



# **Key EPA Internet-Based Tools for Watershed Management**

**In-Depth Level Course Tutorial**

## **Section Nine: Water Quality Models and Tools: TMDL Allocation**

**Full document available at**

**<http://www.epa.gov/owow/watershed/wacademy/epatools/>**

**Assessment and Watershed Protection Division  
Office of Wetlands, Oceans and Watersheds  
U.S. Environmental Protection Agency**

## 9. Water Quality Models and Tools: TMDL Allocation

- 9.1 Open the [Water Science Models Home Page](#).

Geared to water quality managers, this page provides access to a number of specialized models and tools. For example under Analytical Methods, EPA publishes laboratory analytical methods that are used by industries and municipalities to analyze the chemical and biological components of wastewater, drinking water, sediment and other environmental samples that are required by regulations.

### Allocating Loads and Wasteloads

When developing a pollutant TMDL, reduction allocations need to be applied to the various sources that are inputting the pollutant into the waterbody. Load reduction allocations are based on **cost effectiveness** and **equity of pollutant load reductions**. In this section, a concrete example of how a TMDL is established is provided. EPA demonstrates a **cost-minimization framework** and provides examples of load allocations and cost distributions for a case study watershed. A spreadsheet can be downloaded to use it in your own case study.

- 9.2 Click [Allocating Loads and Wasteloads](#) – first bullet under the Tools column.

This case study is of a 10,000-acre watershed (primarily rural and agricultural land) surrounding a stream reach of approximately 6 miles. The stream is impaired by fecal coliform bacteria.

- 9.3 Scroll down and click [Source Loads](#).

**Water Quality Models and Tools**

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### Case Study: Impairments and Loads

The designated use for this waterbody is secondary contact recreation, and applicable water quality criteria for fecal coliform bacteria are:

- 200 cfu/100ml - 30-day Average for each month, and
- 400 cfu/100ml - 30-day 90% upper-bound for each month
- 2000 cfu/100ml - not to be exceeded at any time.

Current instream concentrations exceed these criteria, implying the need for abatement action and load reductions. There are three principle stakeholders responsible for fecal coliform loads (see below), and a variety of [best management practices \(BMPs\) and technology options](#) are available for reducing these loads.

**Table 1: Case Study Characteristics**

Stakeholders	Bacteria Sources ( <a href="#">details</a> )
Hog and Dairy Operations	Manure Applied to Cropland
Beef Cattle	Runoff from Dry Lots, and Cattle Wading in the Stream
Wastewater Treaters	Failing Septic Systems, and Wastewater Treatment Plant

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In this example, there are three stakeholders identified in the TMDL study who are responsible for fecal coliform loads. They each have to take on **load reductions** (changes in their management practices to reduce discharges of fecal coliform into the stream).

9.4 Click [best management practices \(BMPs\) and technology options](#) - an overview of different management techniques available to each source to reduce their pollutant loading is provided.

9.5 Click the **Back** button.

9.6 Click [Modeling Framework](#) in the right-hand box.

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The decisions of how to allocate reductions among the three sources must be negotiated and are ultimately policy decisions. They will reflect acceptable tradeoffs between these measures. As an example, allocation strategies that *minimize* costs may be weighed against allocation strategies on the basis of *equal load reductions*. A TMDL includes *optimization*.

Optimization consists of an iterative search for an optimal solution. The process begins by selecting values for a certain management decision scenario. Then the cost distribution and water quality concentration distributions are determined. If water quality criteria or constraints are not satisfied or if the objective is not being met, the optimization would be worked up again by selecting new values for decision variables. Iterations continue until criteria, constraints and objectives are met.

Instead of running time-consuming hydrology models, these allocation scenarios come up with *impact coefficients* based on source pollutant load levels. The impact coefficients are surrogates for running the hydrology model and help to develop an optimal pollutant load reduction allocation. The spreadsheet model can be customized to apply to any comparable situation.

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