MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
SURFACE WATER QUALITY DIVISION
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STAFF REPORT

INFORMATIONAL TOTAL MAXIMUM DAILY LOAD FOR DISSOLVED OXYGEN IN SYCAMORE CREEK

Introduction

In 1986 the Part 4 Rules of the Michigan Water Resources Commission (Michigan's water quality standards) were revised. This revision increased the dissolved oxygen (DO) standard and provided for comprehensive plans to be prepared for streams that were not meeting the higher DO standard. These comprehensive plans were to form the basis for point and nonpoint source pollution controls to meet the new, higher DO standard. The previous DO standard would apply in the interim.

For demonstration purposes, Sycamore Creek in Ingham County was chosen for the first comprehensive plan for the following reasons:

1. It is close to the Michigan Department of Natural Resources (MDNR) monitoring resources in Lansing.

2. The United States Department of Agriculture (USDA) had chosen Sycamore Creek for intensive cost share and technical assistance for farmers, increasing the probability of success.

3. It has problems representative of many southern Michigan streams.

4. It has only one significant point source discharge (Mason wastewater treatment plant) which avoids complications of multiple discharges.

5. It has uncomplicated hydrologic features.

In 1987, the Federal Clean Water Act was amended and provided for a planning process similar to comprehensive plans called total maximum daily loads (TMDLS). The TMDL process is similar to Michigan's comprehensive plan process but it offers a process to address any water quality standard, not just DO. We have decided to finish the Sycamore Creek demonstration project and do all future comprehensive plans using the TMDL approach because it's application is not as restrictive as the comprehensive planning process.

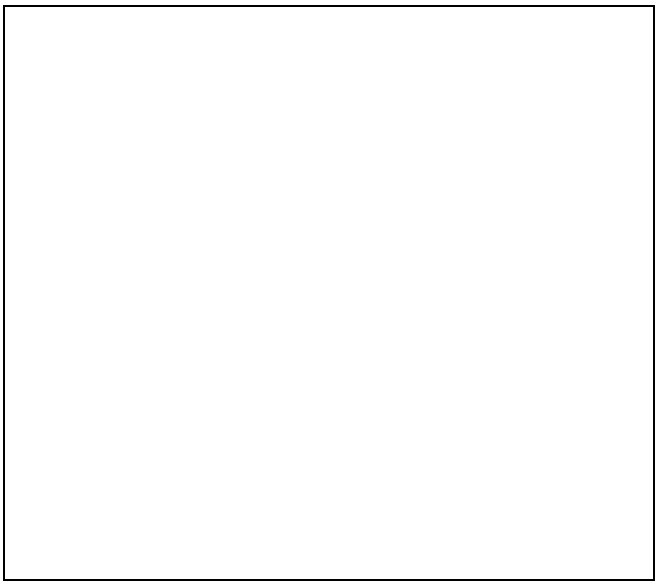

Figure 1 Sycamore Creek and Vicinity

The Sycamore Creek TMDL is considered an informational TMDL. This means that Sycamore Creek is not on the Clean Water Act Section 303d list of priority sites needing TMDLs. Sycamore Creek is not on the list because technological solutions (best management practices or BMPs) will allow the stream to meet the standard. The completion of this TMDL is important for demonstration purposes. Sycamore Creek (Figure 1) will serve as a model for predicting the practicality, cost effectiveness and likelihood of meeting the DO standard in other similar streams.

TMDL

The technical work for the Sycamore Creek TMDL is described in more detail in a paper which was published in the proceedings of the 1992 Water Environment Federation annual meeting (Suppnick 1992). Dissolved oxygen modelling was performed based on data collected in 1989. Modelling showed that Sycamore Creek is not expected to meet the DO standard under drought flow conditions in the summer season. The model simulated DO with the Mason wastewater treatment plant (WWTP) at observed 1990 loading rates of oxygen demanding substances. The daily minimum DO expected at drought flow at 4 locations is as follows:

W. Service Dr.	0.0 mg/l
Cemetery	4.4 mg/l
Howell Rd.	4.5 mg/l
Harper Rd.	3.9 mg/l

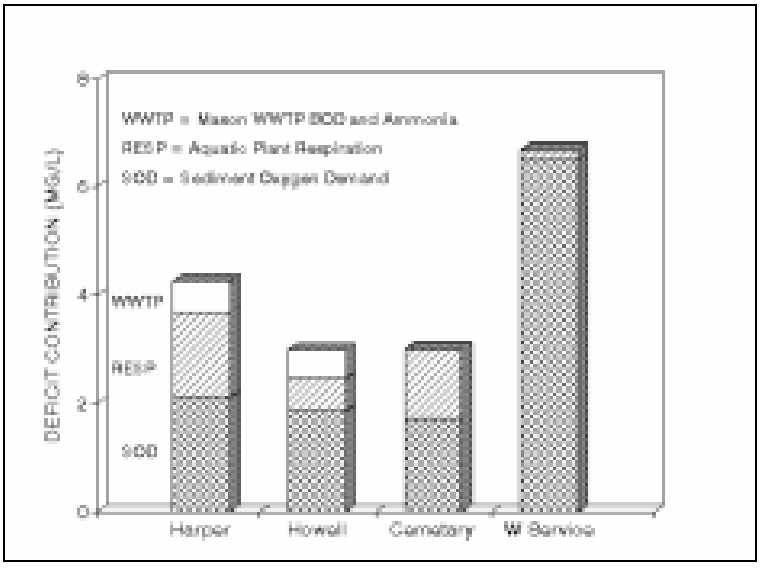

Figure 2. Relative Contribution of DO Sinks to the DO Deficit

The primary dissolved oxygen sink is sediment oxygen demand followed by aquatic plant respiration (Figure 2). The proposed TMDL calls for requiring a stable effluent from the Mason WWTP and reducing sediment oxygen demand by 52%. A stable effluent means that the Mason WWTP must not exceed 4 mg/l of BOD_5 and 0.5 mg/l of ammonia. This level of treatment is assumed to have an insignificant effect on DO in the stream.

The proposed TMDL will allow the DO standard to be met in Sycamore Creek by controlling sediment inputs and thereby reducing sediment oxygen demand in Sycamore Creek. An improvement in DO is expected from sediment load reductions because sediment oxygen demand will decrease as the extent and depth of sediment deposits on the stream bottom decrease. A decrease in sediment deposits on the stream bottom will have the added benefit of improving stream habitat characteristics. Figure 3 shows the existing average annual load of suspended solids from each source and the recommended reduction for each source to achieve an overall reduction of 52%. In this allocation, the two largest sources (stream banks and agricultural land) would be reduced by equal percentages (56%). The recommended urban source reduction is 30%.

The recommended allocation is reasonable and achievable by careful targeting of erosion control measures to important agricultural fields adjacent to the stream, construction sites in the urban area, and the most severely eroding stream channels.

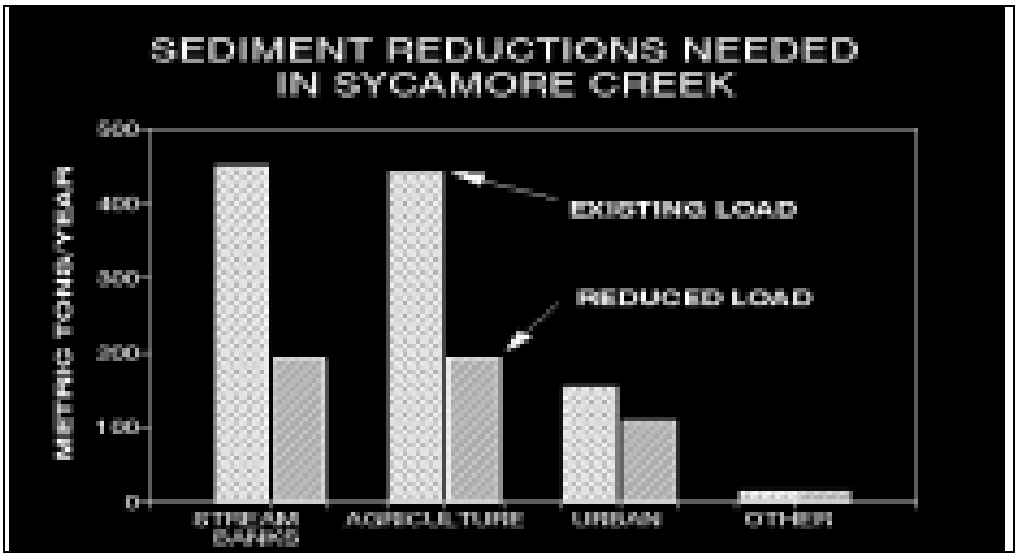

Figure 3. Existing Sediment Sources and Recommended Reductions for Sycamore Creek Upstream of Harper Rd.

Implementation of Corrective Actions

We are using a voluntary approach to achieve the needed sediment reductions. Actions to reduce the sediment load to the stream have begun. The necessary load reductions from agricultural lands will be achieved in part by an ongoing program of the United States Department of Agriculture (USDA), which has the goal of a 50% reduction in erosion on agricultural land (USDA 1990). This program began in 1990 and will continue through at least 1998. Technical assistance is available for farmers and other landowners from the USDA and the Ingham County Soil Conservation District. In addition, cost share money is available to farmers for the implementation of critical area seedings, grass waterways, permanent vegetative cover and other best management practices (BMPs).

The Ingham County Drain Commissioner has obtained grant funds under Section 319 of the Clean Water Act from the Environmental Protection Agency (EPA) for the implementation of stream bank stabilization measures in a portion of the watershed. Implementation of these measures began in 1995 and will make significant progress toward the stream bank erosion reductions specified in this TMDL.

Follow-up Monitoring

The follow-up monitoring in this project is to measure the suspended solids load reductions achieved by erosion control. A response in the suspended solids levels is expected within about 1 year of the implementation of erosion control and will allow quicker feedback on the effectiveness of actions taken than waiting for the DO to improve in the stream.

Follow-up monitoring is being funded by EPA under the national 319 monitoring program. Monitoring of three agricultural subwatersheds using a paired sampling approach is being conducted to provide feedback on whether corrective actions will reduce sediment loads to the stream. These watersheds (Willow Ck., Haines Dr., Marshall Dr.) are shown in Figure 1. Haines Drain is not a part of Sycamore Creek and serves as a control watershed. This monitoring began in 1989 and is funded through 1997.

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References

Suppnick, John D.. 1992. A Nonpoint Source Pollution Load Allocation For Sycamore Creek, in Ingham County Michigan. Proceedings of the Surface Water Quality and Ecology Symposium, Water Environment Federation, Alexandria, Virginia. p 293-302.

United States Department of Agriculture. 1990. Sycamore Creek Watershed Water Quality Plan. USDA, Ingham County, Michigan.