current state of knowledge to explain bay-wide trends in tidal water quality; (2) to conduct some new analysis to advance our knowledge of factors affecting bay-wide trends in tidal water quality; (3) to produce a short white paper that will help inform regional managers' next phase of decision-making for the TMDL Mid-Point Assessment. Stay tuned for a presentation on the white paper in early 2017.

ITAT News

We are pleased to announce that Qian Zhang has joined UMCES to work as a monitoring data analyst at the USEPA Chesapeake Bay Program (CBP) Office. Qian recently earned his PhD from Johns Hopkins University, where he conducted research to quantify nutrient and sediment export from the Chesapeake Bay Watershed. His work at the CBP will focus on developing and conducting statistical analyses to better understand factors that drive water-quality patterns. Congratulations Qian!

The Chesapeake Research Consortium is also looking to publish a newsletter helping to update the scientific community about potential collaborative work and news. Please stay tuned for an email blast later this year!

Trends Analysis Tools

GAMs R package development (PIs: Rebecca Murphy and Elgin Perry)

Analysts at the MD Department of Natural Resources (MDDNR), Old Dominion University (ODU), and the VA Department of Environmental Quality (VADEQ) have been analyzing trends in water quality at long-term monitoring stations throughout the estuary since the mid-1990s. Over the past year, the CBP has teamed up with DNR, ODU, and VADEQ to update their analysis methods from a seasonal Kendall approach to an approach using Generalized Additive Models (GAMs). The method has been submitted to a STAC expert panel for review, and a journal article is planned for 2017. Contact Rebecca Murphy (rmurphy@cheapeakebay.net) for more information.

EGRET R package (PIs: Robert Hirsch and Laura DeCicco)

In the past several years, researchers at the USGS have developed and implemented the WRTDS method (Weighted Regressions on Time, Discharge, and Season) for analyzing trends in riverine water quality. The method is described in several journal articles and scientific reports, and has since been implemented by the USGS for annual reporting of long-term and ten-year trends at USGS monitoring stations throughout the Chesapeake Bay watershed.

To make this method more broadly available, the USGS developed the EGRET (Exploration and Graphics for River Trends) R package. EGRET is available to the research community at <https://cran.r-project.org/web/packages/EGRET/index.html> for more information and links to the EGRET package.

Recent Research

- Ator, Scott W., and Ana Maria Garcia. "Application of SPARROW Modeling to Understanding Contaminant Fate and Transport from Uplands to Streams." *JAWRA Journal of the American Water Resources Association* 52.3 (2016): 685-704.
- Beckett, Leah H., Andrew H. Baldwin, and Michael S. Kearney. "Tidal marshes across a Chesapeake Bay subestuary are not keeping up with sea-level rise." *PloS one* 11.7 (2016): e0159753.
- Cerco, Carl F. "Conowingo Reservoir Sedimentation and Chesapeake Bay: State of the Science." *Journal of environmental quality* 45.3 (2016): 882-886.
- Cerco, Carl F., and Mark R. Noel. "Impact of reservoir sediment scour on water quality in a downstream estuary." *Journal of environmental quality* 45.3 (2016): 894-905.
- Cornwell, Jeffrey C., et al. "Sediment-Water Nitrogen Exchange along the Potomac River Estuarine Salinity Gradient." *Journal of Coastal Research* (2015).
- Coxon, T. M., B. K. Odhiambo, and L. C. Giancarlo. "The impact of urban expansion and agricultural legacies on trace metal accumulation in fluvial and lacustrine sediments of the lower Chesapeake Bay basin, USA." *Science of The Total Environment* 568 (2016): 402-414.
- Gurbisz, Cassie, et al. "Mechanisms of Storm-Related Loss and Resilience in a Large Submersed Plant Bed." *Estuaries and Coasts* (2016): 1-16.
- Harding Jr, L. W., et al. "Long-term trends of nutrients and phytoplankton in Chesapeake Bay." *Estuaries and Coasts* 39.3 (2016): 664-681.
- Harding Jr, Lawrence W., et al. "Variable climatic conditions dominate recent phytoplankton dynamics in Chesapeake Bay." *Scientific reports* 6 (2016).

- Irby, Isaac D., et al. "Challenges associated with modeling low-oxygen waters in Chesapeake Bay: a multiple model comparison." *Biogeosciences* 13.7 (2016): 2011.
- Lee, Minjin, et al. "Climate variability and extremes, interacting with nitrogen storage, amplify eutrophication risk." *Geophysical Research Letters* 43.14 (2016): 7520-7528.
- Lee, Sangchul, et al. "Impacts of watershed characteristics and crop rotations on winter cover crop nitrate-nitrogen uptake capacity within agricultural watersheds in the Chesapeake Bay region." *PloS one* 11.6 (2016): e0157637.
- Li, Ming, et al. "What drives interannual variability of hypoxia in Chesapeake Bay: Climate forcing versus nutrient loading?." *Geophysical Research Letters* (2016).
- Linker, Lewis C., et al. "Influence of reservoir infill on coastal deep water hypoxia." *Journal of environmental quality* 45.3 (2016): 887-893.
- Miller, Matthew P., et al. "Quantifying watershed-scale groundwater loading and in-stream fate of nitrate using high-frequency water quality data." *Water Resources Research* 52.1 (2016): 330-347.
- Odhiambo, B. K., et al. "Effects of forested floodplain soil properties on phosphorous concentrations in two Chesapeake Bay sub-watersheds, Virginia, USA." *Environmental Science and Pollution Research* (2016): 1-11.
- Palinkas, Cindy M., et al. "The Influence of Breakwaters on Nearshore Sedimentation Patterns in Chesapeake Bay, USA." *Journal of Coastal Research* 32.4 (2016): 788-799.
- Patrick, Christopher J., Donald E. Weller, and Micah Ryder. "The relationship between shoreline armoring and adjacent submerged aquatic vegetation in Chesapeake Bay and nearby Atlantic Coastal Bays." *Estuaries and Coasts* 39.1 (2016): 158-170.

- Shields, Erin C., and Kenneth A. Moore. "Effects of sediment and salinity on the growth and competitive abilities of three submersed macrophytes." *Aquatic Botany* 132 (2016): 24-29.
- Tango, Peter J., and Richard A. Batiuk. "Chesapeake Bay recovery and factors affecting trends: Long-term monitoring, indicators, and insights." *Regional Studies in Marine Science* 4 (2016): 12-20.
- Wainger, Lisa, et al. "The relative influence of local and regional environmental drivers of algal biomass (chlorophyll-a) varies by estuarine location." *Estuarine, Coastal and Shelf Science* (2016).
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- Wang, Ping, et al. "Effects of cross-channel bathymetry and wind direction on destratification and hypoxia reduction in the Chesapeake Bay." *Estuarine, Coastal and Shelf Science* (2016).
- Wang, Ping, et al. "Influence of Wind Strength and Duration on Relative Hypoxia Reductions by Opposite Wind Directions in an Estuary with an Asymmetric Channel." *Journal of Marine Science and Engineering* 4.3 (2016): 62.
- Zhang, Qian, William P. Ball, and Douglas L. Moyer. "Decadal-scale export of nitrogen, phosphorus, and sediment from the Susquehanna River basin, USA: Analysis and synthesis of temporal and spatial patterns." *Science of The Total Environment* 563 (2016): 1016-1029.
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