Understanding Total Maximum Daily Load (TMDL)

What Is A TMDL and When Are They Needed?

A TMDL is the calculation pertaining to the maximum amount of a pollutant allowed to enter a body of water so that the waterbody can and will continue to meet water quality standards for that specific pollutant. A TMDL establishes a reduction target for a pollutant, and allocates load reductions to the source or sources of that pollutant. According to the Clean Water Act (CWA), each state must develop TMDLs for all the waters identified on their Section 303(d) list of impaired waters, according to their priority ranking on that list.

Pollutant Sources

Pollutant sources are defined as either point sources that receive a wasteload allocation (WLA), or nonpoint sources that receive a load allocation (LA). Point sources include all sources subject to regulation under the National Pollutant Discharge Elimination System (NPDES). Examples include wastewater treatment facilities, some stormwater discharges and concentrated animal feeding operations. Nonpoint sources account for all remaining sources of a pollutant, as well as natural sources. TMDLs must also consider seasonal variations in water quality, and include a margin of safety (MOS) to account for uncertainty in predicting how well pollutant reductions will result in meeting water quality standards.

How TMDLs Are Developed

The objective of a TMDL is to determine the loading capacity of the waterbody and to allocate that load among different pollutant sources so that the appropriate control actions can be taken and water quality standards achieved. The TMDL process is important for improving water quality because it serves as a link in the chain between water quality standards and implementation of control actions designed to attain those standards.

TMDLs are developed using a variety of techniques, from basic mass balance calculations to complex water quality modeling approaches. The degree of analysis can vary based on a number of factors. These include the waterbody type, the complexity of flow conditions, and the type of pollutant causing the impairment. The program is a two step process. First, states identify waters that are impaired or in danger of becoming impaired (threatened). Second, for these waters, states calculate and allocate pollutant reduction levels necessary to meet approved water quality standards. As part of the CWA, states must establish water quality standards (WQS) for waters within their borders. Such standards designate the use of the particular waterbody (e.g., recreation or protection of aquatic life), establish water quality criteria to protect the waterbody, and adopt requirements to protect and maintain healthy waters. The approach normally used to develop a TMDL for a particular waterbody or watershed consists of five activities:

- Selection of the pollutant(s) to consider.
- Estimation of the waterbody's assimilative capacity (i.e., loading capacity).
- Estimation of the pollutant loading from all sources to the waterbody.
- Analysis of current pollutant load and determination of needed reductions to meet assimilative capacity.
- Allocation (with a margin of safety) of the allowable pollutant load among the different pollutant sources in a manner such that water quality standards are achieved.
- TMDLs should clearly identify the links between the waterbody use impairment, the causes of impairment, and the pollutant load reductions needed to meet the applicable water quality standards.

EPA Approvals of TMDLs

TMDL wasteload allocations (those pollutant allocations assigned to point sources) are generally implemented through EPA's National Pollutant Discharge Elimination System (NPDES) permits under CWA section 402. This section of the Act requires that point source discharges be controlled by including water quality-based effluent limits in permits issued to point source entities. Nonpoint source load reduction actions are implemented through a wide variety of programs at the state, local and federal level. These programs may be regulatory, nonregulatory or incentive-based e.g., a cost-share program.

TMDLs and Agriculture in Colorado

Agriculture is a nonpoint source, meaning TMDLs cannot be involuntarily enforced on agricultural entities. TMDLs can only be implemented through voluntary, incentive-based programs. While nonpoint sources are exempt from involuntary enforcement, there are voluntary, incentive-based programs that encourage Best Management Practices (BMPs) to help decrease pollution from these sources. Colorado's Nonpoint Source Management Program includes the following BMP initiatives:

- Riparian Area Management
- Irrigation Water Management
- Soil Stabilization in Croplands
- Nutrient Management
- Animal Waste Management

For all nonpoint sources, states are responsible for identifying the BMPs and the specific regulatory and nonregulatory programs for enforcement, technical assistance, financial assistance, education, training, technology, etc. to achieve the implementation of the BMPs.