Measures of Success-Water Resources Division

STATE OF MICHIGAN, DEPARTMENT OF ENVIRONMENTAL QUALITY

Nutrient Framework to Reduce Phosphorus and Nitrogen Pollution

Introduction to Measures of Success

The Water Resources Division's (WRD) Measures of Success (MOS) define expected outcomes for the Division whose mission is to make Michigan's waters safe and clean for recreation, fishing, drinking, and healthy aquatic ecosystems. Five major goals provide definition to this mission: (1) Enhance Recreational Waters; (2) Ensure Consumable Fish; (3) Protect and Restore Aquatic Ecosystems; (4) Ensure Safe Drinking Water; and (5) Protect Public Safety.

The measures are based on what is currently measurable and cover a broad suite of concrete goals for the Division to work toward and assess progress. Within the 2013 MOS document there are several goals that relate to nutrient loading reductions to Michigan's surface waters.

MOS Linked to Nutrient Loading Reductions

Goal1, Outcome 3: Eliminate untreated sewage discharges. The long-term combined sewer overflow (CSO) goal is complete elimination of untreated CSO discharges. For sanitary sewer overflows (SSO), the goal is to minimize untreated SSO discharges, recognizing that SSOs may occur in a well-designed and operated sewer system in response to large storms.

Measure: Annual volume of untreated CSO/SSO discharges. (Additional information available from WRD on CSO/SSOs)

2006 SSO in Rhode Island. (image from EPA.gov)

Comment: SSOs are releases of raw sewage from sewer collection systems, which are not designed to carry stormwater. CSOs are releases of raw sewage from older combined sewer systems designed to carry both sanitary sewage and storm water. One of the main concerns with releasing raw sewage is the discharge of pathogens that can cause illness in people exposed to downstream waters, but untreated sewage discharges also discharge nutrients.

Within Michigan, it is estimated that average total phosphorus loading from CSOs/SSOs is approximately 290,000 pounds per year (lbs/yr). To put this in perspective, the annual average phosphorus load entering the western basin of Lake Erie (averaged from 1998 through 2005) is estimated to be approximately 9.8 million lbs/yr. At the scale of the Great Lakes, this may not sound very large, but reducing this source of nutrients is important to the Great Lakes and inland waterbodies.

Goal 3, Outcome 3: Meet the total phosphorus goal in Saginaw Bay of 15 micrograms per liter (µg/L) and maintain a neutral trend in total phosphorus concentrations in the Grand Traverse Bay.

Measure: Phosphorus concentrations and trends in the Grand Traverse and Saginaw Bays.

Comment: Phosphorus concentrations in the Grand Traverse Bay do not appear to be increasing and range between 3 to 7 µg/L (Figure 1). WRD also has a metric for the Grand Traverse Bay of maintaining an annual average total phosphorus concentration of 5 µg/L.

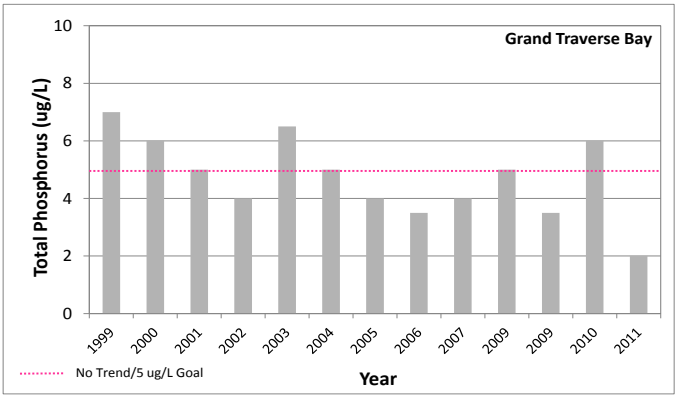

Figure 1. Annual Grand Traverse Bay total phosphorus concentrations and the WRD 5 µg/L total phosphorus metric.

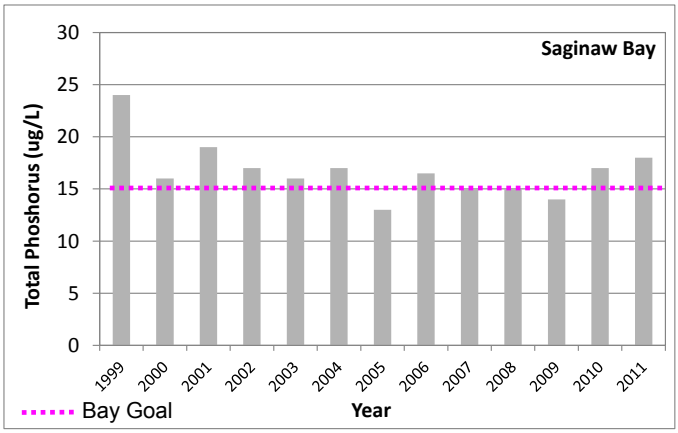

Figure 2. Annual median total phosphorus concentration in the Saginaw Bay compared to the goal of 15 µg/L.

Total phosphorus levels in the Saginaw Bay have been hovering above and below the 15 ug/L goal for the past decade (Figure 2). However, the presence of zebra and quagga mussels, changing lake levels, and other factors have altered the ecology of the Saginaw Bay. Studies to understand these changes are ongoing (and include the Saginaw Bay Coastal Initiative and GLERL Managing the Impact of Multiple Stressors in Saginaw Bay) and may necessitate a reconsideration of the 15 mg/L phosphorus goal.

Goal 3, Outcome 6: By 2020, achieve the total phosphorus targets for the following impaired lakes: Lake Allegan (60 µg/L); Lake Macatawa (50 µg/L); Ford Lake (50 µg/L); and Belleville Lake (30 µg/L).

Measure: Total phosphorus concentration in the lakes.

Comment: Total Maximum Daily Loads have been developed for all of these lakes due to historic hypereutrophic conditions and excessive expression of nutrients. These lakes are not regularly meeting the nutrient goals set in the TMDLS and nuisance algae blooms are still occurring in all of the lakes despite significant efforts to reduce phosphorus loading. The WRD monitors the lakes every other year to track in-lake nutrient concentrations.

WRD monitoring indicates that Lake Allegan phosphorus levels may be declining (Figure 3), Ford Lake and Belleville Lake may have shown some decreases in phosphorus, but still have nuisance algal blooms, and Lake Macatawa shows no evidence of declining phosphorus levels and has ongoing algal blooms (Figure 4). Reductions in point sources of phosphorus in Lakes Allegan, Ford and Belleville are likely the cause of any reductions of in lake phosphorus levels, while nonpoint source loads, which dominate the load to Lake Macatawa are much more difficult to control and show great interannual variability.

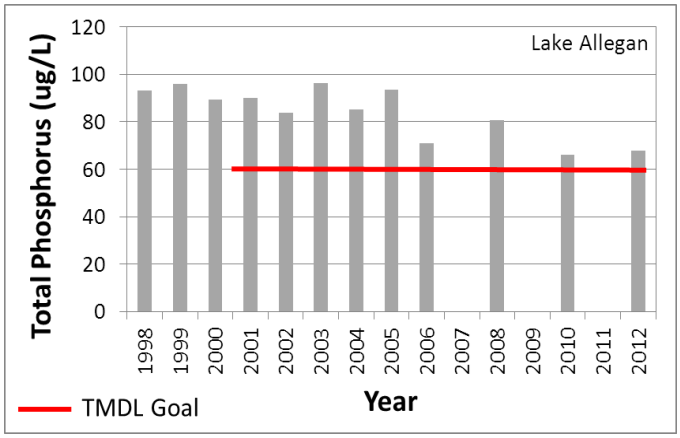

Figure 3. Lake Allegan average growing season total phosphorus concentrations and the total phosphorus TMDL goal of 60 µg/L.

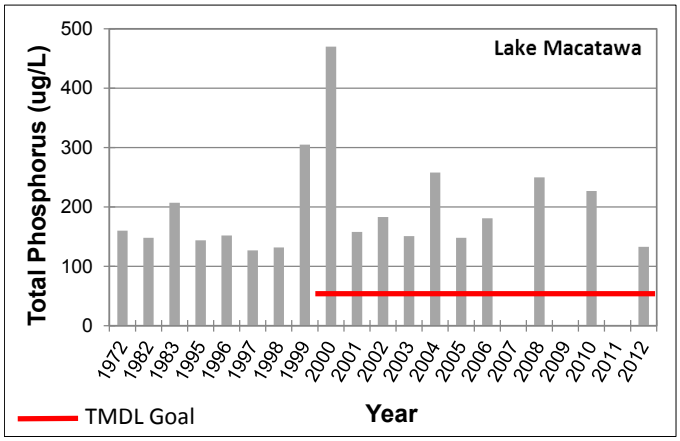

Figure 4. Lake Macatawa average spring total phosphorus concentrations and the total phosphorus TMDL goal of 50 µg/L.