

Description of the WTM

The Watershed Treatment Model (WTM), version 3.1 (Caraco, 2002) is a simple spreadsheet model typically used to:

- Estimate pollutant loading under current watershed conditions
- Determine the effects of current management practices
- Estimate load reductions associated with implementation of structural and non-structural management practices
- Evaluate the effects of future development

The model has two basic components: Pollutant Sources and Treatment Options. The *Pollutant Sources* component of the WTM estimates the load from primary land uses (i.e. residential, commercial, forest land) and secondary sources (i.e. active construction, managed turf, channel erosion, illicit connections) in a watershed without treatment measures in place. The *Treatment Options* component of the model estimates the potential reduction in this uncontrolled load if various treatment measures (both structural and nonstructural) are used. The WTM can examine a wide suite of treatment measures that are not typically tracked in models such as SLAMM and SWMM (see Table 1). The WTM allows the user to quantitatively examine how these practices can most effectively be combined to reduce pollutant loads.

Table 1. Menu of Treatment Options Evaluated in WTM
<ul style="list-style-type: none"> • Stormwater treatment practices (STP): STPs for new development, retrofits
<ul style="list-style-type: none"> • Stormwater management program practices: lawn care education, pet waste education, street sweeping, impervious cover disconnection, riparian buffers, catch basin cleanouts, CSO/SSO repair/abatement, illicit connection removal
<ul style="list-style-type: none"> • Erosion and sediment control
<ul style="list-style-type: none"> • Better site design
<ul style="list-style-type: none"> • Non-Stormwater—Septic system education, septic repair/inspection, septic system upgrade, marina pumpout, point source treatment

The model is based on the Simple Method (Schueler, 1987) for pollutant load calculations where impervious cover is used to estimate primary loads from various urban land uses. Loading for rural areas uses literature reported values and is primarily based on the area dedicated to row crops. Specific concentration assumptions used for urban/suburban loading estimates in the WTM model are based on values for different land uses summarized in the National Stormwater Quality Database (NSQD), a summary of national stormwater data from over 200 communities nationwide (Pitt et. al., 2003). Estimated runoff volumes are multiplied by pollutant concentration data to compute stormwater loads. All loads are computed based on an annual time step.

The *existing management practices* and *future management practices* components of the WTM assess the ability of the treatment options in a watershed to reduce the uncontrolled pollutant loads from primary and secondary sources. The pollutant removal efficiencies associated with various structural and nonstructural urban stormwater management practices are based on existing research and studies in the National Pollutant Removal Performance Database for

Stormwater Treatment Practices (Winer, 2000) and research compiled in the WTM (Caraco, 2002). The existing management practices component is based on information provided by Westchester County and observations made by CWP. The future management practices function of the WTM will be used in the subwatershed treatment analysis to evaluate recommended practices throughout the watershed.

A unique feature of the WTM is the inclusion of *treatability* and *discount* factors. Treatability is the fraction of a source that can be treated by a practice. For structural practices, treatability is best defined as the area that can be treated, while for education programs, it may reflect the fraction of the population that can be reached. The model uses discount factors to account for various levels of implementation, maintenance, and design criteria, in order to provide a more realistic implementation scenario and to avoid double counting management practices that occur in series or on the same site. Discount factors are applied to potential load reductions to account for imperfect practice application and upkeep, inability of educational programs to reach all citizens, and inadequate funding to implement all practices, to name a few.