

Patuxent 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?”

Land use in the Patuxent River watershed as a whole is roughly 40% urban and 40% forest. Approximately 20% of the watershed is used for agriculture. Agricultural land use is highest in the uppermost portions of the watershed, while the central watershed is 45% or more urban. The lower portion of the basin is largely forested. Human population density is mostly low, though moderate densities are common in the areas surrounding cities and towns. There are also a few pockets of lower population density and of very high density.

Point sources are the largest contributor of nitrogen and phosphorus and agriculture is the largest contributor of sediment to the upper river. Urban runoff is also an important source of nitrogen, phosphorus and sediment loadings to the upper river. Agriculture is the largest source of nitrogen, phosphorus, and sediment loadings to the middle river, but septic and forest sources are as important as agriculture for nitrogen loadings, and forest and urban are important sources of phosphorus loadings. Septic is the largest source of nitrogen to the lower river and forest and agriculture are also important. Point sources and agriculture are the major sources of phosphorus to the lower river, and sediment loadings are from agriculture and urban runoff.

How healthy is the Patuxent River?

Upper River

Sediment loadings from the upper river watershed increased but nitrogen loadings decreased. In the non-tidal waters of the Patuxent, phosphorus levels decreased; non-tidal nitrogen levels increased at the upstream station but decreased at the fall line station. There were no trends in sediment levels at the non-tidal stations.

In the tidal portion of the upper river, water quality is poor, but nitrogen, phosphorus and sediment levels are improving. However, nutrient levels are still too high throughout and sediment levels are too high in the lower portion (Table 1). Habitat quality is fair due to low water clarity and algal densities are too high at Nottingham.

Underwater grasses covered larger areas in the early 2000s, meeting restoration goals, but have not been as widespread in more recent years and only covered approximately 15% of the area needed to meet the restoration goal during this period. Bottom dwelling animal populations are healthy.

Middle River

In the middle river, water quality is poor due to high nitrogen, phosphorus and sediment levels. Nitrogen and phosphorus levels improved at the upstream station. Habitat quality is poor due to moderate algal densities, low water clarity and unhealthy dissolved oxygen levels at the two downstream stations. Habitat quality has degraded at the middle station. During the last ten years, underwater grasses covered more than 90% of the area needed to meet restoration goals for several years, but only covered approximately 15% of the goal during this period. Bottom dwelling animal populations are degraded or severely degraded in many areas and have degraded over the longer term period.

Lower River

In the lower river, water quality is good. Nitrogen, phosphorus and sediment levels are low enough to provide healthy habitat for underwater grasses. However, nitrogen levels increased at the upstream station. Habitat quality is poor in the upstream area due to poor water clarity, high algal abundances and unhealthy dissolved oxygen levels. Habitat quality is poor in the downstream area due to unhealthy dissolved oxygen levels. Habitat quality has degraded in the lower river overall.

Very limited areas of underwater grass beds are present in this section of the river. Bottom dwelling animal populations are degraded or severely degraded in many areas and have degraded over the longer term period.

How does the Patuxent River compare to other Maryland rivers?

The Patuxent River is in the 'High Urban, Low Agriculture' land use category. Compared to other similar systems, the Patuxent has lower nitrogen levels, moderate sediment levels and high phosphorus levels (Figure 1). Algal densities are relatively low. Water clarity is moderate for similar systems and summer bottom dissolved oxygen levels are moderate compared to similar systems but are below the 5 mg/l threshold for healthy systems.

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.

River portion	Station	Water Quality			Habitat Quality		
		Nitrogen	Phosphorus	Sediments	Algal Densities	Water Clarity	Summer Bottom DO
Western Branch	Upper Western Branch	Fail Decreasing	Meet	Meet	Meet		
	Mouth Western Branch	Fail Decreasing	Fail Decreasing	Meet Decreasing	Meet	Fail	
Upper River	Waysons Corner	Fail Decreasing	Fail Decreasing	Meet Decreasing	Meet	Fail	
	Jackson Landing	Fail Decreasing	Meet Decreasing	Fail Decreasing	Meet	Fail	
	Nottingham	Fail Decreasing	Meet Decreasing	Fail	Fail	Fail	Meet
Middle River	Lower Marlboro	Fail Decreasing	Fail Decreasing	Fail	Fail	Fail	Meet
	Jack's Creek	Fail	Fail	Fail	Fail Increasing	Fail Decreasing	Fail
	Long Pt.	Meet	Fail	Fail	Fail	Fail	Fail
Lower River	Jack Bay	Meet	Meet Increasing	Meet	Fail Increasing	Fail Decreasing	Fail
	Petersons Pt.	Meet	Meet	Meet	Fail Increasing	Fail	Fail
	Pt. Patience	Meet	Meet	Meet	Meet	Meet	Fail
	Drum Pt.	Fail	Meet	Meet	Fail Increasing	Meet	Fail Decreasing

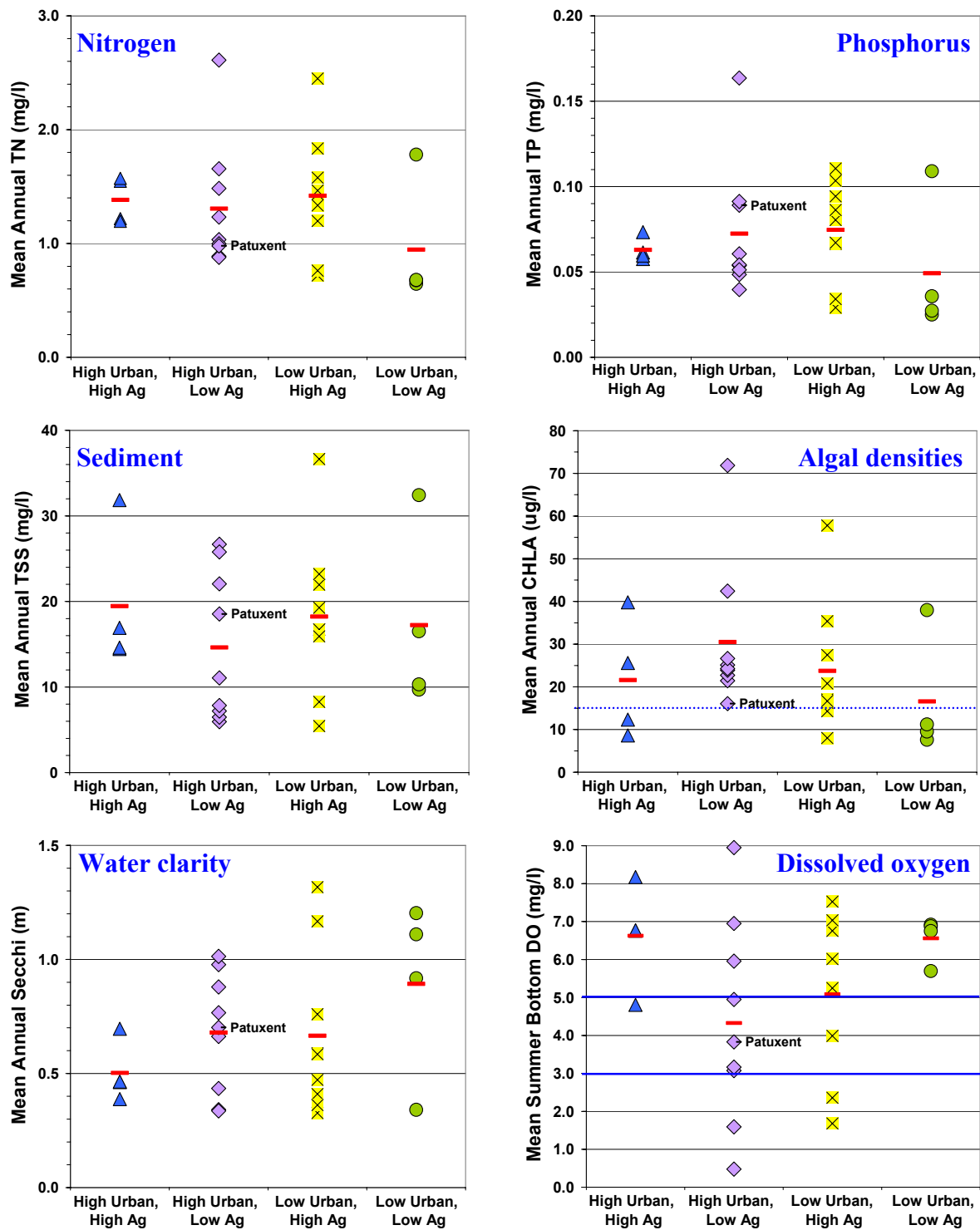


Figure 1. Comparison of the Patuxent River to similar systems.

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.

What needs to be done to make the Patuxent River healthy?

The biggest water quality and habitat issues are moderate to high nutrient and sediment levels and poor water clarity in the upper and middle river and very low dissolved oxygen levels in the lower river. Even though nutrient and sediment levels have improved, habitat quality has degraded. By further lowering nutrients and sediment levels, water clarity should improve which will improve habitat quality for underwater grasses. Lower nutrients will also lead to lower algal densities and further improve habitat quality. Lower algal densities will improve dissolved oxygen conditions and improve habitat for bottom dwelling animals.

Upgrades to wastewater treatment plants will reduce nitrogen and phosphorus loadings, and these improvements are already complete or under construction. Reducing nutrient and sediment loadings from agriculture should also be a priority. In heavily urbanized sub-watersheds, 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.

What has already been done to improve water and habitat quality in the Patuxent River?

A variety of actions have been taken to lower nitrogen, phosphorus and sediment loadings from urban lands. Upgrades to the largest wastewater treatment plant that discharges to the Patuxent River are under construction and will be completed by the end of 2014. Previous upgrades to the largest facilities have already reduced nitrogen loadings by half. Managing stormwater runoff has reduced nitrogen loadings and prevented 20,550 pounds of nitrogen from entering the river since 2003, and almost 450 septic systems retrofits were completed between 2008 and 2013.

To reduce nutrient inputs from agricultural lands, over 15,000 acres of cover crops were planted in between growing seasons to absorb excess nutrients and prevent sediment erosion. Fencing on over 9,300 acres of farmland was used to keep livestock out of streams and prevent streambank erosion. More than 3,100 acres of stream buffers were also in place, allowing areas next to streams to remain in a natural state with grasses, trees and wetlands. A total of 270 containment structures have been built to store animal wastes and allow these nutrients to be applied to the land in the most effective manner at the appropriate time.

Maryland also has a number of programs in place to reduce the impacts of continued development and increasing amounts of impervious surfaces in the Patuxent River watershed. Program Open Space projects have conserved almost 290 acres of land for outdoor recreation opportunities. Rural Legacy Program projects have protected more than 6,680 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 almost 3,500 acres. Maryland Agricultural Land Preservation Program projects have preserved 1,140 acres of agricultural land from development.

For more information

An integrative assessment of the water and habitat quality of the Patuxent River for 1985-2012 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

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