Total Maximum Daily Loads for the Sugar Creek Basin

Final Report

Prepared by

Ohio Environmental Protection Agency
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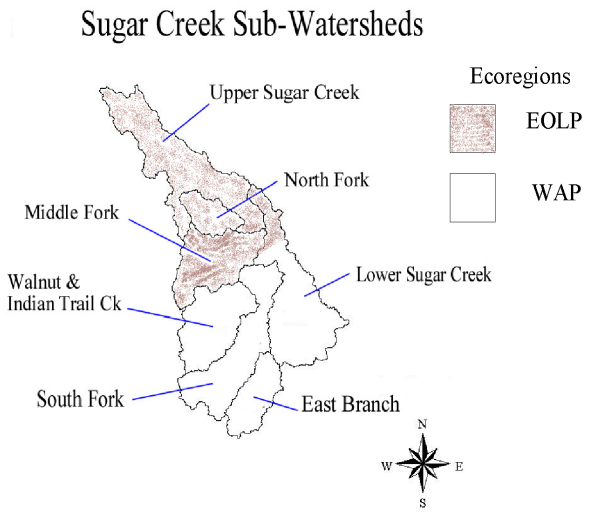

Basin: Sugar Creek, in the Tuscarawas River Basin
Study Area: Whole watershed; listed segments are highlighted in Table 1 and Figure 3 of this report.
Goal: Attainment of the appropriate Aquatic Life Use
Major Causes: Sedimentation, habitat alteration and nutrient enrichment.
Major Sources: Agricultural runoff, streambank modification, lack of riparian vegetation, faulty septic systems, and municipal/industrial discharges.
Measure: Total phosphorus, total nitrogen, biological and habitat indices
Restoration Options: Agricultural runoff controls, fencing livestock, habitat protection and restoration, riparian improvements, septic system improvements, point source controls, and public education & outreach

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Executive Summary

The Sugar Creek watershed covers 357 square miles in northeast Ohio in Wayne, Stark, Holmes, and Tuscarawas counties. The mainstem is 45 miles long and flows from the north near Smithville to the south where it joins the Tuscarawas River near Dover. More than 70% of the basin's land is devoted to agricultural uses including dairy, beef and poultry confined feeding operations, row crops, and forage production. Ohio EPA conducted a comprehensive biological, chemical and bacteriological assessment of the Sugar Creek basin during the summer of 1998. The 1998 Sugar Creek study area included the mainstem from RM 42.8 (near Smithville) to the mouth, including all tributaries with a drainage area of five square miles. Habitat evaluations were determined using Ohio EPA's QHEI (habitat) index. Survey results showed that most locations surveyed throughout the basin failed to meet the assigned aquatic life uses.

The extent of **NON** attainment throughout most of the watershed distinguished Sugar Creek as one of the most degraded basins in Ohio. **The most significant causes of aquatic life habitat impairment in the Sugar Creek basin are sediments/siltation, habitat alteration and nutrient enrichment.** The recreational use of the waterbodies are also being impaired by widespread exceedances of bacterial water quality criteria. Although this report doesn't include TMDLs for bacteria (due to insufficient data), many of the management practices recommended for sediment and nutrient load reductions are expected to lower bacteria loads as well. After the management practices are implemented, the Sugar Creek watershed will be reassessed to verify if bacteria counts are still excessive. The possible impact of abandoned mines on Sugar Creek will also be assessed during future surveys.

The goal of the Sugar Creek TMDL is to achieve full attainment of the applicable biological and chemical water quality standards for all impaired segments, included the 303 (d) listed ones. While only 7 segments are included in the 1998 303 (d) list, additional information about unlisted segments is included in the appendices. The absence of listed segments in some of the subwatersheds is explained by the fact that the 1998 TMDL list was based on limited data collected prior to 1998. When the 303(d) list is revised (in 2002), it is likely that all the subwatersheds will have listed segments, based on the results of the basin wide assessment conducted in 1998-99.

The parameters addressed in the Sugar Creek TMDL are Sediment and Nutrients (Total Phosphorus and Nitrate +Nitrite). **Since good habitat is needed to achieve the applicable biological and chemical water quality standards, this report includes an evaluation of habitat conditions in the Sugar Creek basin, and recommends desirable habitat score targets.** Ohio EPA currently does not have statewide numeric criteria for nutrients but potential targets have been identified using a technical report entitled *Association Between Nutrients, Habitat, and the Aquatic Biota in Ohio Rivers and Streams* (OEPA, 1999). The recommended nutrient targets used in this TMDL are based on that document. It is important to note that these nutrient targets are not codified in Ohio's water quality standards and therefore there is a certain degree of flexibility as to how they can be used in a TMDL setting. It is the biocriteria and not the nutrient targets that will be measured to determine full attainment of water quality standards. The nutrient targets vary by drainage area, helping compensate for lower upstream flow.

Sedimentation from agricultural activities and streambank erosion may be the key factor preventing the attainment of biological standards. It is clear that sedimentation affects all downstream segments, and must be controlled starting with the headwater streams. A Maumee River tributary showed a 50% sediment load reduction after farmers gradually adopted conservation tillage. Ohio EPA recommends that watershed groups set a goal of having 50% of their cropland under no-till or conservation tillage. This goal is based on the results observed in tributaries to the Maumee River (USGS, 2000). A 30% sediment load reduction is recommended as a feasible goal that should boost biological criteria scores in the Sugar Creek basin.

Nutrient and sediment loading in the Sugar Creek basin was simulated using the Generalized Watershed Loading Function or GWLF model. The complexity of this model falls between that of detailed, process-based simulation models and simple export coefficient models which do not represent temporal variability. Point source loads were also included in the simulations, using design flows and permit limits. The model was calibrated for the whole watershed, and used to determine loads for each subwatershed. The calibrated model was used to estimate background nutrient and sediment loads.

Various watershed groups in the Sugar Creek basin have been awarded Section 319 grants to prepare and implement watershed plans. Ohio EPA will provide technical support to help them implement management practices recommended in this TMDL report. A participatory approach for development of watershed groups is successfully being promoted by OARDC (Ohio Agricultural Research and Development Center) in the Sugar Creek basin. This approach will be applied by OARDC to other subwatersheds in the Sugar Creek basin to form stakeholder groups.

Nutrient loads from point sources are being reduced through the NPDES permit process. The implementation of a basinwide total phosphorus limit of 1 mg/l for point source dischargers has already started, and will continue as permits are renewed. Although point source limits are subject to a compliance schedule, it is expected that most point sources will meet the recommended phosphorus effluent limits within 5 years. Point source load reductions for NO_3 + NO_2 are only recommended for one subwatershed (North Fork) for which point sources are the main sources of nitrogen. For other subwatersheds, top priority should be given to nitrogen load reductions from failing septic systems, crop production and livestock activities. Although this report focuses on the listed segments, the basinwide recommendations will protect headwater and effluent dominated tributaries and result in a considerable nutrient load reduction.

Ohio EPA recommends that habitat improvements aimed at achieving the QHEI (habitat) index goal of 60 be implemented within 5 years from the date of this TMDL report. This will assure that the management practices will be in place before the existing watershed coordinator grant ends. Some riparian improvements have already been installed in the East Branch and Upper Sugar Creek subwatersheds.