PART FIVE: SUMMARY OF IMPAIRED WATERS

Total Maximum Daily Load (TMDL) Program

Under Section 303d of the Clean Water Act, all states are required to develop lists of impaired surface waters. These impaired waters are lakes, ponds, rivers and streams that do not meet the water quality standards developed by each individual state. In Vermont, these waters are described on the state's Part A 303d List of Impaired Waters in Need of a TMDL. The Clean Water Act requires that a Total Maximum Daily Load (TMDL) be developed for impaired waters on Part A of the list and the list provides a schedule as to when TMDLs will be completed.

A TMDL is the calculation of the maximum amount of a pollutant that a waterbody can receive and still meet the water quality standards. A TMDL serves as a plan that identifies the pollutant reductions a waterbody needs to meet Vermont's Water Quality Standards and develops a means to implement those reductions. TMDL determinations are unique to each individual waterbody but the general process by which they are developed can be summarized in the following manner:

Problem Identification ▪ the pollutant for which the TMDL is developed must first be identified. Examples might include sediment that impacts habitat for aquatic organisms, nutrients that cause excessive algal growth, or bacteria that creates an unsafe environment for swimming.

Identification of Target Values ▪ this establishes water quality goals for the TMDL. These may be given directly in the Water Quality Standards or may need to be interpreted.

Source Assessment ▪ all significant sources of the pollutant in question must be identified in the watershed. This often requires additional water quality monitoring.

Linkage Between Targets and Sources ▪ this process establishes how much pollutant loading can occur while still meeting the water quality standards. This step can vary in complexity from simple calculations to development of complex watershed models.

Allocations ▪ once the maximum pollutant loading is established, the needed reductions must be divided among the various sources. This is done for both point sources and nonpoint sources.

Public Participation ▪ stakeholder involvement is critical for the successful outcome of TMDLs. Draft TMDLs are also released for public comment prior to their completion.

EPA Approval ▪ EPA approval is needed for all TMDLs as required by the Clean Water Act.

Follow-up Monitoring ▪ additional monitoring may be needed to ensure the TMDL is effective in restoring the waters.

Table 5.1 appearing on the next page is provided as a summary update of overall TMDL progress since 2001. During the 2006 305b reporting period, TMDLs were completed and approved concerning 7 low pH impaired waters (due to atmospheric deposition). Also during the 2006 reporting period, one draft TMDL was prepared concerning a stormwater impaired waterbody. Table 5.1 is also an expression of future TMDL direction for Vermont. Readers of this report are referred to the 2004 305b Report which contained a brief summary of two significant developments regarding previously approved TMDLs (Lake Champlain-phosphorus and 30 acidified lakes).

Table 5.1. Update on Vermont TMDL Projects.

Segment	Pollutant & Waterbody ID number	Project Status	Projected TMDL Submittal
Acid Impaired Waterbodies	pH 7 ponds	TMDLs Complete	EPA Approved (9/04)
Acid Impaired Waterbodies	pH 30 ponds	TMDLs Complete	EPA Approved (9/03)
Lake Champlain	Phosphorus 9 segments	TMDL Complete	EPA Approved (11/02)
Styles Brook (Stratton)	Sediment 11-15	TMDL Complete	EPA Approved (6/02)
Trib #1, N. Branch Ball Mtn. Brook (Stratton)	Sediment 11-15	TMDL Complete	EPA Approved (6/02)
Black River (Ludlow)	Phosphorus 10-14	TMDL Complete	EPA Approved (5/01)
Winooski River (Cabot)	Pathogens 08-09	TMDL Complete	EPA Approved (3/01)
Stormwater Impaired Waters	Approx. 17 segments	Developing TMDL protocols based on setting hydrological targets versus relying solely on pollutant loading targets	Initial draft TMDL submittal occurred in 11/05 (Potash Brook); other TMDLs to follow in 2006

Development of Stormwater TMDLs

For the last two and a half years, the Water Quality Division of DEC has been working collaboratively to develop TMDLs for the 17 stormwater impaired waters identified on the Vermont 303d List of Impaired Waters. The genesis of the current approach came about when the Vermont Water Resources Board initiated a docket hearing process to explore the scientific uncertainties in remediating stormwater-impaired waters. The docket hearings drew a large number of participants from the business community, consulting groups, EPA, state agencies, environmental groups and the general public. The Board's conclusions are set forth in a document entitled *"A Scientifically Based Assessment and Adaptive Management Approach to Stormwater Management"* (Stormwater Cleanup Plan Framework, 2005). The primary outcome of the docket proceedings was general agreement regarding the scientific uncertainties involved in remediating stormwater-impaired waters.

Additionally, a design was formulated using hydrology and sediment as surrogates to predict how the aquatic biota in impaired waters will respond to stormwater controls, making it feasible for ANR to develop and implement TMDLs for stormwater impaired waters.

This Framework identified a reference watershed approach whereby hydrologic targets are developed by using similar "attainment" watersheds as a guide. The agreed upon concept was that if the hydrologic and sediment dynamics of the impaired streams are brought into closer alignment with attainment streams, the aquatic biota will respond positively to the resulting better habitat conditions.

The first step in using this attainment stream approach was to select appropriate attainment streams, which, ideally, are as similar to the impaired watershed as possible in physical makeup, such as slope, soils, climatic patterns, channel type, and land use/cover, etc. Since all of the lowland stormwater-impaired streams are located in the Lake Champlain Valley, a collection of similarly located streams were identified as a pool from which the most representative attainment watersheds could be selected for each stormwater-impaired watershed.

Next, modeled hydrologic regimes of existing conditions for both the impaired and attainment streams were developed; achieved by applying the P8-Urban Catchment Model to all the streams. Flow output from this model was utilized to develop flow duration curves (FDC) which give a picture of the long term hydrologic conditions in any given watershed. The differences in particular measures within the FDCs (i.e. high and low flows) between impaired and attainment streams provides insight as to the extent of stormwater controls necessary to bring the impaired waters into compliance.

With the FDCs for all attainment and impaired streams in hand, a statistical approach was developed cooperatively by researchers at the University of Vermont and DEC that allowed the selection of the most appropriate attainment streams for each stormwater-impaired stream. Using this approach, watersheds were grouped based on intrinsic similarities that effect flow, resulting in attainment streams being grouped with the most similar stormwater-impaired streams. Within each group, the attainment stream FDCs represent a hydrologic regime that will likely support healthy aquatic life and thus the attainment of the Vermont Water Quality Standards.

From the extensive efforts involved in the above steps, the necessary information was derived allowing the development of hydrology-based TMDLs for the stormwater impaired streams in Vermont. Upon completion and approval by EPA, these TMDLs will provide the targets necessary to develop stormwater implementation plans for each individual watershed. These plans will specify stormwater control actions necessary to meet the TMDL derived hydrologic targets and, therefore, ultimately attain the applicable Vermont Water Quality Standards.

Overview of the Vermont 2006 Priority Waters List - including Section 303d List of Waters

Development of the 2006 Section 303d List of Impaired Waters is a process that is ongoing and concurrent to the development of the 2006 Section 305b Report. Consequently, neither the draft nor final 2006 303d listing have been included in this report. The 2006 303d list will assume a content and format similar to the 2004 list. Appendix C describes Vermont's 2006 Listing Methodology.

The 2004 303d List of Impaired Waters was approved during the 2006 305b reporting period (EPA approval on July 19, 2004). The 2004 303d List of Impaired Waters has been made available separately and can be inspected on the Water Quality Division's web site: www.vtwaterquality.org.

A brief summary of the Vermont Priority Waters List, which identifies and tracks both impaired and non-impaired waters is given in Table 5.2. It should be noted that the Section 303d List of Impaired Waters is only a portion of the overall Vermont Priority Waters List. Much of the Priority Waters List process occurs outside the scope of Section 303d. It is important to be aware of the overall listing process because it is indirectly involved with and directly referred to in the 303d listing process. Table 5.2 gives an overview of all the sections of the Priority Waters List. Part A, the single component of the 303d List of Impaired Waters, has been highlighted.

Table 5.2. Overview of Vermont Priority Waters List.

Vermont Priority List Section	Description	Included as Part of 303d Listing?
Part A	Impaired Waters in Need of a TMDL	***Yes***
Interim List	Candidate Waters for Section 303d De-listing	Yes, until EPA approval; after approval these waters are removed from 303d; EPA approved 303d list does not include de-listed waters
Part B	Impaired Waters - No TMDL Required or Needed	No
Part C	Surface Waters in Need of Further Assessment	No
Part D	Waters with Completed and EPA Approved TMDL	No
Part E	Surface Waters Altered by Exotic Species	No
Part F	Surface Waters Altered by Flow Regulation	No
Part G	Surface Waters Altered by Physical Channel Changes/Adjustments	No

A summary of the number of waterbody segments listed as impaired on the year 2004 listings is given in Table 5.3. The Vermont Year 2004 303d List of Impaired Waters (i.e. Part A) was approved by EPA on July 19, 2004.

Table 5.3. Number of Impaired Segments (taken from Year 2004 listings).

Impaired Segments	Lakes & Ponds	Streams & Rivers	Total
Listed in Part A – impaired waters needing a TMDL (newly listed waters in 2004 are given in parentheses)	44 (1)	111 (5)	155 (6)
Listed in Part B – impaired waters not needing a TMDL (newly listed waters in 2004 are given in parentheses)	0	13 (1)	13 (1)
Total number of impaired segments	44	124	168