MARYLAND DEPARTMENT OF NATURAL RESOURCES

*Tidewater Ecosystem Assessment*

# Choptank and Little Choptank Rivers 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 Choptank River is divided into three regions- upper, middle and outer. Human population density is mostly low, but is moderate in small areas. Agricultural land uses cover more than 50% of the watershed, and agricultural sources are the largest contributors of nitrogen, phosphorus and sediment loadings. Urban runoff is also a source of sediment and phosphorus loadings, and point sources are important to phosphorus loadings to the outer Choptank.

Land use in the Little Choptank River watershed is half forest and approximately one-third agriculture. Agriculture is the largest source of nitrogen, phosphorus and sediment loads.

## *How healthy are the Choptank and Little Choptank Rivers?*

***Choptank River*** Water quality in the upper Choptank is poor. Phosphorus and sediment loads from the watershed to the non-tidal waters have increased, but phosphorus levels in nontidal waters have decreased. Still, nitrogen, phosphorus and sediment levels in the tidal waters of the upper Choptank are too high (Table 1). Habitat for underwater grasses is poor because algal densities are too high and water clarity is poor. Summer bottom dissolved oxygen levels are also low. No underwater grass beds were found in the upper Choptank. Bottom dwelling animal populations are healthy in this portion of the river.

Water quality in the middle Choptank is poor due to high nitrogen and sediment levels. Habitat for underwater grasses is poor because algal densities are high and water clarity is too low. Algal densities have also increased. No underwater grass beds were found in the middle Choptank but bottom dwelling animal populations are generally healthy. Harmful algal blooms occur in most years. Summer bottom dissolved oxygen levels are too low.

Water quality in the outer Choptank is fair due to low phosphorus and sediment levels but high nitrogen levels. Algal densities are low but have increased. Water clarity is good. Despite good habitat quality, underwater grass beds covered less than 30% of the area needed to meet the restoration goal during this period. Summer bottom dissolved oxygen levels are good. Bottom dwelling animal populations are healthy in the tributaries to the main river, but bottom dwelling animals are unhealthy in the central portion of the outer Choptank.

***Little Choptank*** Water quality in the Little Choptank is currently good due to low nitrogen, phosphorus and sediment levels. Habitat quality for underwater grasses is good but algal densities have increased. Underwater grass beds covered less than 12% of the area needed to meet the restoration goal during this period. Summer bottom dissolved oxygen is unhealthy and often below 2 mg/l.

**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.

| | Water Quality | | | Habitat Quality | | |
|---|---|---|---|---|---|---|
| **River portion** | **Nitrogen** | **Phosphorus** | **Sediments** | **Algal Densities** | **Water Clarity** | **Summer Bottom DO** |
| Upper Choptank | Fail | Fail | Fail | Fail | Fail | Fail |
| Middle Choptank | Fail | Meet | Fail | Fail<br>Increasing | Fail | Fail |
| Outer Choptank | Fail | Meet | Meet | Meet<br>Increasing | Meet | Meet |
| Little Choptank | Meet | Meet | Meet | Meet<br>Increasing | Meet | Fail |

***How do the Choptank and Little Choptank Rivers compare to other Maryland rivers?***

The Choptank River and the Little Choptank River are in the 'Low Urban, High Agriculture' land use category. In the Choptank River overall, nitrogen, phosphorus, sediment and summer bottom dissolved oxygen levels are moderate compared with other high agricultural systems, and water clarity and algal densities are better than other high agricultural systems (Figure 1).

The nitrogen, phosphorus and sediment levels, algal densities and water clarity in the Little Choptank River are among the best in all of the Maryland rivers and bays. However, summer bottom dissolved oxygen levels are extremely low and one the worst of any Maryland rivers and bays.

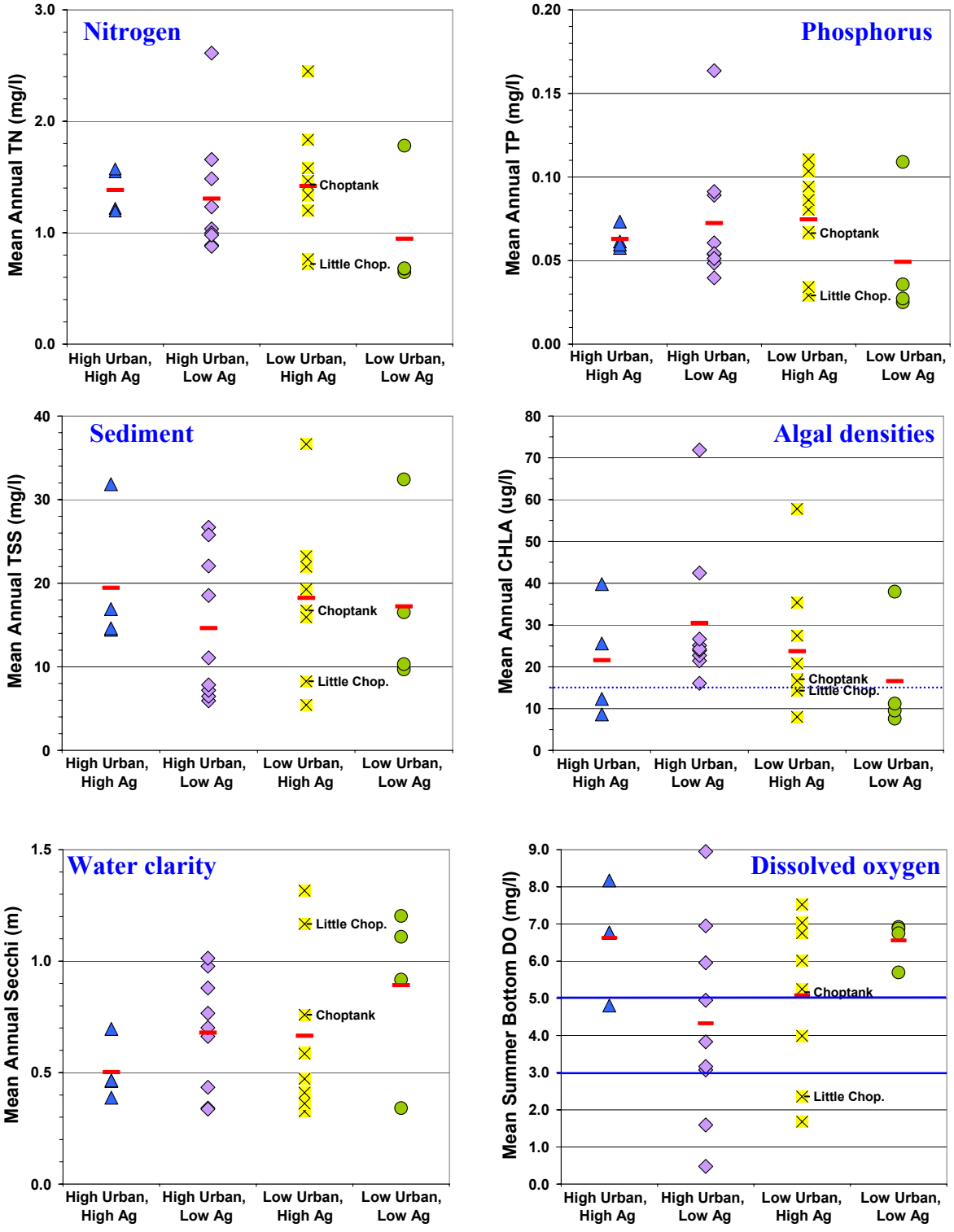


**Figure 1. Comparison of the Choptank and Little Choptank to similar rivers.**
The mean annual concentration or depth (bottom dissolved oxygen is only summer) for 2011-2013 data. Total nitrogen (TN), total phosphorus (TP), total suspended solids (TSS), chlorophyll *a* (CHLA), Secchi depth and summer 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.

***What needs to be done to make the Choptank and Little Choptank Rivers healthy?***

The most important problems that should be addressed in the Choptank River are nitrogen, phosphorus and sediment loadings from agricultural lands, especially to the upper river. Nitrogen levels in the upper and middle Choptank, water clarity in the upper river and water clarity in shallow water areas throughout the river also need to be improved. Efforts should focus on best management practices specific to agricultural lands. With lower nutrients and sediment, water clarity should improve which will improve habitat quality for underwater grasses. Lower nutrients will also reduce the frequency and duration of harmful algal blooms.

Urban land use in the Choptank watershed increased by 5% from 2000 to 2010. As more area is developed, alternatives to conventional building methods and materials should be used to reduce the amount of impervious surfaces and prevent additional degradation of water quality. Also, as more area is developed, management of wastewater through wastewater treatment plants instead of septic systems is also needed.

The most important problems in the Little Choptank River are low dissolved oxygen levels in the bottom waters and poor water clarity in shallow water areas. High turbidity in the shallow water reduces water clarity even though sediment levels met the habitat requirement for underwater grasses. Agricultural sources of nitrogen, phosphorus and sediment loadings should be reduced to improve water quality. Reductions in nutrients will lead to lower algal densities and further improve habitat quality. Improvements in algal densities will also help to improve the very low dissolved oxygen levels. Improved habitat quality for bottom animals will lead to more diverse and stable populations.

***What has already been done to improve water and habitat quality in the Choptank and Little Choptank Rivers?***

A variety of actions have been taken to lower nitrogen, phosphorus and sediment loadings from agricultural lands. While specific goals have not been set for this basin, improvements are being made. In 2011 there were more than 70,260 acres of cover crops planted in between growing seasons to absorb excess nutrients and prevent sediment erosion. Fencing on 370 acres of farmland was used to keep livestock out of streams and prevent streambank erosion. More than 260 containment structures had 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. Almost 18,350 acres of stream buffers were also in place, allowing areas next to streams to remain in a natural state with grasses, trees and wetlands.

To reduce nutrient inputs from urban lands, additional actions have been taken. Upgrades to the largest wastewater treatment plant that discharges to the Choptank River was completed in 2013. Previous upgrades to the facility have already reduced the nitrogen loadings to one-third and phosphorus levels to one-tenth of previous levels. No major wastewater treatment plants discharge to the Little Choptank River. Almost 380 septic system retrofits were completed between 2008-2013, and stormwater retrofits have reduced nitrogen loadings and prevented more than 2,500 pounds of nitrogen from entering the rivers since 2003.

Maryland also has a number of programs in place to reduce the impacts of continued development and increasing amounts of impervious surfaces in the Choptank and Little Choptank watersheds. Program Open Space projects have conserved almost 1100 acres of land for outdoor recreation opportunities. Rural Legacy Program projects have protected more than 3,480 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 7,575 acres. Maryland Agricultural Land Preservation Program projects have preserved almost 6,250 acres of agricultural land from development.

**For more information**

An integrative assessment of the water and habitat quality of the Choptank and Little Choptank 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**

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Chesapeake Bay Program
*A Watershed Partnership*