Western Branch Patuxent River Biological Oxygen Demand TMDL

Source Document:	MDE (Maryland Department of the Environment). 1999. Total Maximum Daily Load for Biological Oxygen Demand in the Western Branch of the Patuxent River. Document Version December 3, 1999.
Water Body Type:	Tidal and non-tidal tributary to the Patuxent River
Pollutant:	Biochemical oxygen demand (BOD)
Designated Uses:	Use I – Water Contact Recreation, and Protection of Non-tidal Warm Water Aquatic Life
Size of Watershed:	71,420 acres (111 square miles) Length: approx. 20 miles
Water Quality Standards:	5 mg/L minimum
Indicators:	Dissolved oxygen (DO)
Analytical Approach:	Water Analysis Simulation Program (WASP) 5.1
Date Approved:	Approved June 6, 2000

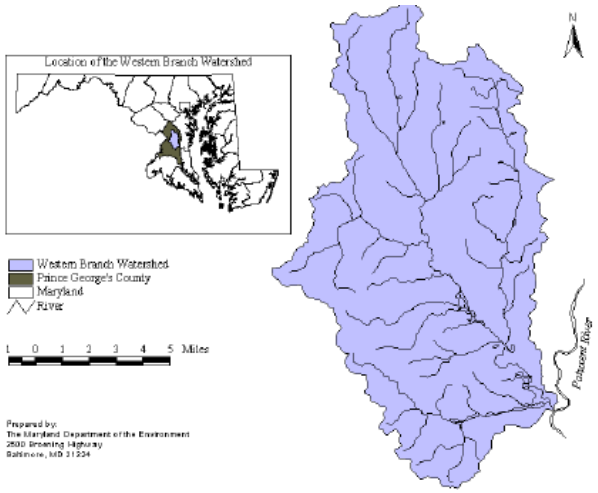

Figure 1. Western Branch of the Patuxent drainage area

Introduction

This Total Maximum Daily Load (TMDL) was developed to address low DO levels in the Western Branch of the Patuxent River (Figure 1) due to BOD. Because this is a low-flow TMDL, and stormflow contributions are not contributing to the problem condition, it is not as critical to municipal separate storm sewer system implementation planning as other TMDLs affecting streams in Prince George's County.

This fact sheet provides summary data related to the TMDL and includes specific information related to allocations made for Prince George's County, Maryland, regulated stormwater sources.

Problem Identification and Basis for Listing

Historical monitoring data from two stations (WXT0001 and WXT0045) in the Western Patuxent drainage were evaluated to characterize water quality. Available parameters included DO, chlorophyll *a*, dissolved inorganic nitrogen (ammonia, nitrite, and nitrate), and ortho-phosphate for the period between August 1990 and December 1998. Data showed that DO levels occasionally fell below the numeric criteria of 5.0 mg/L during summer months and exhibited frequent borderline low levels at other times.

Applicable Data

TMDL analysis was performed using the data collected from August 1990 to December 1998. Dry-weather sampling in the Western Branch watershed from 1995–1998 showed average in-stream concentrations of BOD to be 2.0 mg/L, which was assumed to be representative of the nonpoint contribution.

Sources

Sources contributing to low DO levels were primarily thought to be nutrients and BOD from point and nonpoint sources. One dominant point source, the

Western Branch Wastewater Treatment Plant (WWTP), contributes most of the nutrients and BOD to the system during low flows. Two other smaller point sources, Croom Manor Housing WWTP and Prince George's County Yardwaste Composting Facility also contribute small amounts of nutrients and BOD to the system. The point source values used in the TMDL analysis were taken from the facilities' discharge monitoring reports. The bulk of nonpoint sources (atmospheric deposition, runoff, septics) of nutrients and BOD are thought to enter at the upstream boundary near station WXT0045.

Technical Approach

Steady state simulations using the WASP 5.1 model were conducted using the Eutro 5.1 module to simulate effects of eutrophication. The upper boundary of the model is Station WXT0045 and the lower boundary is the confluence with the Patuxent River. The model simulates entry of two nonpoint source loads. One enters at station WXT0045. The second, Charles Branch, enters just before the confluence of the Western Branch with the Patuxent River. These nonpoint source loads represent all loading from atmospheric deposition; septic tanks; and loads from urban development, agriculture, and forest land. The Western Branch WWTP is represented as a direct discharge to the Western Branch, and the Croom Manor Housing WWTP is represented as a direct discharge at the same location as the entrance of Charles Branch.

Steady state simulations representing three groups of scenarios were conducted:

- Beginning condition scenarios – represented the future conditions of the system with no reductions in point or nonpoint source loads.
- Impairing substance determination scenarios – analyzed the sensitivity of the system to several different nutrient and BOD loading conditions, which showed BOD to be the primary factor behind the low DO concentrations.
- Final condition scenarios – represented the projected maximum point and nonpoint source loads

Allocations

Analyzing the various model scenarios resulted in a final loading allocation of 84,840 lb/month BOD for April 1–October 15 (Table 1)**.** Allocations were developed for the 7Q10 critical flow and are applicable only during the specified period. Nonpoint source allocations are small because they are assumed to be very small during the critical condition. In addition, during times of rainfall where stormwater runoff is occurring, DO concentrations are not a problem. The TMDL also included a future allocation and an explicit margin of safety.

Table 1. BOD Allocations (lb/month)

Allocations	NPS	PS	Future	MOS
BOD	1,040	75,080	4,680	4,040

Note: NPS = nonpoint source; PS = point source; MOS = margin of safety.

Table 1 uses the assumption that the Western Branch WWTP will continue meeting its current National Pollutant Discharge Elimination System (NPDES) discharge limits for nitrogen, ammonia, and phosphorus, and that the Croom Manor WWTP will continue meeting its NPDES limit for nitrogen. In addition, this TMDL indicates that water quality standards will be met if DO concentrations from the Western Branch WWTP are increased to 7 mg/L; revising limits was to be addressed during the permit renewal process.

For the nonpoint source allocation, the low-flows (7Q10 flows) are attributable to baseflow contributions. The 2.0 mg/L concentration was multiplied by the 7Q10 flow (3 cubic feet per second) at the upper boundary of the Western Branch and the Charles Branch to produce the nonpoint source load allocations for the TMDL.

Reference

MDE (Maryland Department of the Environment). 1999. Total Maximum Daily Load for Biological Oxygen Demand in the Western Branch of the Patuxent River.