



## ***Tidewater Ecosystem Assessment***

# **Patapsco River and Back River Water Quality and Habitat Assessment Overall Condition 2011-2013**

Healthy rivers and bays support a diverse population of aquatic life as well as recreational uses, such as swimming and fishing. To be healthy, rivers and bays need to have good water and habitat quality. High levels of nutrients and sediment lead to poor water quality. Poor water quality reduces habitat quality, including water clarity (how much light can get to the bottom) and the amount of dissolved oxygen in the water. In turn, habitat quality affects where plants and animals can live. The Maryland Department of Natural Resources (DNR) is responsible for monitoring water and habitat quality in the Chesapeake Bay and rivers, as well as the health of aquatic plants and animals. DNR staff use this information to answer common questions like “How healthy is my river?”, “How does my river compare to other rivers?”, “What needs to be done to make my river healthy?” and “What has already been done to improve water and habitat quality in my river?”

The Patapsco River and Back River basin has high to extremely high human population densities and intense urban land use (more than 50% of the watershed area). Point sources are the largest sources of nitrogen and phosphorus loadings, and urban run-off is the largest source of sediment loadings. Phosphorus and sediment levels have decreased in non-tidal streams in the Patapsco River watershed.

### ***How healthy are the Patapsco River and the Back River?***

Water quality in the tidal waters of the Patapsco River is fair because nitrogen levels are too high (Table 1). Water quality in the tidal waters of the Back River is poor because nitrogen and sediment levels are too high. Nitrogen and phosphorus levels have decreased in the Back River. Sediment levels have decreased in the Patapsco River.

Habitat quality is poor for underwater grasses in both rivers due to high algal densities and poor water clarity. Severe algal blooms are common in the Patapsco in the summer. Habitat quality for bottom dwelling animals is poor in the main Patapsco River. Summer dissolved oxygen levels in Back River are good but indicate poor habitat quality due to excessive algal densities.

Underwater grasses have been limited or not present in the Patapsco River. Back River had some underwater grass beds in 2011 but there was very little underwater grass growing in the river in 2012 or 2013. Bottom dwelling animals are not healthy in about 60% of the areas sampled in the Patapsco River. Bottom dwelling animals were marginally healthy during this period in Back River at a long-term monitoring station.

**Table 1. Summary of tidal habitat quality and water quality indicators.**

Algal densities, water clarity, inorganic phosphorus and sediment either ‘Meet’ or ‘Fail’ SAV habitat requirements for 2011-2013. Dissolved nitrogen levels below the level for nitrogen limitation ‘Meet’ criteria, otherwise ‘Fail’ criteria. Summer bottom dissolved oxygen levels either ‘Meet’ or ‘Fail’ EPA open-water 30 day dissolved oxygen criteria. Annual trends for 1999-2013 either ‘Increase’ or ‘Decrease’ if significant at  $p \leq 0.01$ ; blanks indicate no significant trend. Improving trends are in green, degrading trends are in red. Nitrogen trends are for total nitrogen, phosphorus trends are for total phosphorus, water clarity trends are for Secchi depth. \*While summer bottom dissolved oxygen levels ‘Meet’ criteria in Back River, this is the result of too much nutrients and poor water quality.

River	Water Quality			Habitat Quality		
	Nitrogen	Phosphorus	Sediments	Algal Densities	Water Clarity	Summer Bottom DO
Patapsco	Fail	Meet	Meet Decreasing	Fail	Fail	Fail
Back	Fail Decreasing	Meet Decreasing	Fail	Fail	Fail	Meet

***How does the Patapsco River and the Back River compare to other rivers?***

The Patapsco and Back rivers are in the ‘High Urban, Low Agriculture’ land use category. In the Patapsco River, nitrogen and phosphorus levels, algal densities and water clarity are moderate compared to other rivers, while sediment levels are lower (Figure 1). However, summer bottom dissolved oxygen levels in the Patapsco River are the lowest of all rivers in Maryland and greatly degraded.

In many ways, Back River water and habitat quality is the worst of all Maryland rivers. Percent urban land use in the Back River watershed is the highest (and percent agriculture is the lowest) of all Maryland rivers. Nitrogen and phosphorus levels in the water and algal densities are also the highest, and water clarity is among the worst. Sediment levels are also among the highest of the high urban watershed rivers. Even though summer bottom dissolved oxygen levels are the highest of all Maryland rivers, this is an indication of poor habitat quality due to high nutrient levels and algal densities.

***What needs to be done to make the Patapsco River and the Back River healthy?***

The biggest water quality and habitat issues are high nitrogen levels, high algal densities and poor water clarity. Upgrades to wastewater treatment plants will reduce nitrogen and phosphorus loadings to the rivers, and these improvements are already in place or planned. Reducing sediment loadings from urban runoff should also be a priority. Because most of the lower watersheds are heavily developed, retrofitting existing structures with alternatives to conventional building materials and methods should be used to reduce the amount of impervious surfaces and prevent additional degradation of water quality.

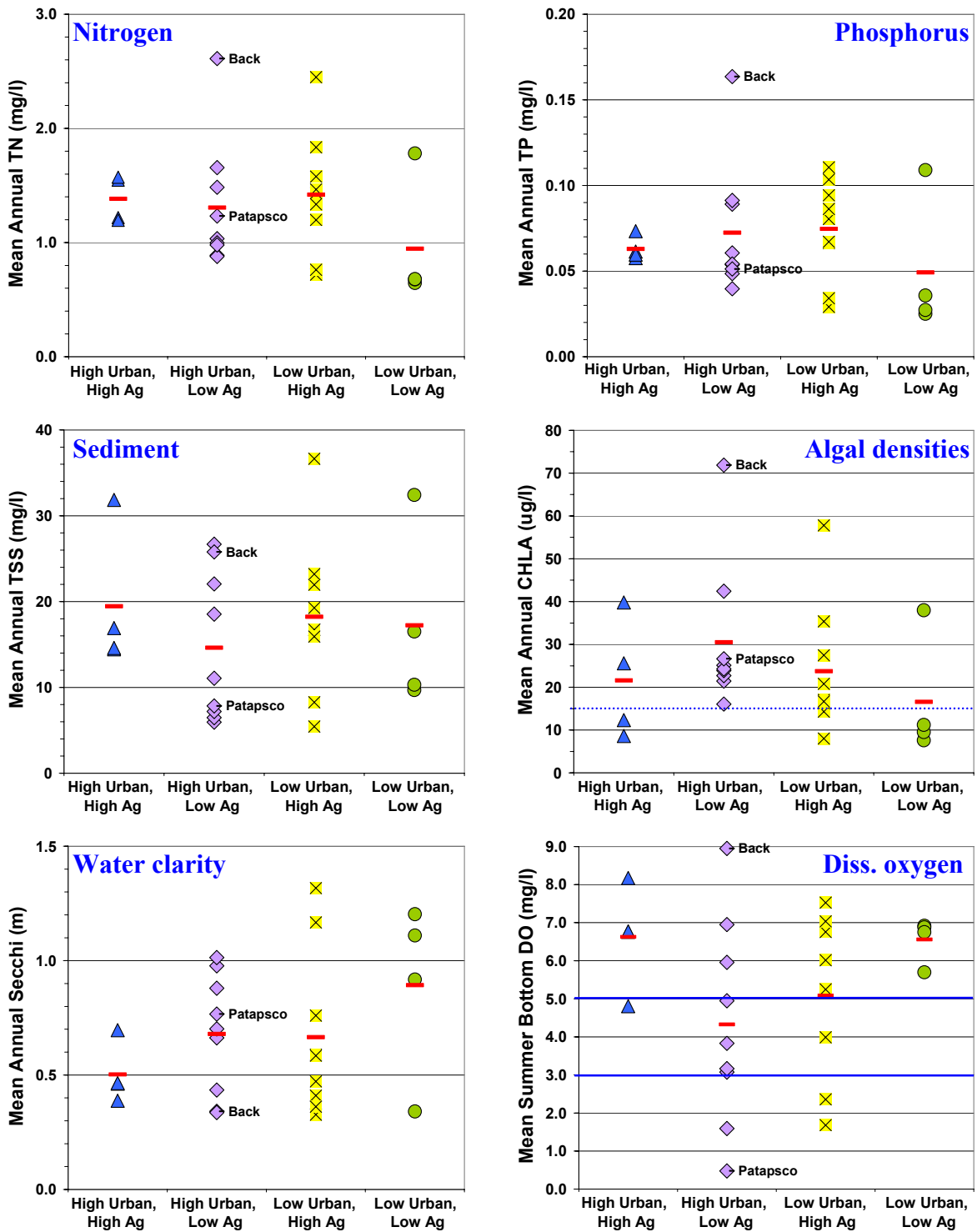
By lowering nutrients and sediment levels, water clarity should improve which will improve habitat quality for underwater grasses. Reductions in nutrients will also lead to lower algal densities and further improve habitat quality. Reducing algal densities by reducing nutrients will improve dissolved oxygen conditions, especially in shallow water areas.

***What has already been done to improve water and habitat quality in the Patapsco River and the Back River?***

A variety of actions have been taken to lower nitrogen, phosphorus and sediment loadings from urban lands. While specific goals have not been set for this basin, improvements are being made. Upgrades to the largest wastewater treatment plants that discharge to the Patapsco River are under construction and scheduled to be completed by 2015. Upgrades to the largest wastewater treatment plant that discharges to the Back River are scheduled to be complete by 2016. Previous upgrades at the Back River facility cut nitrogen levels in half. Stormwater retrofits have reduced nitrogen loadings and prevented more than 77,000 pounds of nitrogen from entering the rivers since 2003, and almost 190 septic system retrofits were completed between 2008 and 2013.

To reduce nutrient inputs from agricultural lands, additional management actions have been taken. In 2013 there were more than 5,990 acres of cover crops planted in between growing seasons to absorb excess nutrients and prevent sediment erosion. Fencing on over 7,100 acres of farmland was used to keep livestock out of streams and prevent streambank erosion. More than 2,500 acres of stream buffers were also in place, allowing areas next to streams to remain in a natural state with grasses, trees and wetlands.

Maryland also has a number of programs in place to reduce the impacts of continued development and increasing amounts of impervious surfaces in the Patapsco and Back Rivers watersheds. Program Open Space projects have conserved 415 acres of land for outdoor recreation opportunities. Rural Legacy Program projects have protected almost 1,200 acres, with special focus on areas with important cultural sites and natural resources and to ensure large areas of habitat. Maryland Environmental Trust projects have helped individual land owners protect more than 1,660 acres. Maryland Agricultural Land Preservation Program projects have preserved 450 acres of agricultural land from development.



**Figure 1. Comparison of the Patapsco River and Back River to similar rivers.**

The mean annual concentration or depth (bottom dissolved oxygen is only summer) for 2011-2013 data. Total nitrogen (TN), total phosphorus (TP), total suspended solids (TSS), chlorophyll *a* (CHLA), Secchi depth and summer bottom dissolved oxygen (DO). Red bars indicate the mean of all systems within a category. Reference lines are included on the CHLA and summer bottom DO graphs.

### **For more information**

An integrative assessment of the water and habitat quality of the Patapsco and Back Rivers for 1985-2010 is available online at

<http://mddnr.chesapeakebay.net/eyesonthebay/tribsums.cfm>.

The full report includes:

- Information on land use and human population densities within the basin, including the health of streams and location of Maryland Trust Fund Priority watersheds
- Information on land use in 2010, change in land use since 2000 and percent impervious surfaces in watershed
- Nutrient and sediment loadings information, including breakdown of nitrogen, phosphorus and sediment load by source (agriculture, urban runoff, point source, etc.)
- Loadings information for major wastewater treatment plants including status of upgrades and progress toward loading caps
- Water and habitat quality results for non-tidal streams and tidal waters from long-term monitoring programs
- Shallow-water monitoring results including percent failures of dissolved oxygen, chlorophyll and turbidity thresholds and comparison to long-term monitoring stations
- Phytoplankton information
- Submerged aquatic vegetation coverages
- Benthic program results
- Appendices with station locations, analysis methods and tabular results

Current water and habitat quality information is also available from Maryland DNR's Eyes on the Bay website [www.eyesonthebay.net](http://www.eyesonthebay.net)

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